ONLOCED
Finding Learning Resources and Communities

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Abstract: Online learning ability is enhanced when learners can have immediate access to suitable learning resources and a community of peers for collaboration is easily formed. Online Social Networks (OSNs), location information, and mobile devices can be used together to build a learning environment that can facilitate collaborative learning anywhere, anytime. To this end, in this position paper we discuss a new concept called OnLocEd, a model for it, and a R3 methodology that can be employed to build such a learning environment.

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1 INTRODUCTION

Collaborative learning is a social activity that is based on two essential components: learning resources and a learning community. In a closed learning environment, such as a traditional classroom, learning resources are mostly provided by course designers or instructors and a learning community is formed under the guidance of a central authority (e.g., university). The sense of community developed in this setting is further reinforced by the long term working relationships created as learners collaborate, often in-person, to achieve a common learning goal or share learning resources.

On the other hand, in Web-based learning (e- or m-learning) environments, both locating a resource and finding, or building, a community is less structured, often requiring initiative from individual learners. The task of locating resources or a learning community is a precursor to learning, requiring investment of valuable time and effort. The burden of these precursory tasks can de-motivate learners from utilizing the potential of collaborative learning or avail the flexibility of an open learning environment.

In this position paper, we argue that Online Social Networks (OSNs), location information, and mobile devices can be used collectively to help learners build or partake in a community and locate learning resources which will provide support for collaborative learning activities anywhere, anytime. The motivation for this paper comes from our recent development of an online social navigation network (SoNavNet) (Karimi et al., 2009). SoNavNet embodies the concept of Location-Based Social Networks (LBSN) which combines OSNs and location awareness and can be accessed through mobile devices. In support of our argument we propose a generic model, called *OnLocEd* (Figure 1), that facilitates collaborative learning activities through community building and resource discovery using SoNavNet. The objectives of *OnLocEd* are as follows.

- To provide learners with an environment where they can request peers and learning resources.
- To facilitate an environment where nearby peers and learning resources are recommended to learners.
- To remind students of learning opportunities and resources located in their close proximity.

Popular OSNs and third party applications have transformed people's communication and information sharing habits. As such, these tools have become an integral part of many learners' lives. Business oriented social networks (e.g., Lotus Connections) are already in use to support collaboration in the workplace. In similar ways,

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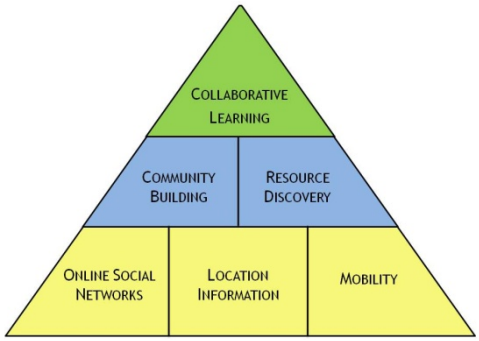

Figure 1: Overall concept of OnLocEd.

OSNs can provide a rich environment for supporting collaborative learning activities. We realize that participation is not collaboration but it is an essential component of collaboration. OSNs can be used to share location information, graphic or video annotation of a learning resource, among other things. In addition, the use of tagging facilities can help learners construct rich learning resource meta-data, and befriending functionality can help learners discover and connect to peers of interest. To be clear, in this paper, we use the term 'learning resources' to refer to physical resources (e.g., paperback books or museum exhibits) and underline its distinction from learning objects, the term predominantly used to refer to digital learning materials.

OnLocEd is unique in that it utilizes another critically important component, i.e., location information. The premise of OnLocEd is based on the observation that people's location information is readily available from navigation assistance technologies and smartphones. Location-centric decision-making is the goal of location-based services (Karimi, 2010), which has recently made its presence in educational settings (Tan et al., 2009). It is natural for humans to use location information to build communities and value location-specific services or resources. For instance, neighbors in neighborhoods form local communities and people use locations of friends and relatives to gain access to location-specific resources. Similarly, locations of learners can be used to build a local community or to recommend location-centric activities and learning resources.

