

Visualizing Learning Activities in Social Network

Thi Hoang Yen Ho, Thanh Tam Nguyen, and Insu Song^(✉)

School of Business/IT, James Cook University Australia,
Singapore Campus, Singapore, Singapore
{yen.hothihoang, thanhtam.nguyen}@my.jcu.edu.au,
Insu.song@jcu.edu.au

Abstract. Proliferation of social networks and its use in education and higher learning have become an interesting topic. In order to accommodate diverse student cohorts in the age of massification of education market, this approach has become attractive. Recent advances in learning analytics and data visualization further proved to be useful in encouraging collaborative learning. On the other hand, information of social networks can be too complex to visualize often overloading users with too much possibly unwanted information. The question is what to show and what not to show when we visualize social relationships of users. In this paper, we propose a new visualization model called learning space and develop a method for visualizing learning activities on social network in a 3D virtual learning space. We evaluate the method using questionnaires to see whether visualization of social relations of learning will improve the learning in the following ways or not: make it more fun, make it easier, motivate more. The result shows that our method of visualization of learning activities in social network made learning more fun and easier. The result also shows that it helps student engage and motivate on the subjects.

Keywords: Engagement · Motivation · Encouragement · Collaborative learning

1 Introduction

Proliferation of social networks and its use in education and higher learning have become an interesting topic. In order to accommodate diverse student cohorts in the age of massification of education market, this approach has become attractive [1]. Recent advances in learning analytics and data visualization further proved to be useful in encouraging collaborative learning.

On the other hand, information of social networks can be too complex to visualize often overloading users with too much possibly unwanted information. The question is what to show and what not to show when we visualize social relationships of users. In particular, we are interested in whether visualization of social relations of learning will improve the learning in the following ways or not: make it more fun, easier, and motivational.

In this paper, we propose a method of visualizing learning activities in social networks using a 3D virtual world platform. First we review existing literature to identify

gaps and opportunities in improving learning and teaching in educational social network. We then develop a new method for visualizing learning activities in an m-learning platform. We evaluate its effective in making learning more fun and easier as well as motivating students. Interviews and questionnaires are used for the evaluation. The result shows that our method of visualization of learning activities in social network made learning more fun and easier. The result also shows that it helps student engage and motivate on the subjects. We also observed changes in students learning behaviors. It also made easier for students to identify areas of focus for their studies. It also helped students avoid common mistakes by observing activities of other students.

2 Background

2.1 Data Visualization

One of the oldest document about data visualization was found in Turkey, 8000 years ago, it is the town map of Catal Hyuk in 6200 BC. At the time, people had learned to describe the information in graphical form so that we can understand it easier.

Visualization in general bring the huge advantage to our life in many fields. Burkhard, Meier [2] has presented a framework and model which can identify and related the key-aspects to help the communication. In this map, the target groups are presented as tubes. They found that the tube map visualization present the whole project and help the communication of a complex project with different target groups.

Jeffrey Heer has published a paper about the usage of visualization in online social network [3]. In this paper, he has presented a system which allow end user to navigate the large-scale online social networks. This model shows the connectivity of users and supports many visual feature functions for exploring the community structures. In result, author has provided the evidence of the usability of social network visualization on many purposes.

2.2 Use of Social Network for Education

Martinez et al. [4] have proposed a novel approach to evaluating the real experiences to encourage students' active and collaborative learning. This approach combines the traditional sources of data with computer logs with the social network analysis to evaluating. This proposal has provided an innovative techniques of studying. Fournier et al. [5] have presented a paper to illustrate the research methods used in exploring networked learning online. They proposed a hypothesis to analysis the online learning network and using visualization to improve the learning experiences.

2.3 Learning Analytics

Learning analytics has been examined by many researchers. Some researchers combined and analysed multiple sources of observations to provide a better understanding of learning and discovered new learning scenarios [6, 7]. Barre et al. [8] have set up

experimentations of a collaborative e-learning system to argue how tracks arising from communication tools are analyzed and how useful it is in the reengineering purposes. Mazza, Milani [9] have published a paper of their research on the usage of learning systems and gaining insights from visualisations. Authors presented GISMO system to visualize data from courses collected in real settings, and to track on the status of the student to quickly discover which individuals need more attention.

