Je-LKS
Journal of e-Learning and Knowledge Society
The Italian e-Learning Association Journal
PEER REVIEWED PAPERS
Vol. 14, n.3, 2018
ISSN: 1826-6223 | eISSN: 1971-8829

COMMUNITY OF PRACTICE ONLINE, THE IMPORTANCE OF TECHNOLOGY FOR LEARNING: AN APPLICATION OF SOCIAL NETWORK ANALYSIS

Stefania Fantinelli
Vanessa Russo

University G. d'Annunzio Chieti - Pescara, Italy

Keywords: community of practice online, blended learning, social network analysis

The pervasiveness of technology is affecting also the education field, so it is possible to evaluate whether technology can foster collaboration among students or improve the learning outcomes.
A community of practice online is the subject of the present study, it represents a kind of blended learning which is defined as the integration of classroom face-to-face learning with online learning experiences with the objective to increase students' engagement and motivation.
A recent experience of blended learning education has been carried out by four Italian Universities and in the present research study we have implemented social network analysis technique in order to observe online interactions of students, thus describing the nodes that exert the most influence in the group and to evaluate if the online interactions can positively affect the learning process.
As result we can state that the outcomes of social network analysis are

for citations:
Fantinelli S., Russo V. (2018), *Community of Practice Online, the Importance of Technology for Learning: an Application of Social Network Analysis,* Journal of e-Learning and Knowledge Society, v.14, n.3, 29-39. ISSN: 1826-6223, e-ISSN:1971-8829 - *DOI: 10.20368/1971-8829/1545*

valuable information for teachers and tutors in order to facilitate participation and collaboration, that in turn promote an effective learning process.

1 Introduction

In order to better frame this work it could be useful to first provide a definition of learning, there are many definitions in literature and we have tried to collect the most meaningful.

According to Kara (2009) there have been several definitions of learning across past years, it can be a better adaptation of the response to the situation and this concept is similar to Stern' intelligence definition which is: a general mental adaptability to new problems and conditions of life. Also Köhler formulated a definition of learning as a consequence or a result, according to the author, learning is the outcome deriving from personal interactions with the environment. Köhler was a Gestalt theorist who defined the concept of *insight learning*, so that learning can be a restructuring or a rearrangement of various elements involved in the situation rather than a simple result of trials and errors.

In 1936 Washburne stated that learning is «an increase, through experience, of ability to gain goals in spite of obstacles» (p. 603) and a sort of balance between goals and obstacles is needed. Boyd and Apps elaborated for the first time, in 1980, a double definition of learning as an act or as a process: learning is the act or process by which behavioural change, knowledge, skills and attitudes are acquired (Hammad, Odeh & Khan, 2017). But nowadays in the most of school systems, learning is approached as a product: activities such as copy a text from the blackboard or doing a dictation, are aimed at evaluating student's performance measured through the outcome of the task, so the process is not evaluated.

Later on Bandura defined learning as «an information processing activity in which information about the structure of behaviour and about environmental events is transformed into symbolic representations that serve as guides for action» (p. 51); according to the *social cognitive theory* (Bandura, 2012) there are three major factors that interacting each other can determine human behaviour and learning: environment, person characteristics and behaviours. Learning can occur either *actively* through actual doing or *vicariously* by observing models perform (live, symbolic, portrayed electronically), so from this moment we can assume that learning is a social process where learners interact with peers or models, as well as with situations.

Humanism scholars describe learning as a human centred activity, a personal act to fulfil potential, for the first time it is expressed the idea of a collaborative and supportive environment in order to facilitate learning, just as it is in an asynchronous environment (Duret *et al.*, 2018). This view is the best fitted in

the contest of new technology supporting education and it is the definition of learning which can introduce our objective study.

The aim of our project is to observe a community of practice online where a sort of collaborative learning is involved, so that individuals are active creators of the knowledge building process. As stated by Wenger and colleagues (2002) a community of practice is «a group of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis» (Wenger, McDermott & Snyder, 2002, p. 4). The mix of face to face interactions with technology mediated communication can determine a community of practice, objective of the present project is to determine the relational dimension of a virtual learning community, by applying mathematical models typical of Social Network Analysis (SNA).

2 E-learning

The term "e-learning" has only been in existence since 1999, when the word was first utilized at a *CBT systems seminar*.

