Designing a Gamified Theory-Driven System Model for Postgraduate Research Students to Encouraging Progression and Social Connectedness

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Abstract: Postgraduate research students often feel isolated studying in their own topic and the long-term effect of isolation and lack of social connectedness brings negative impacts e.g. dropping out from the research program. Gamification is defined as the use of game design elements in non-gaming environments. It is envisaged that the two main classes of game elements to guide postgraduate research students along the journey are progression and social. We propose a system model using these two main classes of game elements to progress and connect postgraduate research students in increasing their learning efficacy and socializing among other postgraduate research students. Our proposed system model is grounded in the recent research presenting that one can be inspired extrinsically through fulfilment of the three basic psychological needs known as autonomy, competence and relatedness and these are influenced by autonomy support. Our future effort is to utilize this proposed system model to deploy and implement the system model to a prototype of an app and demonstrate empirically that it delivers a positive impact on postgraduate research students' satisfaction and completion of their program.

Keywords: Postgraduate research students, motivation, progression, social connectedness, theory

1. Introduction

The number of students worldwide enrolled in higher education is 131 million and this will more than double by 2025 (World University News, 2012). Postgraduate programs can be divided into two cohorts: Taught e.g. MSc, MCom etc. and by Research e.g. MRes, MPhil, PhD etc. In 2012, there were an estimated 1,284,000 PhD students in the European Union, the United States, and Japan. Of these, there are 717,000 PhD students from European Union-28 (EC Europa report, 2012). In Ireland, 38,000 students are studying at postgraduate level. 8,413 of these students study at a postgraduate research level: 887 MRes and 7,526 PhD (IUA report, 2015). In a taught postgraduate course, it is usually quite easy for a student to gauge progress e.g. grades in class tests and continuous assessment. On the other hand, postgraduate research students can feel isolated as they study their own research topic and get few chances to share their ideas. They can be surrounded by loneliness/isolation. Loneliness is a devastating psychological condition. (Cacioppo et al., 2008) The long term/chronic loneliness brings health problems i.e. lonely people are more likely to have high blood pressure and stress (Miller, 2011). Postgraduate research students can struggle to fight the feeling of overwhelming loneliness/isolation (Ali & Kohun, 2006). It can be expected that the long-term effect of isolation and lack of social connectedness in the research study bring negative impacts e.g. delay in completion as well as dropping out from the research program.

Technology can be used to support behavioural change e.g. learning through persuasion. Two primary ways influence the techniques of persuasion, external and internal behavior. Most persuasive applications concentrate on external behavior (Torning & Kukkonen, 2009) e.g. blended e-learning application for learners (Noour & Hubbard, 2015). The reason for this is that external behaviours are more tangible, accessible and thus, convenient for influencing. In recent times, persuasive applications have been designed for psychological influence, e.g. game mechanics to inspire students to progress in their study in the context of learning environment (Hanus & Fox, 2015). Gamification is the use of game design elements in non-gaming environments (Deterding et al., 2011). The approach behind the gamified application is to enhance engagement in learning, social habit, and progression. Gamification has been shown to help students within an institution to improve learning performance (Geelan et al., 2015). Game elements (badges, reward points etc.) have been used to help with social connection e.g. Health Month (Health Month, 2016) in which users choose rules for health-related behaviour for one month, and win or lose points and badges based on those rules, as well as receiving and giving support and encouragement through a social platform. However, little is known about game elements

concerning postgraduate research study completion. Recent research discovered methodological limitations on gamified learning systems – *"proper psychometric measurements, absence of motivational affordance, psychological and behavioural outcomes*" (Hamari et al., 2014). This leads to the question: Can we integrate a psychological construct in designing a system model for postgraduate research students' progression and social connectedness? For this approach, Self-Determination Theory (SDT) was selected from established theories present in literature. SDT brings the ability to control one's behaviour to give encouragement by the three basic psychological needs of autonomy, competence, and relatedness. We introduce a system model by using these psychological needs influenced by autonomy support to motivate postgraduate research students in their research journey (through progression and social connectedness) in a research environment.

The paper is organized into four sections. Section I is the introductory part. Background of the study is presented in Section II. Section III presents system model design adopting SDT and directions in further research work. Lastly, Section IV concludes the paper.

