

## An Integrated VLE to Enhance Social Interaction for User-centred Active Learning

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**Abstract**—With the advent of social networking on the Internet, the great impacts of social interaction have rapidly migrated into the online world in order to enable multiple users to share opinions, insights, expertise, experiences, and interests with each other and further reduce the barriers to collaboration, skill-development, and discovery. Social networking facilitates social interaction and share of user-generated content in a collaborative environment. It has transferred the Internet into a dynamic platform for the development of innovative e-commerce and e-learning applications. Social networking has already begun to foster an intuitive and immersive virtual environment by converging Web 3D technology for enhancing user motivation and engagement. This paper presents an integrated Virtual Learning Environment (VLE) which is designed to incorporate social networking services into conventional VLEs in order to support both informal and formal learning practices required in Higher Education. A Social Virtual World (SVW) is adopted as a visual interface to access the integrated VLE since it enhance social interaction for user-centred active learning by supporting visual communication, mutual awareness and accountability. This paper further discusses and experiments some actual educational practices prototyped in the proposed integrated VLE to evaluate the valued learning experience achievement.

**Keywords**- *Social interaction; e-Learning; Virtual Learning Environments*

### I. INTRODUCTION

Humans are fundamentally social beings bounded to interact with each other by establishing empathy relations, to create groups, and to collaborative with others. Social Interaction usually follows a set of predefined behavioural patterns or models shaped by our natural abilities and rational skills to improve productivity, especially when a group of people works in a given homogeneous cultural environment [1]. Therefore, the social information obtained through interaction plays an important role in decision making and collaborative working. For instance, people would more likely purchase the best selling products (e.g. books, games, and toys) in real life because the best selling product implies that many people who have used it were satisfied with it and even were inspired by it. With the advent

of social networking on the Internet, the great impacts of social interaction have rapidly migrated into the online world in order to enable multiple users to share opinions, insights, expertise, experiences, and interests with each other and further reduce the barriers to collaboration, skill-development, and discovery.

Social networking facilitates social interaction and share of user-generated content in a collaborative environment. It has evolved and transferred the Internet into a platform for the development of innovative e-commerce and e-learning applications [2, 3, 4, 5]. Social networking has already begun to foster an intuitive and immersive virtual environment by converging Web 3D technology. As one of emerging technologies, Social Virtual worlds (SVWs) has expanded and challenged ideas of the next generation of virtual learning environments. It is important for educators to analyze and understand what the characteristics of the 21st century learners are and how learning is changing as a result of these learners' participating in these environments in comparison to the conventional static and text-oriented Virtual Learning Environments (VLEs).

In this paper, Section II firstly analyzes multimodal interaction and requirements of social interaction enhancement through social networking. It then discusses the impact of SVWs on the Internet and its applications for e-learning. Section III outlines the limitations of SVWs when being used in formal educational learning and then presents an integrated VLE which is designed to incorporate social networking services into conventional VLEs in order to support both informal and formal learning practices. A SVW is adopted as a 3D visual interface to access the integrated VLE since it facilitates social interaction for user-centred active learning by supporting visual communication, mutual awareness and accountability. Section IV discusses and experiments some actual educational practices prototyped in SVWs to evaluate the learning experience achieved in the proposed integrated VLE. Finally, a brief conclusion is drawn in section V.

### II. ANALYSIS AND REQUIREMENTS

Social networking on the Internet provides a dual-way mechanism for users, which allows them not only to read and download content in a top-down approach as before but also to write and upload online content in a bottom-up approach.

By using user friendly interfaces along with rich media, it encourages users as producers to enrich information, including video, audio and even 3D data. This stands in contrast to traditional Internet use, which limits users to browsing content that only the site owner can modify in a top-down approach. The advent of social networking is transferring the Internet into a dynamic platform for user active participation rather than a primary conventional information repository. The impact of the emerging technology has resulted in facilitating social interaction and share of user-generated content in a collaborative online environment. This section analyzes multimodal interaction on social networking and identifies the requirement of social interaction enhancement. It then discusses the impact of SVWs on the Internet and its applications for e-learning.