We argue that location information can contribute to collaborative learning in two ways: location-based learning and location-aware learning. In location-based learning, location itself is a learning resource or a location provides a learning resource. Location-based learning is a common occurrence in the traditional education setting. The field trip is an example of location-based learning, which uses a specific location to supplement in-class learning. On the other hand, location-aware learning allows learners to capitalize on location to manage their learning activities. Location-aware learning is a more informal process. For example, a student studying in the library finds peers from a course to study with or learns about a museum exhibit from a posted flyer. We view location-aware learning as an exploratory process where learners seek potential peers or interesting learning resources in and around their physical location.

Location-based and location-aware learning offer experiential and authentic learning activities that could significantly benefit learners from experience exchange among peers. Basing OnLocEd model on SoNavNet architecture enables sharing of navigational and learning experiences. For instance, while on a trip to a dinosaur museum in Canada, Alice could team up with a SoNavNet friend Bob who is an archaeology student from a nearby University to learn about dinosaur habitat. In a different example, both Alice and Jill may have visited the same museum, at different times, and they can share their experiences to complement each other's observation. The experience of one learner is crucial to help another learner engage in a location-aware learning situation. One learner can more easily find a learning activity or gain advice about a certain activity from a peer with a similar experience. With this, location-aware learning could become a daunting task without navigational support. For example, while visiting a new location, a learner may not engage in a location-aware learning activity, such as attending a museum exhibit, due to the unfamiliarity with the city and the fear of getting lost. In SoNavNet, a local peer can provide advice about public transportation or join the travelling peer at the museum.

Mobility is an inherent characteristic of modern life. People need to communicate, collaborate, or even conduct impromptu meetings while in on-the-go. A growing majority of today's learners are equipped with mobile devices, and hence, the emerging trend in Web-based learning is mobile learning (m-learning). However, the primary focus in m-learning has been on creating and distributing digital learning objects through mobile devices (Cherian and Williams, 2008). We believe that mobile devices can be used to enhance anytime, anywhere learning experience. A learner can use mobile devices to access SoNavNet and seek recommendation for location-specific learning resources or peers; furthermore, the learner can find

and obtain learning resources through the navigational assistance of other experienced peers.

The main contribution of the paper is an Online Location-based Education model (OnLocEd) to facilitate community building and learning resource discovery. The rest of the paper is organized as follows. We justify and elaborate our position in Section 2 followed by our preliminary research on the *OnLocEd* model and SoNavNet architecture in Section 3. Section 4 provides background for our position and Section 5 provides a summary of the paper and presents future work.

2 COMMUNITY BUILDING & RESOURCE DISCOVERY

The success of collaborative learning activities depends on community building and resource discovery; in other words, finding helpful and competent peers or mentors and knowledge of and access to suitable learning resources. As a result, both community building and learning resource discovery are colossal tasks for learners. The issue is far more pronounced in open learning environments where learners are outside of the structured learning environment, present in the traditional classroom. We seek to leverage existing technologies with novel ideas in order to help learners in finding peers or learning resources in both static and dynamic mobility settings. To this end, we adopt the "R3" methodology, which stands for Request, Recommend, and Remind. Learners need to **Request** locations of learning resources and peers; learners need **Recommend**ation of relevant learning resources and available peers, and learners may need to be **Remind**ed about resources, such as lectures, or scheduled meetings. To accommodate the varying mobilities of learners, spatial and temporal constraints need important consideration. A learner may request the location of a resource such as an article, a route to get to the nearest library, or a list of pertinent seminars within a reasonable geographic region that will take place during a given week. A learner can be presented with recommendations for available peers or resources based on their preferences or a content model of their typical resources. Furthermore, a learner may want to be reminded of an event of interest.

To facilitate community building and learning resource discovery, OnLocEd components (Figure 2) offer: (a) virtual meeting place anywhere anytime, (b) location awareness, (c) mobile accessibility, and (d) navigation assistance to learning resources and peers. OSNs are virtual platforms for sharing information and experiences beyond the capabilities of courseware-based tools.

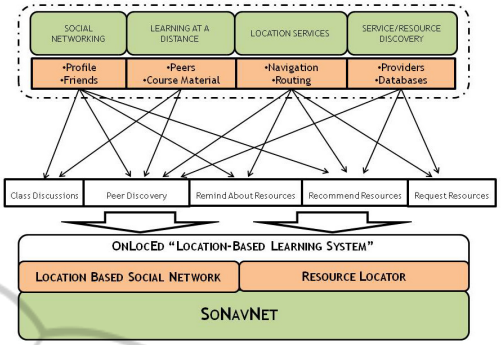

Figure 2: OnLocEd components.