2. Background

2.1 The Feeling of Isolation

The sense of isolation is a key aspect that leads to higher dropout rate (Hawlery, 2003). Researchers have suggested fully addressing the sense of isolation while designing research programs (Lovitts & Nelson, 2000). Most research programs are deprived of detailed design features that handle this feeling of loneliness/isolation among the enrolled postgraduate research students (Hawlery, 2003; Lovitts & Nelson, 2000). Past research showed little knowledge as to why postgraduate research students are dropping out (Hawlery, 2003; Lovitts & Nelson, 2000) and the emotional aspect is usually ignored when discussing dropping out (Ali & Kohun, 2006). When the emotional aspects are ignored, students are left alone to fight emotional issues (Bess, 1978). Out of those emotional issues, a feeling of isolation is experienced by postgraduate research students during their research journey (Lewis et al., 2004). Studies have confirmed that the feeling of isolation is the key concern for dropping out among postgraduate research students (Hawlery, 2003; Lewis et al., 2004).

The feeling of isolation occurs at different stages of the research programs (Ali & Kohun, 2006). Two main issues lead to the development of isolation among postgraduate research students. Firstly, they start feeling isolated due to the confusion caused by the program structure and its requirements. Secondly, lack of communication (student-to-student and student-to-faculty) occurs throughout several segments of the research program. Miscommunication occurs due to a failure to communicate e.g. failure to communicate ideas on program structures among students/faculty members. The feeling of isolation has been divided into four stages to explain its development: pre-admission to enrolment, the first year of a program, the second year through candidacy and the dissertation stage (Ali & Kohun, 2006).

During the pre-admission to enrolment stage, postgraduate research students start reviewing guides of research programs. This stage begins early in the process when the student is reviewing pamphlets. Pursuing a research degree includes a different journey to that of taught courses. Therefore, a different type of psychological need is to be found in the postgraduate research students in their first year of the program stage. During the second year through candidacy stage, they often take modules that are related to their research programs. Postgraduate research students get accustomed to these modules prior to their previous experience in the taught degree level. The dissertation or the conference paper writing stage is the most intense level of the feeling of isolation. The reason is that on the stage of the dissertation, communication lies only within a few individuals (Ali & Kohun, 2006). Postgraduate research students write up their practical tasks e.g. thesis and progress report etc. and within this process, they find themselves alone. Thus, postgraduate research students find it difficult to progress. Our study focuses on the dissertation/thesis writing up/research paper writing for publication stage. Many factors influence postgraduate research students' completion rates, including academic ability, availability and type of financial support, support networks of friends, family, peers, and departmental culture. It is hypothesized that sense of progress and sense of social connectedness are key factors both of completion and of the overall satisfaction of the postgraduate research students' experience.

2.2 Progression and Social Connectedness of Postgraduate Research Students

2.2.1 Progression

Employee's positive emotions, strong motivation, and favorable perceptions have been emphasized to boost their inner work lives (Amabile, 2011). Moreover, researchers suggested various progression tips in working life and highlighted the following: understand that inner life matters, celebrate progress every day, deal with setbacks constructively, supply catalysts to support progress, supply nourishers to support inner work life, build on progress, sweat the small stuff, minimize the negative, take your foot off the gas (once in a while) and keep a daily journal (Amabile, 2011). Postgraduate research students have different phases of progress or milestones on their journey e.g. formulating research questions, finding the right method, selecting the sample, collecting data and writing up the paper for thesis/publication etc. It can be predicted that the published paper is one of the key milestones for postgraduate research students to progress in their research path. Taking into account the progress of postgraduate research students, our study design concentrates on using the above key progress tips such as focusing on postgraduate research students' daily progression level such as tracking every day's positive and negative experience, what successes are available on a daily basis? From the perspective of postgraduate research students, progress means encouraging them in self-expression, whether they do their task to write up the papers for thesis/publication as well as complete the research program. Research degrees last more than a year and in this long period can postgraduate research students divide their task into several segments and can they do the task on a daily or weekly basis?

2.2.2 Social Connectedness

In the sphere of multidisciplinary research, it is important to have a surrounding to which researchers can associate and transmit for a better research outcome. The postgraduate research student with whom other postgraduate research students collaborate might not have the same educational background. Hence, it is essential to make an encouraging network platform that can be called on to contribute experience in the multi-disciplinary environment (Stobbe et al., 2013). A strong network platform becomes all important component for future coaction, taking the next steps in one's career and this is how socialization is must of ensuring more interaction among network participants (Stobbe et al., 2013) e.g. postgraduate research students. Social connectedness facilitates a flexible environment to which participants e.g. postgraduate research students share ideas, gather and connect to form collaborations (Stobbe et al., 2013). In a social atmosphere, research trainees or postgraduate research students "*acquire the values and attitudes, the interests, skills, and knowledge, in short the culture, current in the groups of which they are, or seek to become a member*" (Merton et al., 1957). Further, efforts could be made to emphasize a networking platform for the socialization of postgraduate research students in everyday research and scholarly activities (Weidman et al., 2001) e.g. sharing their values, ideas, every day's thoughts and experience.