#### A. Social Interaction on Social Networking

As a novel medium, social networking facilitates multimodal interaction among users to improve information exploration and enrichment in collaborative way. Different social networking services focus on different aspects of human interaction. For example, MySpace ([www.myspace.com](http://www.myspace.com)) as a media-based social network allows self-publishing within users' network of friends and colleagues. Facebook ([www.facebook.com](http://www.facebook.com)) allows users to create personal profiles and build up social relationship with other users by uploading various media such as photos and videos. Wikis provide multiple users a web-based collaborative interface to edit content and add links. Blogs support regular and frequent content editing via quickly thoughts and images posting and interaction with the public. It provides a quick, responsive, and user-centred mechanism for effective collaboration. YouTube ([www.youtube.com](http://www.youtube.com)) as an online video-sharing network allows users to upload and share videos clips and give out comments on shared content.

One of the clear evolutionary trends of social networking is that these sites keep changing because there is a constant drive for extension and development as social grouping change and reformation as a result of social interaction among large numbers of users through these services. For example, while browsing a discussion forum, users may select a particular review or comment with a high rating from other users. Such decision is actually made based on observation of the activity of other users in the information space. To support coherent interaction in online environments, Erickson and Kellogg in IBM research centre developed a social translucence approach [6] which aimed at revealing and visualizing the presence and activity of users in digital environments in order to promote shared awareness and to support social processes. It emphasized the importance of perceptually-based social cues visible to their users and pointed out three key features of such systems for social interaction enhancement [7]:

- **Visibility/Co-presence:** A system should allow users to observe each others' presence and actions and further offer a sense of co-presence - "being there together" which is bound to be closely related. In

face-to-face settings, social information is used to guide interaction among users in the system.

- **Awareness:** A system enhances mutual awareness among the users through their co-presence. However, this awareness does not mean that user activities becomes total transparent. A system must protect user privacy and only reveal information that is necessary to support social awareness.
- **Accountability:** Shared awareness leads to user accountability. Since users know that they can see each others' actions, they must be responsible for their actions. This facilities user to follow social rules and conventions.

However, it is observed that most social networking services on the Internet are still heavily based on text, image and video such as blogs, wikis, Facebook, and YouTube. There is a lack of efficient ways to support rich interaction that mainly enhanced by perceptually-based social cues visible among users such as gesture, posture, and emotional expression in real time. Recently, in conjunction with Web 3D technology, social networking has already begun to foster an intuitive and immersive 3D Social Virtual World (SVW) to address these deficiencies.

#### B. Social Virtual World for E-learning

Social Virtual Worlds (SVWs) are intended to build up lively-based interactive virtual communities which represent part of reality and also leave some space for fantasy to be filled in. Users interact with each other through their emotional avatars in a 3D virtual world. One of the most successful SVWs is Second Life ([www.secondlife.com](http://www.secondlife.com)), an online social space in which users can explore, meet others, socialize, and participate in individual and group activities for educational or business purposes. Since its introduction to public in 2003, the 3D virtual community has grown explosively and today is inhabited by millions of users from all around the world. Some well-known companies start to embed SVWs into e-commerce and e-performance services [8, 9]. For example, the British Broadcasting Corporation (BBC) staged its annual 'One Big Weekend' rock concert in Second Life. Online audiences were able to see avatars of their favorite musicians, as well as watch and listen to live streams of the bands on stage in Scotland. It is agreed SVWs added a social level of interactivity for those who were unable to attend physically. Meanwhile, thanks to the popularity and success of massively multiplayer online role-playing game (MMORPG), SVWs are rapidly growing in popularity due to game-play features. These massive 3D virtual environments have been widely accepted by wide range of people and become more attractive for young generation. Millions of users spend hours in SVWs at a time socializing, competing, and most of all, learning, learning how to builds digital creative content (e.g. architecture and crafts), learning how to work as a team, learning how to make decisions, and learning how to solve problems. They enjoy engaging within learning activities and are highly motivated and stimulated in the environments.