2.4 Online Learning, E-Learning, M-Learning

Song and Vong [1] have introduced the Mobile Collaborative Experiential Learning (MCEL) to allow the students to interact with the system through mobile devices or any interactive devices which have internet connection. This system gives student ability to change their state of simulating learning lab at any time anywhere to archive their goal. In result, Song and Bhati [10] have applied MCEL on experiment. Students interacted with the system by low cost SMS message. This research has been evaluated by questionnaires in terms of User-friendliness, Technical feasibility, and Cost effectiveness.

On the research of online learning systems, MOODLE is known as one of the most popular open source course management system. With over than 65 million users, MOODLE was trusted by many large or small institutions and organizations as an effective online learning and courses management platform.

2.5 Use of Social Network for Education and Online Learning

Brady et al. [11] have argued that the trend of social network usage of students is increasing and the role of distance education in expanding of college or university level. In this paper, authors have figured the possibility of non-commercial, education-based SNSs such as Ning in the context of education. By doing the survey participating by the graduated students, authors found that education-based SNSs can be the most effective method in distance learning.

Santos et al. [12] have researched on an approach to promote the online learning. In this paper, they argue the fact that with the innovation of technology, teachers and students no longer solely interact directly face-to-face. This causes a difficulty to both sides on having an overview of the class and hard to discover the students' issues in-time. Therefore, the visualization of learning activities was proposed in order to solve this problem. Although they have evaluated the usability and user satisfaction, authors also provided a future plan for further evaluation.

2.6 Methodology

In order to identify gaps in literature and opportunities, we reviewed existing literature on online learning platforms, social network, their use in education and higher learning, and visualization of learning activities in social network.

Our literature review shows that not much research has been done in the visualization of social relations in learning. Therefore, we develop methods for visualizing

education social network to investigate whether this would improve effectiveness of learning and motivational appeal, and encourage collaborative learning.

In this research, we create a survey for education social network users to find their needs, requirements and problems. An online questionnaire is created. The content covers these fields: ages, major, social network usage frequent for education purpose. With assumption of 3D data visualization for education activities, the questionnaire investigate user’s experience to define the usability of 3D learning activities visualization in terms of engagement, motivation, encouragement and collaborative. Target of this survey will be JCU students and more focused on KOPO MES online mobile learning platform users (<https://www.a.kopo.com/>). After that, we analyzed the questionnaire data to justify the usability of visualizing social learning activities and identify the need of users.

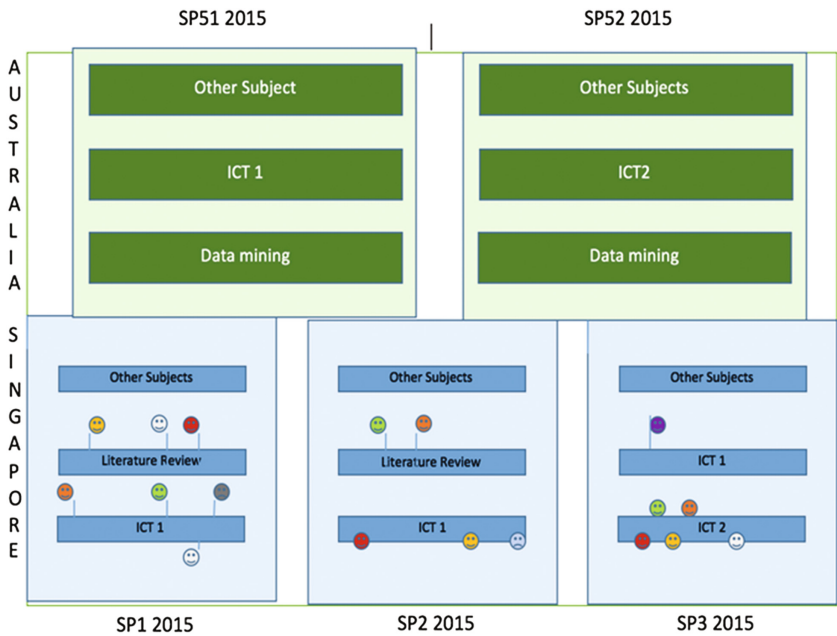


Fig. 1. Illustration of learning activities in Social Network. The activities are laid out in two dimensions: time and location. The horizontal axis represents time, such as semesters. The vertical axis represents locations. Each box represents a learning entity (a group of students in the same location and time).