Motivation is an interest for gamification researchers to create theories of motivation using game elements (Malone, 1981). In our study, we used established motivational theory- SDT to encourage postgraduate research students in their daily tasks and socialize among other postgraduate research students. The term 'SDT' is very popular in the learning and education domain. In SDT, behavioural change process can be described as autonomy support, psychological needs and motivation (Deci & Ryan, 2000). Autonomy support means an individual has the option to view his/her social environment, facilitating choices, and decisions and hence admits individual's view while suggesting varieties (Deci & Ryan, 2002). The psychological needs of an individual are satisfied through autonomy, competence, and relatedness that are influenced by the higher level of autonomy support. Autonomy is defined as *"the perceived origin or source of one's own behavior"* (Deci & Ryan, 2002). Competence means *"feeling effective in one's ongoing interactions with the social environment and experiencing opportunities to exercise and express one's capabilities"* (Deci & Ryan, 2002). The last need relatedness is the desire to be connected to others (Deci & Ryan, 2000). A higher level of self-determination motivation is the outcome of these three psychological needs. The motivation found in SDT are of three types termed as intrinsic, amotivation and extrinsic. Intrinsic motivation is motivation to do something because it is naturally interesting or enjoyable (Deci & Ryan, 2000). Amotivation means the absence of willingness (Deci & Ryan, 2000) e.g. to join in progression and socialization. Extrinsic motivation refers to the willingness to do a task because of benefits or rewards from completing that task (Deci & Ryan, 2000). In the learning context, SDT has been used but not in the SDT sequence i.e. autonomy support – psychological needs – self-determination motivation.

Motivating learners is the central concept to understanding academic progress (Pintrich, 2003) and can be beneficial to support postgraduate research students in completing their journeys such as progress and social interaction. Motivating the postgraduate research students has been identified as the key idea to explain the reason of completing research studies such as MRes, MPhil and PhD (Bair & Haworth, 2005; Ivankova & Stick, 2007). Out of those established motivational theories, SDT has confirmed its core value given the background of education and learning (Ryan & Deci, 2009).

Figure 1. Approach of SDT sequence (autonomy support– psychological needs – self-determination motivation).

Recent research has shown that SDT is widely used to motivate learners (Noour & Hubbard, 2015). A model has been proposed and tested for online learner motivation that integrates SDT (Chen & Jang, 2010). This model was particularly designed for the online learner, did not think about the social connectivity among online learners and did not use the gamification techniques. In this model, relatedness support (one of three psychological needs of SDT) was not involved. SDT brings advantage to address learning problems (Noour & Hubbard, 2015) e.g. postgraduate research students' progression and social connectedness in the research environment. Our study is specifically designed for postgraduate research students and we propose a system model using gamification techniques by adopting SDT theory to direct them to progress and socialize among other postgraduate research students. Past research has shown little empirical evidence in facilitating learning and involvement of postgraduate research students while designing the system followed by a theoretical framework. Our research shall contribute to overcoming this mentioned limitation by proposing a theoretical system model and a future direction to design and develop a system followed by the pilot study.

3. Designing the System Model

Progression can motivate research students to interact with others as well as progress in their study. Socializing can motivate research students to share their thoughts and co-operate with other postgraduate research students. But they become bored if the system does not bring an advantage such as fun (Werbach, 2016). The system can become fun by winning, exploring, problem-solving, chilling, teamwork, triumphing, collecting, imagination, sharing, role playing, customization and surprise (Werbach, 2016). Surprise can be an unwanted and uncertain gift. Research has shown that the uncertainty of positive outcomes stimulates positive feelings of enjoyment and excitement (Lee & Qiu, 2009; Moon & Nelson, 2014). Our design implements the idea of a surprise to make the system fun. Four kinds of fun exist: easy, hard, serious and people fun (Lazzaro, 2004). People fun deals interacting with the users and creating fun to participate. It also opens the corridor for users to compete, co-operate and perform well among other users. People fun facilitates a multi-user gaming environment to enhance user-to-user social interaction (Lazzaro, 2004). Thus, we design to encourage users i.e. postgraduate research students to interact socially and progress in their study. Not all game elements e.g. rewards are fun for postgraduate research students. Leaderboards, badges and competition mechanics do not improve educational outcomes and at worst can harm motivation, satisfaction, and empowerment. These elements are suggested for future study on, particularly game elements (Hamari et al., 2014). Gamification research should investigate particularly game elements i.e. to identify a very particular game element for a very specific task.