While offering a source of entertainment for users, SVWs make huge contribution to user-centred active learning. They have begun to be used in e-learning by many institutions, such as colleges, universities, libraries, and government entities. Institutions explore SVWs for a wide range of educational activities including learning, teaching and research in order to enhance personal development skills within a collaborative and sharing virtual environment [10, 11, 12]. Researchers and educators favour the innovative learning environment because it is more personal and social than traditional e-learning. In recent, Second Life has become one of novel virtual learning platforms for major colleges and universities, including the University of Florida, Harvard, Open University, and Ohio University.

### III. DESIGN OF AN INTEGRATED VLE

Wegerif [13] emphasizes that many evaluations of asynchronous learning networks understandably focus upon the educational dimension, either learning outcomes or the educational quality of interaction, overlooking the social dimension. After identifying the requirement of social interaction enhancement and investigating SVWs for e-learning, we believe that SVWs should be adopted as a means to extend and enhance the existing VLE for user-centred active learning. Users are encouraged to become dependent on each other's knowledge and experience to the point of leading and teaching others. However, SVWs along with other social networking services have primarily made contribution to informal learning which is mainly relies on self-motivation and self-management. There are still some challenges of adopting social networking for formal learning in High Education (HE) systems which requires explicit curriculum design, indicative content development, learning material management, and learning outcome achievement [4].

This section presents the design of an integrated social learning approach for user-centered active learning in order to support both informal and formal learning practices. The approach is to propose an integrated VLE system on which enables incorporating SVWs as a new component into traditional distance learning. Figure 1 illustrates this integrated VLE which is designed to use a SVW as a visualization integration interface to present educational activities while coupling with conventional Learning Management System (LMS) such as Blackboard and student supporting system.

The integrated system is intended to carry out learning in SVWs through both formal and informal practices including seminars, workshops, group discussions, and social events which are organized and led by guided members or through peer-to-peer synchronous voice chatting, or instant messaging (IM). A SVW (e.g. Second Life) is adopted as a visual interface to access the integrated VLE for user-centred active learning since it facilitates social interaction to improve learners' motivation and engagement in learning activities by supporting visibility, mutual awareness and accountability. Such a system will make it easier for users to carry on coherent discussions; to observe and imitate others' actions; to engage in peer pressure; to create, observe, and

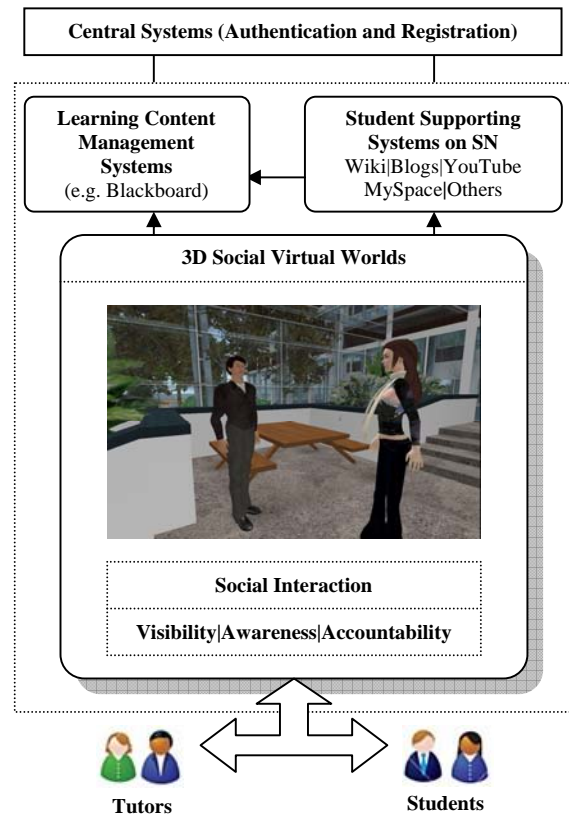


Figure 1. The integrated VLE enhanced by social interaction

conform to social conventions; and to engage in other forms of collective interaction as suggested in the social translucence approach by Erickson and Kellogg [6].