Furthermore, OSNs have already become an integral part of our life and an extended means to be connected with friends and communities. Therefore, OSNs are a natural choice for item (a). To integrate item (b) into OnLocEd, we suggest LBSNs. LBSNs allow communication and collaboration based on members' and points of interest (POIs') locations to possibly have an impromptu meeting and actually meet-up with them in the real-world (Karimi 2010). Mobile devices enable students to access learning resources and facilitate anytime, anyplace learning. Therefore, SoNavNet has to support item (c). A new trend in both general Web 2.0 technologies and their applications in education is the inclusion of location information. For example, location-based games have been created to teach lessons on particular topics, and mobile learning applications disseminate location-aware knowledge when a learner moves to or passes by a specific location. By means of each other's location information, learners can discover informal learning spaces such as libraries and museums, benefit from subject specific events such as lectures, and connect with nearby peers. Item (d) is one feature that, in addition to locating resources, will provide optimal routes to some learning resources (e.g., library) to learners based on their current location or on a given date and time. In essence, we argue that OSNs, location awareness, and mobile devices can be used in concert to support collaborative learning activities anywhere, anytime.

3 OnLocEd MODEL

OSNs have gained popularity through augmenting a person's physical (real world) communities in a virtual setting. OnLocEd mirrors this by enhancing

and improving virtual learning communities, used in e- and m-learning contexts, by making connections to physical communities (nearby peers). OnLocEd leverages SoNavNet where learners are: (a) aware of the locations of their peers and potential learning resources, (b) can engage in class discussions, (c) post navigation or learning advice, and (d) get directions or navigation support for in-person meetings or to available resources. OnLocEd, employing R3 methodology, allows students to utilize their current location to collaborate with peers and find learning resources. We argue that location-based and location-aware learning, enabled by OnLocEd, are paradigm shifts for community building and collaborative learning in distance and online learning environments.

Central to the OnLocEd model is LearNet, a network of learners and resources (Figure 3). LearnNet is a graph representing the relationships between learners and between learners and learning resources. LearNet consists of two types of nodes: learner nodes and resource nodes. Each learner node has, among other things, the learning needs and characteristics (availability, needs, and preferences) of the learner. Each resource node also has characteristics, such as the location, availability, and description of the resource. Each node in LearNet may be connected to other learner or resource nodes by edges (links).

There are two types of connections (links): learner-to-learner and learner-to-resource. In addition, these links contain distance and context parameters that enable dynamic or static connections between nodes. A link between a pair of learners indicates the relationship between the two learners based on a specific context for learning, such as a course that both are enrolled in during a term, or a common learning interest, such as learning Spanish.

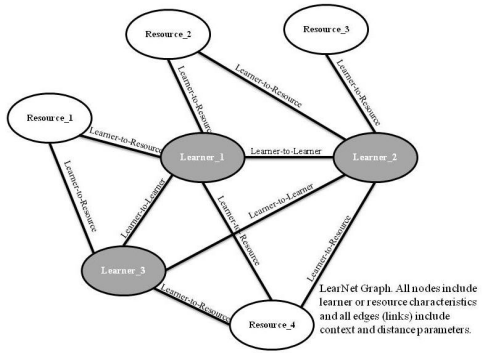

Figure 3: LearNet – a network of learners and resources.

Each link in the graph is assigned a weight based on the physical distance and context relevancy between the two nodes (i.e., learner, resource) connected by the link. These weights are dynamic as the location of a learner or a resource could be either dynamic or static. A learner-to-learner link is established through the mutual consent of a pair of learners. A learner-to-resource link is established either through the learner's request for the resource or through recommendation based on the learner's preferences or content model. Furthermore, a learner-to-learner link or a learner-to-resource link is removed when any of the following conditions applies: (a) a learner disconnects the link, (b) the physical distance between the two learners exceeds a certain threshold, or (c) the context of the link is no longer relevant to the learner.

Once formed, LearNet is used to fulfill the R3 methodology employed by OnLocEd. Of request, recommend, and remind, a general description of how recommendation is formalized and used in OnLocEd is discussed below.