Out of the game attributes or game elements found in the literature, we have selected possible game elements. The reason for this is that our study deals with the isolation problem of postgraduate research students leading to increasing dropout rates. We hypothesize that two key factors (progress and social connectedness) influence postgraduate research students' completion rates. The following game elements deal with social interaction and progress to achieve a goal and we assume that these game elements will boost the key factors (progress and social connectedness) to lessen the feeling of isolation among postgraduate research students.

Table 1. Examples of possible game elements of the system model.

Game Elements	Reference
Assessment (points, badges, feedback, goals)	Chen & Michael, 2005; Kim & Shute, 2015; Wilson et al., 2009
Social interaction (social display menu, leaderboards, ranking badges)	Prensky, 2001
Progress (progress bar, progress graph)	Owen, 2004; Fullerton, 2014
Surprise (gift, voucher)	Fullerton, 2014
User story (Characters)	Simons, 2007

Table 1. represents examples of possible game elements: Assessment/Goals, Social interaction, Progress and Surprise, and User story. Assessment means the measurement of achieving within a system. Users should see the connections between their activities and outcomes to improve performance (Wilson et al., 2009). This connection is reinforced by three forms of assessment: completion assessment, in-process assessment and mentor evaluation (Chen & Michael, 2005). Completion assessment means asking a simple question (Chen & Michael, 2005) e.g. whether postgraduate research students complete their task. In-process assessment focuses on the processes e.g. what are the steps postgraduate research students taking to complete their task? Mentor evaluation is the combination of completion and in-process assessment.

Social interaction means making a connection among other postgraduate research students and colleagues. These interpersonal activities (socializing) could be mediated by technological tools (Prensky, 2001) such as any social display in a learning system to which users see and share their activities. While talking about the progress of postgraduate research students, we recognize every small daily task that postgraduate research students accomplish. A learning system can let users monitor their activities on the system. This can be in the form of badges or achievements or even moving to a new level of tasks. An example, in a learning system, if a postgraduate research student completes one section of a literature review while writing up a conference paper, badges/achievements can be shown. The System can provide progress bars (e.g. LinkedIn has progress bar while filling account info), levels, and coins to collect—all items signifying the users are near the end goal.

User story game elements e.g. characters (Simons, 2007) could be useful to promote users' progression in their task so that they feel that they can work with others. An existing serious storytelling framework (Lugmayr et al., 2016) can be utilized to scaffolding the user story game elements. The components of serious storytelling framework are context, course, content and channel. The context is the application context, space, situation, space and situation. The course is an adaptive path to assist individual learning process. The content is the actual content of the narrative Channel is the multiplatform where media objects can be perceived (Lugmayr et al., 2016). Nevertheless, it is a possibility to use story game elements if and only if a system can become story oriented. The usage of these game elements can be mapped to the SDT specially to fulfil the three psychological needs of autonomy, competence, and relatedness.

Figure 2. Linking game elements into SDT sequence.

Figure 2. represents some of the possible game elements that can be used in the SDT sequence. The effect of the game elements can bring a sense of positive experience to the postgraduate research students by fulfilling the three psychological needs of autonomy, competence and relatedness. Psychological need autonomy is the feeling that the postgraduate research students can control their activity and can decide what to do. Game elements (assessment-points/badges and goals) convey postgraduate research students to set their own goal e.g. from one level to new level of the task. Psychological need competence is the feeling of ability to finish a task. Game elements (progress and surprise) assist them in making progress, setbacks with small little tasks for progression which leads to finish their task e.g. writing one section of the literature review. The last need relatedness is the feeling of being part of the bigger environment. Game elements (progress, social interaction) could encourage

postgraduate research students to be part of an area e.g. they can feel that their progress in writing literature review will bring cutting-edge knowledge to the society as well as become part of a social connectivity to bring new knowledge to the world by sharing their ideas and experience. The effectiveness of these game elements could be measured if these can increase the feeling of the postgraduate research students to complete their research activity, their willpower to finish a task and their need of belongingness. A higher level of self-determination motivation is the outcome of these three psychological needs is the extrinsic motivation that is naturally interesting such as rewarding points and badges. A system model can be beneficial in visualizing the above game elements in its usage to the theoretical construct SDT to generate a gamified learning system in the context of postgraduate research students' progression and social connectedness.

3.1 The System Model

Our approach in proposing the model might be one effective method for better learning systems dedicated to postgraduate research students. The approaches used are a combination of the theoretical concept of SDT, game elements (to be applied in a system) and positive outcomes (progression and social connectedness for postgraduate research students).