Figure 1 illustrates the learning space of students in the world. Students participate in one or more learning activities in various locations and time. For instance, Fig. 1 shows two locations: JCU Singapore campus and JCU Australia campus over one year period. Students can move between campuses and same subjects offered in the two campuses but at different timing as the Singapore campus runs the tri-semester system whereas the Australia campus runs two-semester system.

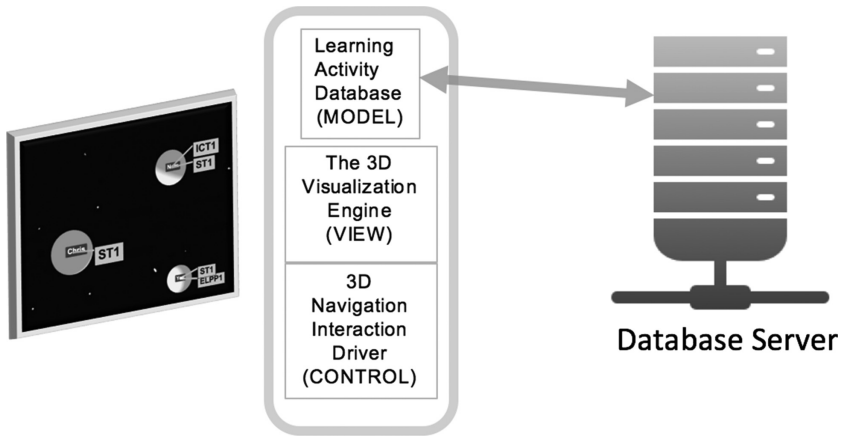


Fig. 2. The 3DLAV (Learning Activities Visualization) system of the social network is a HTML5 web application learning on any mobile devices. The system comprises of the learning activity database (model) which retrieves learning activity data from a remote server (<https://www.a.kopo.com/>), the 3D visualization engine (view), and 3D navigation interaction driver (control).

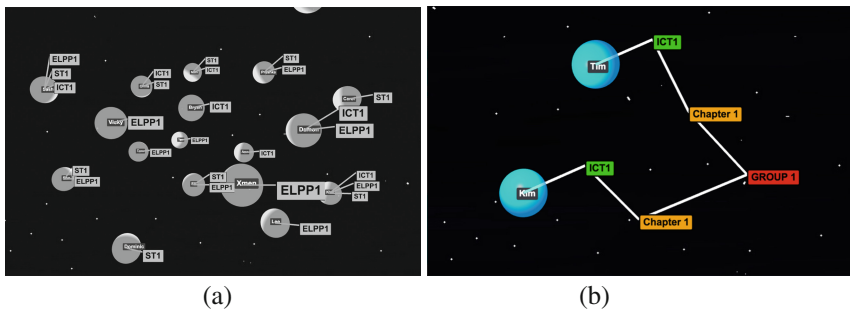


Fig. 3. Visualization of learning activities of students. Each circle represents a student and labels represent subjects and groups. Users use the standard touch interface on mobile devices and search tools to explore learning activities of other users in time and location. (b) shows that two students Tim and Kim are studying ICT1 in a same group for chapter 1.

We often find that students are interested in what other students studying, where and when. Our system is to visualize these learning activities so that students can help each other forming close student communities.

Figure 2 illustrates the proposed system for visualizing these learning activities. Users work with the 3D Navigation Interaction Driver to interact with the system, the control component will send the request to the server to retrieve the data and filled into the learning activities database model component. The 3D visualization engine uses open-source ThreeJS library to visualize the learning activities on users' computer.

Based on the survey and literature review results, we develop methods for visualizing social relations of learning using HTML5 (css3 and JavaScript) to visualize learning social network. The three.js-JavaScript 3D library is used. Figure 3 shows that each user is presented as a sphere and connected to learning activities. The spheres which have the same activities are connected together.

3 Experiment Setup

In order to evaluate the new 3D learning activity visualization system (3DLAV), we created a set of synthetic data comprising of 27 users and 3 subjects. This data is used to generate the test database for the visualization system of 3DLAV.

A group of 31 participations who are the users of KOPO MES was invited to join the experiment, but there are only 23 people actually completed the test. Participants were presented with demo and given the access to the 3D visualization system to use the system and have an overview about the topic. The twelve of them were tested with a new module to see if they are motivated or whether the system gives them a better overview. The eleven participants were tested with the subject they are studying to see whether the system motivate them in their learning, and helping them to solve the problems. Finally, they were given a questionnaire to complete. The questionnaire covers the following fields: easiness, friendliness, motivation, encouragement, collaboration and the feedback on what need to be improved of the system.