In OnLocEd, recommendation could be p (set of peers to meet virtually or physically) and/or r (set of resources to be provided online or accessed at a location), that is:

$$R = (p, r)$$

where $p = \{p_1, p_2 \dots p_n\}$ is the set of peers selected in a recommendation and $p \subseteq M$, (M is the set of peers) in LearNet. At least one set must be non-empty to have a valid recommendation.

Recommendations on online resources use are expressed as:

$$R_{r_o} = (r_o, t_s)$$

where r_o is the set of online resources (e.g., websites) and t_s is the time when resources are needed.

Recommendations on physical locations are expressed as:

$$R_{r_p} = (r_p\ , \Delta t)$$

where r_p is the set of physical resources (e.g., library) and Δt is the duration within which resources are available/accessible (e.g., library hours).

Recommendations on virtual meetings are expressed as:

$$R_{p_v} = (P, t)$$

where P is the set of peers and t is the suggested meeting time.

Recommendations on physical meetings are expressed as:

$$R_{p_l} = (O, D, T, S, G, t)$$

where O is the origin, D, is the destination, T is the mode of travel, S is the sequence of road segments, G is the sequence of guidance/direction, and t is the suggested meeting time.

As a first step to the implementation of OnLocEd, a SoNavNet framework has been developed in the Geoinformatics Laboratory of the School of Information Sciences, at the University Pittsburgh. Access to SoNavNet is provided through two media: Web browsers on a desktop/laptop machine or mobile device (smartphone) application, both are connected to a Web server for access to the system. Since the central goal of SoNavNet is navigation assistance through online social networking, an online mapping service is included in the architecture to provide the user with a sense of the navigation environment. User's current location on mobile devices can be determined through GPS and/or Wi-Fi. SoNavNet offers three main functions. The first allows the user to manipulate a map of their surrounding area and to place POIs, routes, and regions on it, thus allowing them to trace places they visit and how they get there. The second and third functions are request and recommend services. Members seeking navigation recommendations are able to message their friends with a map on which they can mark off an area and request a POI/route/direction within it. The system searches the recommended POIs/routes/directions stored in its database and sends a match POI/route/direction to the user.

Our plan is to develop a prototype OnLocEd in SoNavNet and make it available to students enrolled in online courses. This prototype will be based on a complete version of the OnLocEd model that we will develop. There are several issues and challenges for the implementation of OnLocEd. Learning resources and peers will be static or dynamic based on their mobility. Classifying each resource and peer based on their current mobility will be a complex task. Many questions remain regarding how these resources and peers will be classified, for example: What are static learning resources? What criteria, such as course, subject, etc., would determine static resources? What are dynamic learning resources? What criteria, such as course, subject, etc., would determine dynamic resources?

Communication in OnLocEd brings about other challenges. Discovering how learners communicate or prefer to communicate will require empirical knowledge of current trends in social software and mobile tool usage in learning settings. How should two peers, identified through LearNet, be notified of each other's needs and a possible impromptu solution? Yet another challenge deals with defining thresholds. In order to provide adequate recommendation and navigation coverage, thresholds must be set for various parameters. For example, the meaning of "near" needs to be defined in "Is learner A near resource X?" Apart from implementation issues, the issues of learner privacy and trust, as discussed in Anwar et al. (2006) also need to be addressed.

4 BACKGROUND

Web-based learning environments require initiation and effort by the learner for participation. Perhaps, as a result of this demand, students using these environments have been reported to feel isolated and remote. Rovai (2002) discusses physical separation as a barrier to building a sense of community resulting in disconnection between students. Wahlstedt et al. (2008) attribute these feelings of isolation to the environment's structure as an isolated space where students are unwilling to establish relationships and fail to achieve trust and a sense of community. McInnerney and Roberts (2004) find that even on-campus students taking an online class may experience a feeling of isolation from peers. Moreover, Kester et al. (2007, p. 1) find "learner self-directedness easily degrades to learner isolation" in learning networks without support.

Whether due to the physical distance between students, the structure of the environment as an isolated space, or limited support during the learning process, these studies highlight the lack of learner support and engagement that exists in current learning environments. One effort to remedy this lack of support and engagement is a theoretical work by Fetter et al. (2010) who adapt the concept of an Ad Hoc Transient Community and posit a peer support service to improve relationship characteristics, increase feelings of belonging, and heighten mutual support between students. This work has the similar goal of community building sought by OnLocEd, yet this service exists solely in an OSN without the benefit of location information or mobile capabilities.