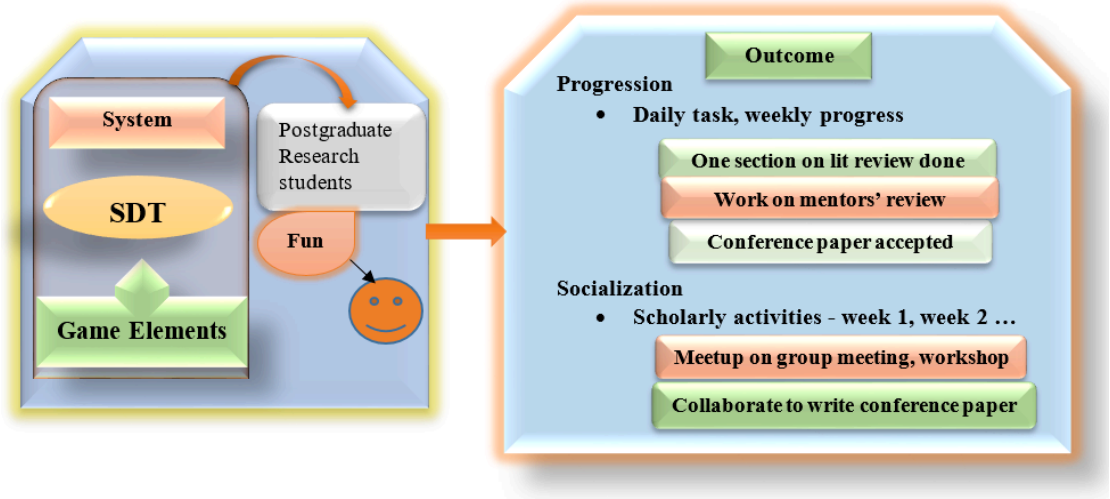

Figure 3. Proposed System Model adopting SDT.

Figure 3. represents our proposed system model that incorporates SDT. After reviewing established theories, SDT has been selected as it runs particularly as a psychological level of analysis, finding the reasons and sources of individual motivation, their reactions, emotions, and thoughts. SDT demonstrated learning environment to support the intrinsic motivation of learners by fulfilling their three entire psychological needs (autonomy, competence, and relatedness) and learners are more prospective to advance their capabilities (Ryan & Niemiec, 2009). At the core of SDT is a focus on the intrinsic inner resources of learners to integrate and self-organize knowledge under the appropriate social conditions (Ryan & Niemiec, 2009). This focus of SDT gives us the opportunity to conceptualize a system model such as our system model for postgraduate research students to integrate and self-organize their knowledge and learning. Let us consider a system in which SDT has been used and postgraduate research students update their daily tasks on the system (e.g. write one section on lit review of a conference paper with actively share research materials among other research partners). Postgraduate research students choose to write now/write later one section on literature review. They express their views and able to choose their options and thus, autonomous support has been promoted. Postgraduate research students daily write part of the literature review by sharing research materials/draft paper to others to receive comments and feedback that indicates postgraduate research students' expression of the psychological need *relatedness* as relatedness is the urge to feel connected with others (Deci & Ryan, 2000). They can also write alone the daily portion of one section of the literature review which indicates their expression of the psychological need *autonomy* as it refers *"to being the perceived origin or source of one's own behaviour"* (Deci & Ryan, 2002). They feel effective in a social network platform of the system (e.g. social interactive display- a dashboard on the system to see others' activities) that expresses the psychological need *competence* as *"feeling effective in one's ongoing interactions with the social environment and experiencing opportunities to exercise and express one's capabilities"* (Deci & Ryan, 2002).

For the motivational approach, we have carefully chosen extrinsic motivation to use game elements (e.g. rewards - scoring points to track the progress of writing a research paper). A narrative literature review was conducted to search for game elements. From seven pieces of literature, these possible game elements have been selected: assessment/goals, social interaction, progress and surprise, and user story (described earlier). We then adopted SDT (the approach of using SDT: autonomy support – psychological needs – self-determination motivation) using these game elements to build a system that brings more fun for the postgraduate research students. For progression, postgraduate research students will do their daily task and success etc. so that they can track their achievement when writing up for publishing a conference/research paper. An example of a milestone is that postgraduate research students start to write one section of the literature review. They divide the task into small steps, finish writing one section, do progress and get rewards (scoring points) in return. Similarly, other milestones can be tracked such as success in writing a conference paper once gets accepted. For socialization, they will conduct scholarly activities that can open gateways to share ideas, gather and connect. Their activities can be measured in a system on a weekly basis to monitor the level of connection among them, how they are mixing with other postgraduate research students and their feelings to meet in workshops, seminars, and other research environments. This can be done by comparative analysis of several weeks (from the first to the last week). A system followed by this model will be expected to tracking progress and socialization among postgraduate research students. The learning system will be developed iteratively using a standard User-Centered Design (UCD) process consisting of the following steps: Empathize, Define, Ideate, Prototype, and Test.