In order to prove to usefulness of 3DLAV, we proposed an evaluation methodology of using questionnaire with 3DLAV users. The USE Questionnaire (Usefulness, Satisfaction, and Ease of Use Based) is used for this survey.

The content of the survey included 2 parts: Basic information of participants and the usefulness of 3DLAV with 5 Likert Scale (Strongly agree, agree, neutral, disagree, and strongly disagree).

With assumption of 30 data visualization for education activities, the questionnaire investigates user's experience to define the usability of 3D learning activities visualization in terms of engagement, motivation, encouragement and collaborative. Target of this survey will be JCU students and more focus on KOPO MES users. After that, we analyzed the questionnaire data to justify the usability of visualizing social learning activities and identify the need of users.

4 Results

There are 60.87 % of participants from 21 and 25 years old, 30.43 % of them are from 26 to 30 years old. Most of the participants are between 21 and 30 years old. Male participants took nearly 70 % of 23 people. The several of nationalities of participants helped to increase the accuracy of the result by getting data of different cultures and different methods of study. One thing in common is they all agreed with the hypothesis of the research.

More than 80 % of participants strongly agree or agree that they have problem with finding relevant information about courses, subjects and solutions online. This shows

Table 1. Questionnaire questions and survey result. 1 is strongly agree, 2 is agree, 3 is neutral, 4 is disagree, 5 is strongly disagree.

No	Question	Count	Av score
1.	3DLAV helps me be more effective in studying.	22	1.64
2.	3DLAV helps me be more productive in studying.	22	1.73
3.	3DLAV is useful in studying.	22	1.77
4.	3DLAV gives me a good overview of courses and students.	22	1.27
5.	3DLAV gives me more control over the activities in my study.	22	2.05
6.	3DLAV makes the things I want to accomplish easier to get done.	22	2.09
7.	3DLAV saves me time when I use it.	22	1.82
8.	3DLAV meets my needs.	22	1.95
9.	3DLAV does everything I would expect it to do.	22	2.00
10.	3DLAV is easy to use.	22	1.50
11.	3DLAV is simple to use.	22	1.41
12.	3DLAV is user-friendly.	22	1.64
13.	3DLAV requires the fewest steps possible to accomplish what I want to do with it.	22	1.91
14.	3DLAV is flexible.	21	1.90
15.	Using 3DLAV is effortless.	22	1.86
16.	I can use 3DLAV without written instructions.	22	1.91
17.	I don't notice any inconsistencies as I use 3DLAV.	22	1.95
18.	Both occasional and regular users would like 3DLAV.	22	2.05
19.	I can recover from mistakes quickly and easily.	21	2.00
20.	I can use 3DLAV successfully every time.	21	1.90
21.	I learned to use 3DLAV quickly.	22	1.50
22.	I easily remember how to use 3DLAV.	22	1.50
23.	3DLAV is easy to learn to use it.	22	1.68
24.	I quickly became skillful with 3DLAV.	22	1.73
25.	I am satisfied with 3DLAV.	22	1.86
26.	I would recommend 3DLAV to a friend.	22	2.09
27.	3DLAV is fun to use.	22	1.73
28.	3DLAV works the way I want it to work.	22	1.86
29.	3DLAV is wonderful.	22	2.00
30.	I feel I need to have 3DLAV.	22	2.09
31.	3DLAV is pleasant to use.	22	1.77
32.	I believe in the future, text lessons will be replaced by visualization.	22	1.73
33.	I think visualization of the social relations of other students' learning will motivate me in learning and improve my studying.	22	1.50

a strong need of 3DLAV and the potential benefits of the project. The fact is that many of the students do not know how to use social network effectively for their studies (Table 1).

The result has proved the hypothesis, the usefulness of 3DLAV in terms of improving students' experience, making study more fun and easier as well as motivating students more.

5 Conclusion

Our survey shows that students are interested or using social media during their study in order to find how other students studying, what they are studying, what subjects they have completed.

We proposed a new visualization model called learning space. We then developed a new way of visualizing learning activities on a 3D learning space. The results are promising that students find it intuitive to navigate learning activities of other student otherwise too complex or too time consuming to navigate manually. In the future, we believe visualization will play an important role in education field. Learning will be much easier and fun than ever when social media and easy to use learning activity explorer are combined.

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