In a synthesis of literature in mobile learning, Cobcroft (2006) confirms that mobile technologies are able to support learners' engagement in creative, collaborative, critical, and communicative learning activities. Discussing virtual learning communities, Yang et al. (2004) note that a learner's capability to locate collaborators and requested knowledge impacted learning. Other studies find awareness of

peer activity and online status can help build community (Wahlstedt et al., 2008; Minocha, 2009; Fetter et al., 2010). Cho et al. (2002) emphasize the call for a focus on the communicative processes of peer interaction rather than learning outcomes in collaborative learning studies. McInnerney and Roberts (2004) proposed three protocols to fortify online social interaction including, most importantly, a community forming stage devoted to the creation of a solid classroom community.

The development of location-based services and the rapid adoption of GPS-enabled mobile devices have expanded OSNs from standard Web-based versions to mobile social networks (Krishnamurthy and Wills, 2010). Using location services, mobile OSNs are gaining popularity and ubiquity among mobile users. There has been a dramatic growth in the number of active users of mobile OSNs with forecasted growth from 54 million in 2008 to nearly 730 million in 2013 (Holden, 2009). These networks have potential for community building. Ganoe et al. (2010) find that providing users with mobile tools and relevant time and location information regarding community events can aid in community engagement. To date, most of these networks are not specific to education and only few actively incorporate location information. Gentile et al. (2007) modify an existing collaborative knowledge building model to work in a mobile environment and augment the learning space using geo-conceptual maps. This is an example showing the benefit of mobile tools for collaborative knowledge building but does not address the need for peer support. Jorge and Profírio (2010) introduce an Academic Social Network to address mobility issues for European universities and supply ontology for student profiles. This work provides a perfect example of an OSN devoted to education but lacks location awareness. These advanced mobile applications, while making resources and peers available, do not account for problems encountered by feelings of separation and dislocation prevalent in e-learning.

Reflecting on the aforementioned studies, we realize the aptness of mobile technologies, location awareness of peers and resources, and online social networks in supporting learner's engagement and community building.

5 SUMMARY & FUTURE WORK

In open learning environments, learners are in charge of their own learning. As such, learners need to perform the precursory task of finding suitable learning resources and a community of peers in order to initiate collaboration. The burden of finding resources or peers can de-motivate learners to engage in collaboration or take advantage of anytime and anywhere learning. Location is an important consideration in selecting a suitable resource or peers. Mobility of learners is another factor to consider while developing a solution to facilitate collaboration for learners on-the-go. Furthermore, access to a physical resource can be a daunting task without proper navigational assistance. We view that online social networks, location information, and mobile devices can be used together to offer a learning environment that can facilitate learning resources and peers in order to support collaborative learning. In support of our position, we propose the OnLocEd model and R3 methodology that can be used to build such learning environments.

This paper is the first step towards addressing the challenges of collaborative learning in open learning environments. In this paper, we have identified the challenges (i.e., finding learning resources and a community of learners) and set forth our vision to address the challenges. Our future work includes: (a) extending the basic OnLocEd model to accommodate learner preferences and personalization (b) developing a prototypical system based on the model and (c) conducting empirical studies to gauge the effectiveness of our solution.

REFERENCES

Anwar, M., Greer, J., and Brooks, C. (2006). Privacy-enhanced Personalization in e-Learning. In *Proceedings of the International Conference on Privacy, Security, and Trust*, October 30 - November 1, 2006, Markham, Ontario: Canada.

Cherian, E. J., and Williams, P. (2008). Mobile Learning: The Beginning of the End of Classroom Learning. In S. I. Ao, Craig Douglas, W. S. Grundfest, L. Schruben & J. Burgstone (Eds.), *Proceedings of the World Congress on Engineering and Computer Science* (WCECS), October 22-24, 2008, San Francisco, CA: USA.

Cho, H., M. Stefanone, and G. Gay (2002). Social Information Sharing in a CSCL Community. In G. Stahl (Ed.), *Proceedings of Computer Supported Collaborative Learning* (pp. 43-50). Boulder, Colorado: USA.