3.2 User-Centered Design Process

As the first step is Empathize, we tried to observe postgraduate research students' behaviour, engaged them through interviewing, and watch and listen to them carefully. To do this, face-to-face interviews were conducted with 11 postgraduate research students at their preferred place (research room and coffee lounge). Most of those (8) are pursuing their research study at Institute of Technology, Carlow, Ireland and the rest (3) are from different institutes in the European Union. The purpose of this interview was to summarize the views of the postgraduate research students regarding the isolation and the two key factors (sense of progress and sense of social connectedness) both of completion and of the overall satisfaction of the postgraduate research students' experience. Postgraduate research students were asked to describe their experience of progression and social connectedness e.g. how do they progress, connect with other postgraduate research students, things that might increase progress and connectedness, and what type of technological tools might be helpful to them.

9 postgraduate research students (82%) reported the lack of social connectedness and lack of progress on their research journey. 9 postgraduate research students (82%) responded to connect with others over a cup of coffee (e.g. coffee morning once a day) or meetings and rest 2 postgraduate research students (18%) responded to connect only over weekly meetings. They mentioned about the social tools: Facebook, WhatsApp that they use for connecting with other postgraduate research students. 7 postgraduate research students (64%) reported that they rely on some aspects (e.g. waiting for the lab result, wait for supervisor's review comments, a response from collaborate partners) to progress in writing one section of a lit review. Overall, 10 postgraduate research participants (91%) strongly recommended for a personalized social tool/system to which they can connect with others for socializing such as fun activities-coffee break, chatting to arrange group discussion. In the socialization menu of the system, they wanted to see the connection among others. 8 postgraduate research students (73%) described that they tried to set their own goal but suggested for a social tool to progress in their research journey i.e. divide their task into small portions for daily update (e.g. codecademy). They showed interest to use the game elements: assessment (e.g. scoring points), social interaction (social display platform with others), and progress and surprise (e.g. progress bar and voucher/gift in exchange of the scored points to buy coffee). Based on the above observation, our future research will move to the next step-Define to drawing the conclusions from the step-Empathize and will come up with an actionable problem statement. The next step will be the Ideate by which multiple ideas shall be brought to forwarding into Prototyping and then testing the prototype of an app.

An example of a system model to a prototype of an app is presented in below. Postgraduate research students can log in the system, check progress and can upload their daily task i.e. 300-word for writing a research paper (screen 1). Daily task can be submitted in the system, they can see their achievements to reach their end goal through progress bar and can reveal surprise gift e.g. coffee voucher (screen 2). They view their earned points, leaderboards with ranking badges - gold, silver and bronze (screen 3).

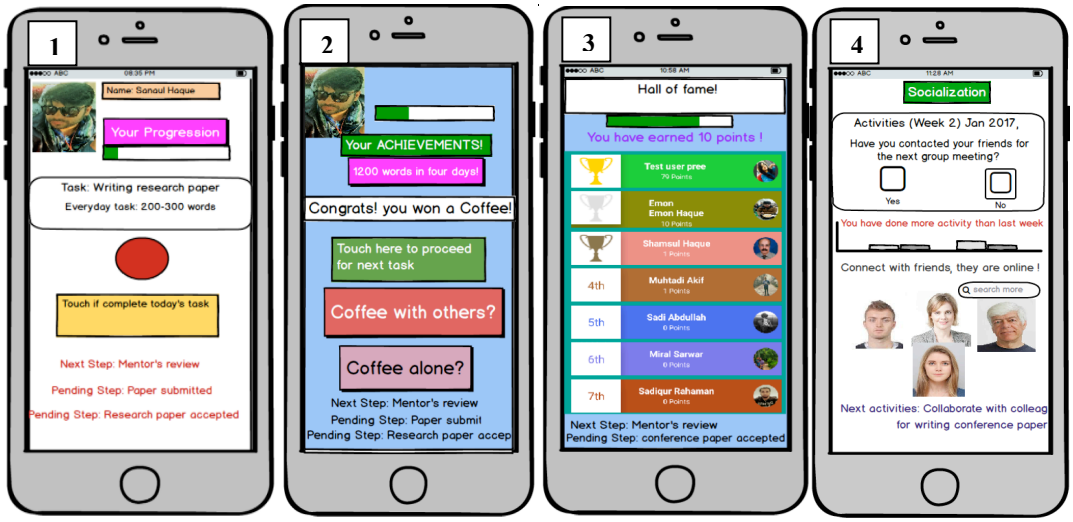

Figure 4. Mock-up UI (the system model to a prototype of an app).