The conventional LMS such as Blackboard is responsible for hosting courses on the Internet as a supplement to traditional classroom courses. It is used for course management in this VLE and allows lecturers and tutors to upload and organize course material including course content, reading lists, assessment, and announcement similar to those used in classroom. Students can browse and download these course materials via the LMS. The integrated system relies on a customizable open architecture, authentication protocols, and a scalable design that allows the integration of other social networking services such as YouTube, blogs, and wikis in student supporting systems. These social networking services are interlinked within a SVW (e.g. Second Life) to enhance the efficiency of communication between tutors and students and further achieve real-time social interaction among students and tutors. Learning in the integrated VLE is supported by exchange of knowledge, expertise, and information through coupling with these social networking services such as writing blogs, co-editing wikis, uploading videos on YouTube, or joining MySpace and Facebook.

The integrated system allows students and tutors to download or upload learning content, and conduct course-related discussion through a 3D space that students would

like to take part in, where they not only work on course-related tasks, but also relax, socialize, and talk with others. It enables connecting students and tutors on both an academic level and a social level for supporting both formal and informal learning.

IV. EXPERIMENTS AND EVALUATION

In order to evaluate the proposed system, this section discusses and experiments some actual learning practices prototyped in the integrated VLE. In our research, a virtual campus build up in Second Life as a visual interface of the integrated VLE allows users to access a social interactive learning environment where learning practices occur including workshops, seminars, invited speeches, group discussions, and tutorial demonstrations. The virtual campus represents learning scenarios in 3D intuitive way and uses hypermedia to improve delivery of learning materials beyond text. It has capability of interlinking with LMS such as Blackboard in conventional e-learning systems and integrating with other social networking tools such as YouTube, blogs, and wikis. The methods followed to deliver lectures in a SVW are very similar to those followed in the real world like PowerPoint presentations, video tutorials, and guest lectures. But at the same time there are facilities that would be possible only in a SVW. Since educational activities are diverse, the following learning practices are chose to be prototyped in SVWs for experimental study.

1) *Role Playing Simulations*: Role-playing simulations have been popular teaching and learning methods which encourage students to enact different roles through acting rehearsals. Role-playing activities help students familiarize the situations they might encounter in their work sectors and therefore have been used extensively for training. SVWs introduce a significant shift in student-centre active learning because students are able to take on new roles in such a game-like virtual environment or expand their identities as a supplement to a real world identity. Also they have great impacts on the change of the roles of students and instructors. Students in SVWs present social information about their enacted roles and further develop their identity and knowledge both outside and inside the world by role playing. One such example would be the production of a court simulation in the virtual campus where the avatars participate in the role play involving lawyers, interest groups, and justices. This type of role-playing activity requires that students apply their substantive knowledge of constitutional law and the jurisprudence of their justice in deciding important constitutional issues. Although the simulation places extra demands on both instructors and students, the effort is worthwhile because this kind of training becomes a challenging social interactive learning practice.

2) *Social Events*: Many academic social events are organised regularly in universities in order to enhance the students' active learning experience. By taking advantage of

SVWs, we launched a virtual exhibition in our virtual campus as shown in Figure 2. The feature of 'the learner as content producer' in a SVW allows students to put their visual works (e.g. poster, animation, video) as user-generated content in the virtual exhibition centre. Students can change and replace their exhibits whenever they want. Compared to the on-site gallery show, the virtual exhibition in a SVW has great competitive advantages including low cost, removing the barriers such as limited time and space of exhibition, and being able to reach a much wider audience through the Internet. Furthermore, the learner as content producer in this SVW has greatly spurred students' motivation, enhancing their creativity and productivity. As a result, students are increasingly stimulated into active participation in social events in the intergrated VLE while achieving a student-centred active learning experience.