Cobcroft, R. S., Towers, S., Smith, J., and Bruns, A. (2006). Mobile Learning in Review: Opportunities and Challenges for Learners, Teachers, and Institutions. In *Proceedings of Online Learning and Teaching (OLT) Conference* 2006 (pp. 21-30). Queensland University

of Technology, Brisbane: Australia. Retrieved from: http://eprints.qut.edu.au

Fetter, S., Berlanga, A. J., and Sloep, P. (2010). Fostering Social Capital in a Leaning Network: Laying the Groundwork for a Peer-Support Service. Retrieved from: http://dspace.learningnetworks.org/handle/1820/2024

Ganoe, C. H., Robinson, H. ., Horning, M.A., Xie, X. and Carroll, J. M. (2010). Mobile Awareness and Participation in Community-Oriented Activities. In *Proceedings of COM. Geo 2010*, June 21-23, 2010, Washington, DC: USA

Gentile, M., Taibi, D., Seta, L., Arrigo, M., Fulantelli, G., Di Giuseppe, O., and Novara, G. (2007). Social Knowledge Building in a Mobile Learning Environment. In R. Meersman, R. Tari, Z. Herrero, P. et al. (Eds.), *On the Move to Meaningful Internet Systems OTM* 2007 *Workshops, Part I Lecture Notes in Computer Science* 4805 (pp. 337-346). November 25-30, 2007, Vilamoura, Portugal, DOI: 10.1007/978-3-540-76888-3_56

Holden, W. (2009, August 4). Advertising to Fuel Mobile Social Networking Growth as UGC Revenues Reach $7.3bn by 2013. Retrieved from: http://juniperresearch.com/shop/viewpressrelease.php?pr=108

Jorge, A. L., Profírio, F. P. (2010). Building and Academic Network for Bologna Mobility. In *Proceedings of The Third Workshop on Social Network Systems, SNS '10*. April 13, 2010, Paris: France.

Karimi, H. A. (2010). Genetic Location-Based Social Networks (G-LBSN). In *Proceedings of the 3rd International Workshop on Location and the Web, LocWeb '10*. doi>10.1145/1899662.1899671

Karimi, H. A., B. Zimmerman, A. Ozcelik, and D. Roongpiboonsopit. (2009). SoNavNet: A Framework for Social Navigation Networks. In *Proceedings of the International Workshop on Location Based Social Networks, LBSN'09*, (pp. 81-87). Seattle, WA: USA.

Kester, L., Sloep, P. B., Van Rosmalen, P., Brouns, F., Koné, M. and Koper, R. (2007). Facilitating Community Building in Learning Networks Through Peer-tutoring in Ad Hoc Transient Communities. *International Journal on Web Based Communities,* 3, 198–205.

Krishnamurthy, B. and C. Wills. (2010). Privacy Leakage in Mobile Online Social Networks, In *Proceedings of Workshop on Online Social Networks*, WOSN 2010, June 22-25, 2010, Boston, MA: USA. Retrieved from: http://www.usenix.org/event/wosn10/tech/slides/krishnamurthy.pdf

McInnerney, J. M. and Roberts, T. S. (2004). Online Learning: Social Interaction and the Creation of a Sense of Community. *Educational Technology & Society,* 7(3), 73-81.

Minocha, S. (2009). A Case Study-based Investigation of Students' Experiences with Social Software Tools. *New Review of Hypermedia and Multimedia,* 15(3), 245-265.

Rovai, A. (2002). Building a Sense of Community at a Distance. *International Review of Research in Open and Distance Learning*, 3(1), 2-16.

Tan, Q., Kinshuk, Kuo, Y., Jeng, Y., Wu, P., Huang, Y., Liu, T., and Chang, M. (2009). Location-based Adaptive Mobile Learning Research Framework and Topics. In *Proceedings of International Conference on Computational Science and Engineering, IEEE CSE'09*, (pp. 140-147), August 29-31, 2009, Vancouver, BC: Canada.

Wahlstedt, A., Pekkola, S., and Niemela, M. (2008). From E-Learning Space to E-Learning Place. *British Journal of Educational Technology*, 39(6), 1020-1030.

Yang, S. J. H, Chen, I. Y. L., and Shao, N. W. Y. (2004). Ontology Enabled Annotation and Knowledge Management fort Collaborative Learning in Virtual Learning Community, *Educational Technology & Society*, 7(4), 70-81.

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