The social display menu allows them to check other colleagues who are online and a chance to meet them for a coffee break as well as comparing individual weekly progress (screen 4).

3.2 Future Research

This is a work-in-progress paper. The aim of the future work is to guide the postgraduate research students on their journey using gamification techniques and to answer the following research questions: (i) What is the effect of using game elements on the postgraduate research students' sense of the postgraduate journey? (ii) What is the effect of using game elements on their sense of social connectedness? Initially, we have proposed a theory-driven system model that will be used to develop a gamified learning system. We conducted iteration of UCD: empathize and will forward for the next iterations. The future system will be developed for postgraduate research students using the UCD process (Empathize, Define, Ideate, Prototype, and Test) to visualize their progress, interact with other postgraduate research students and review their work. Users' responses will be gathered from forms built into the system. In addition, users' activity in the system will be logged automatically by the system. Postgraduate research students will use the system every day to update their activities. After building the system based on the proposed system model, a pilot study will be conducted on the postgraduate research students for a three-month period.

4. Conclusion

This paper seeks to design a model integrating SDT theory to help postgraduate research students' progress in their research journey i.e. increase in learning efficacy as well as socializing to connecting with other postgraduate research students. To build a working gamified learning system, we selected game elements from literature and presently conducting UCD process to design the system in the context of how the system will be used by the users. The game elements will be applied to a gamified system which will be designed scientifically. To do this, SDT has been selected as it runs particularly as a psychological level of analysis, finding the reasons and sources of individual motivation, their reactions, emotions, and thoughts. SDT demonstrated learning environment to support the intrinsic motivation of learners by fulfilling their three entire psychological needs (autonomy, competence, and relatedness) to progress in students' research paper writing and making connections with other postgraduate research students to overcome the feeling of isolation. In this study, we have been able to integrate the theoretical concept SDT by using game elements to encourage the postgraduate research students. We believe this model shall have positive impact on postgraduate research students' satisfaction and completion of their program.

References

Ali, A. & Kohun, F. (2006). Dealing with Isolation Feelings in IS Doctoral Programs, *International Journal of Doctoral Studies*, 1.

Amabile, T. (2011). Progress principle: Using Small Wins to Ignite Joy, Engagement, and Creativity at Work.

Bair, C. & Haworth, J. (2005). Doctoral student attrition and persistence: Ameta-synthesis of research. *Higher Education: Handbook of Theory and Research*, 19, 481–534.

Bess, J. L. (1978). Anticipatory Socialization of graduate students. Research in Higher Education, 8.

Cacioppo, J.T., Norris, C.J., Decety, J, Monteleone, G. & Nusbaum, H. (2008). In the eye of the beholder: individual differences in perceived social isolation predict regional brain activation to social stimuli. *Journal of Cognitive Neuroscience,* 21, 83–92.

Deterding, S., Khaled, R., Nacke, L. & Dixon, D. (2011). Gamification: Toward a Definition, CHI 2011, Vancouver.

Chen, K. & Jang, S. (2010). Motivation in online learning: Testing a model of self-determination theory, *Computers in Human Behavior*, 26.

Chen, S., & Michael, D. (2005). Proof of learning: Assessment in Serious Games. Gamasutra. Retrieved October 9, 2006, from http://www.gamasutra.com/features/20051019/chen_01.shtml.

Deci, E.L. & Ryan, R.M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, 11, 227–268.

Deci, E.L. & Ryan, R. M. (2002). Handbook of self-determination research. Rochester, NY.

EC Europa report, (2012). The number of PhD students [Online] Available from: http: //ec.europa.eu /eurostat/ statisticsexplained/index.php/R_%26_D_personnel [Accessed on 27 October 2016]

Fullerton, T. (2014). Improving Player Choices, Game Design Workshop: A Playcentric approach to Creating Innovative Games, CRC

Geelan, B., Salas, K.D., Lewis, I., King, C., Edwards, D. & O'Mara, A. (2015), Improving Learning Experiences Through Gamification: A Case Study, *Australian Educational Computing*, 30(1).

Habgood, M.P.J., Ainsworth, S., & Benford, S. (2005). The educational content of digital games made by children. Paper presented at the 2005 conference on Computer Aided Learning, Bristol, UK.

Hamari, J., Koivisto, J. & Sarsa, H. (2014). Does Gamification Work? – A literature review of Empirical Studies on Gamification, 47th Hawaii International Conference on System Science.

Hanus, M.D. & Fox, J. (2015). Assessing the effects of gamification in the classroom: A longitudinal study on intrinsic motivation, social comparison, satisfaction, effort, and academic performance, *Computers and Education*, 80, 152-161.