Figure 2. The virtual exhibition event

3) *E-mentoring/e-tutoring*: Previous research pointed out that successful mentoring demands frequent and regular interaction but all sorts of barriers such as time, work responsibilities, geographical distance and lack of trust - often reduce if not halt interaction [14]. In the case of distance learning when students are geographically dispersed, it is usually impossible for mentors and mentees to meet face-to-face regularly. A SVW as an visual interface in the integrated VLE is used to teleport students to the virtual campus. An e-mentoring system was developed in order to allow students to discuss their work with their online tutors or mentors through their 3D avatars by real time communication in the form of voice chatting, IM, and even non-verbal expressive gesture and posture. For example, as shown in Figure 3, one of our MSc students joined in an online tutorial in Second Lift while he was actually in Spain and met up his tutor based in the UK. With the utilisation of a SVW, an e-tutoring/e-mentoring system offers cost-effective solutions which impinge less upon the participants' time and effort, so that more frequent social interaction is easier to achieve and manage. It has several

advantages, including open correspondence, access to more geographically isolated regions, and efficiency of communication. As a result, students feel that the e-tutoring/e-mentoring systems in the SVW are more attractive and engaging, enabling more thoughtful and deliberate discussions with trust.



Figure 3. E-mentoring/E-tutoring

According to Gilroy [17], the formula of Valued Learning Experience = F (Pedagogy, Trust, Content, Community). This emphasized the key factors for achieving valued learning experience include a functional pedagogy for instruction, the level of trust, indicative content to be learned, and a networked community for collaborative learning. Based on the above experimental study, it is observed that the integrated VLE coupled with a SVW as visual interface has great potential to support user-centred active learning in terms of the creation, distribution, and access of learning resources, collaboration and interaction, time and location independency, roles changing (e.g. student and tutor), and learning outcomes achievement. There are many other learning practices such as workshops, seminars, and conferences, and even alumni reunions that can be prototyped and take place in the virtual campus. Based on the overall positive student feedback for these educational applications, the social advantages and student-centred learning experience offered by the integrated learning environment are seen to be strongly valued to students. With the utilization of SVW as a social portal, the integrated VLE not only allow users with specific learning requirements to be able to access and share of learning materials from dispersed locations through a visual online interface but also offer the following innovative characteristics for being a social learning environment:

- Massively multi-user participation: to enable a large number of learners joining together in shared 3D virtual environments and be able to attract new learners.
- Focus of socialisation and collaboration: to focus on interpersonal relations rather than moving around in the environment and further encourage the formation

of in-world social groups in order to coordinate and work together for a common learning objectives.

- Multimodal social interaction: to offer rich modes of real-time interaction based on perceptually-based social cues such as gesture, posture, and emotional expression to support visual communication, mutual awareness and accountability.
- Focus of self-motivation and active engagement: to facilitate self-motivated participation and attract a number of learners to actively take part in a focus group because of common learning interest.
- Share of learner-generated content: to support learners to contribute customized content and encourage sharing of learning materials generated by learners themselves as creative effort.
- Low cost participation: no fee for registration and low cost participation in SVWs.

## V. CONCLUSIONS

By introducing social interaction into e-learning that conventional VLE cannot offer, it is seen that SVWs can be used to enhance various types of learning practices for user-centred active learning. This paper has presented an integrated VLE which was designed to incorporate social networking services into conventional VLEs in order to support both informal and formal learning practices required in Higher Education. A SVW is adopted as a visual interface to access the integrated VLE since it facilitates social interaction to improve learners' motivation and engagement in learning activities by supporting co-presence, mutual awareness, and accountability. The integrated VLE has considerable advantages and strength to benefit users, including improving student engagement and motivation, offering student-centred active learning experience, and introducing socio-technical innovations. Preliminary experiments prototyped in the integrated VLE, including social events, e-tutoring/mentoring, and role-playing have produced favourable responses from academics and students. In summary, SVWs are transforming the nature of learning as social practice in a collaborative environment. Through enhancing social interaction, the integrated VLE will be able to facilitate self-motivation, active engagement, and creative thinking in user-centred active learning. More experimental educational activities will be validated in future work and these will be further evaluated through student feedback and progression analysis. It is intended to expand the social interactive VLE by integrating more academic resources and services departments in HE such as career service, library service and training centres. However, social networking also raises challenging research issues about privacy, identity and Intellectual Property (IP) [11] and even after-effects issues including how online behaviours affect users' behaviour offline in real life. Furthermore, higher level interaction (e.g. cognitive, motivational) has not yet been fully achieved in SVWs and researchers and practitioners are

now attempting to address these complex natural multimodal interaction issues [16].

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