Hawlery, P. (2003). Being bright is not enough. Springfield, IL: Charles C Thomas.

Health Month (2016). Game Elements for Social Connection, [Online] Available from: http:// healthmonth.com [Accessed on 23 August 2016].

IUA report (2015). University Facts, [Online] available from: http://www.iua.ie/the-irishuniversities/university-fast-facts/ [Assessed on 25 October 2016].

Ivankova, N., & Stick, S. (2007). Students' persistence in a distributed doctoral program in educational leadership in higher education: A mixed methods study. *Research in Higher Education*, 48, 93–135.

Kim, Y.J. & Shute, V.J. (2015). The interplay of game elements with psychometric qualities, learning, and enjoyment in game-based assessment, *Computers and Education*, 87, 340-356.

Lazzaro, N. (2004). Why We Play Games: Four Keys to More Emotion without Story, XEOdesign.

Lee, Y.H, & Qiu, C. (2009). When Uncertainty Brings pleasure: The Role of Prospect Image ability and Mental Imagery, *Journal of Consumer research*, 36(4), 624-633.

Lewis, C.W., Ginsberg, R., Davies, T., & Smith, K. (2004). The experience of African PhD. Students at a predominantly white carnegie I-research institution. *College student journal*, 38(2), 231-245.

Lovitts, B.E. & Nelson, C. (2000). The hidden Crisis in graduate education: Attribute from PhD prog.

Lugmayr, A., Sutinen, E., Suhonen, J., Sedano, C.I., Hlavacs, H. & Montero, C.S. (2016). Serious storytelling – a first definition and review. *Multimedia Tools and Applications*, 1–27.

Malone, T.W. (1981). Toward a Theory of Intrinsically Motivating Instruction. *Cognitive Science*, 5.

Merton, R.K., Reader, G.G., & Kendall, P.L. (1957). The student physical, Harvard University Press.

Miller, G. (2011). Why loneliness is hazardous to your health. *Science*, 331, 138–140.

Moon, A., & Nelson, L.D. (2014). Dissecting the uncertainty effect: Do people really dislike uncertainty?.Paper presented at the Behavioral Decision Research in Management Conference.

Noour, M.A.T. & Hubbard, N. (2015). Self-Determination Theory: Opportunities and Challenges for Blended E-learning in Motivating Egyptian Learners, *Social and Behavioural Sciences*, 182.

Owen, M. (2004). An anatomy of games: A discussion paper. Futurelab.

Pintrich, P.R. (2003). A Motivational Science Perspective on the Role of Student Motivation in Learning and Teaching Contexts. *Journal of Educational Psychology,* 95(4), 667–686.

Prensky, M. (2001). Digital game-based learning. New York: McGraw-Hill.

Ryan, R.M. & Niemiec, C.P. (2009). Self-determination theory in schools of education Can an empirically supported framework also be critical and liberating? *Theory and Research in Education,* 7(2) University of Rochester, New York.

Ryan, R.M., & Deci, E.L. (2009). Promoting self-determined school engagement: Motivation, learning, and well-being. In K. R. Wentzel and A. Wigfield (Eds.), *Handbook on motivation at school.*

Simons, J. (2007). Narrative, Games and Theory. *The International Journal of Computer Game Research*, 7(1).

Stobbe, M, Mishra, T, & Macintyre, G. (2013). Breaking the Ice and Forging Links: The Importance of Socializing in Research. *PLoS Comput Biol,* 9(11): e1003355.doi:10.1371/journal.pcbi.1003355.

Torning, K. & Kukkonen, H. (2009). Persuasive system design: state of the art and future directions. Proceedings of the 4th International Conference on Persuasive Technology, Springer, 30.

Weidman, J.C., Twale, D.J. & Stein, E.L. (2001). Socialization of graduate and professional students in higher education: A perilous passage? *ASHE-ERIC Higher Education Report*, 28. Jossey-Bass.

Werbach, K. (2016). Lecture notes. Coursera [Online] Available from: https:// www.coursera.org/ learn/ gamification [Accessed on 16 Nov 2016].

Wilson, K.A., Wendy, L. Bedwell, W.L. Lazzara, E H., Salas, E.C., Burke, C.H., Estock, J.L., Jamie L. Estock, Orvis, K.L. & Conkey, C. (2009). Relationships between Game Attributes and Learning Outcomes, *Simulation & Gaming*, 40(2), 217-264.

World University News (2012). Worldwide student numbers forecast to double by 2025 [Online] Available from: http://www.universityworldnews.com/article.php?story=20120216105739999 [Accessed on 27 October 2016].