E-learning can be defined as «technology-based learning in which learning materials are delivered electronically to remote learners via a computer network» (Zhang *et al*., 2004, p. 76). We can say that distance education is a sort of precursor of modern e-learning, the first distance education course was done in 1840, by letters correspondence. So, we can say that nothing has changed except of tools. In 1972 Moore coined the term *distance education*. He elaborated the theory of Transactional Distance, stating that the education process is essentially based on the relation between the teacher and the learner and it concerns three main issues: environment, persons, behaviours (Beldarrain, 2006). In a distance education – which is also called transaction – communication misunderstanding can easily happen, due to the communication and psychological gap created by the distance. This space is called transactional distance, it is a subjective and variable concept that will change from one person to another; another assumption is that as the level of interaction between teacher and learner decreases, learner autonomy should increase. There are three kinds of interactions in learning activities: students with teachers, students with materials, students with students (*Ibidem*). We see as in an e-learning education the strongest and frequent interaction is the one between students and materials.

E-learning completely changes the traditional world of education: in classroom is the teacher to define time, subjects order and way of information providing. With e-learning the education become student-centred. This approach reflects the constructivist principle of learning as an active process conducted in a self-directed way; in this sense e-learning provides many opportunities by

supporting a learning method rich in resources, student-centred and interactive (Zhang *et al*., 2004).

2.1 Blended learning

Technologies designed for education can be described as a continuum, where we can find different levels of technology adoption and where e-learning is in the middle, one step behind we find blended learning.

Blended learning is defined as the attentive combination of classroom face-to-face learning experiences with online learning activities (Dziuban *et al.*, 2018) and it is very close to what happen in a community of practice online.

It could represent one way to tackle those limits of e-learning that we mentioned before; in fact the three interactions described by Beldarrain are all present in this case, in different degrees there will be relations between students and material, teacher and other students.

The main objective of blended education is to redesign the teaching and learning relationship adopting new available technologies, but as some scholars said: it is not enough to deliver old content in a new medium (Dziuban *et al.*, 2018). It means for example that some traditional practice can be reversed: students can attend an online lecture at home instead of in the classroom and then discuss it face to face or do some work together about what learned at home. Another objective is to increase students' engagement and motivation as well.

There has been a sort of prejudice concerning the preference of technology based learning only by young students, but some scholars demonstrated that both young and adult students regard technology as an essential part of their learning experience (Richardson & Jelf, 2013). Moreover recent works have explored the persuasive power that information and entertainment can play in the use of mobile technologies, these features can also enrich the education environment (Fantinelli & Cortini, 2018).

3 Social Network Analysis for Communities of practice online

The use of computer mediated communication (CMC) tools has contributed to the creation of communities of practice and learning online, where individuals work together to create and share knowledge. The evolution of a synchronous and an asynchronous communication (mailing lists, chat, forum, etc.) allows the interaction between social actors and the development of informal roles, in an environment of online education.

At the structural level, the peculiarity of these social groups resides in relational mutation, which develops during the learning process. Communities of practice, in fact, were born as graph structured elements and connections clearly

defined, that in the course of their evolution acquire weak ties, informal and unexpected that can get to transform completely the structure, the connotation of roles and the relations trend.

The learning derives from a self-managed, complex and interactive process, that is configured at the structural level as a Sociogram displayed by a graph consisting of nodes and connections among them. At the structural level, the peculiarity of these social groups lies in the alteration of relationships among individuals, that can develop during the learning process.

The SNA is a theoretical and methodological perspective that analyses the social reality from its lattice structure. This implies that the social relationship has to be considered as a minimum unit of observation at the expense of individual attributes (eg, gender, age, education, status, socioeconomic etc.), that are not excluded from the analysis, but traced to one of three possible levels of interdependence of social phenomena: the actors, the connecting relations and the networks that make up the overall structure (Scott, 2018).

The SNA has a fundamental objective: to analyse the complex system of interdependencies and multiple interconnections within society. In particular, the SNA is interested in explaining the dynamics of contamination of interdependencies between systems and social behaviour of individual actors.

The group, in essence, is meant as a complex web of relationships variously structured, preferably readable in a structural and relational key. The networks of relationships, in turn, are seen as dynamic relational systems that provide the context with social action of the actors. The actors are not always driven by an utilitarian or an instrumental motivation, which to varying degrees are influenced in their choices by the rules of the reticular system, but at the same time they are agents of change of the system itself.

4 Method

Objective of the project is to determine the relational dimension of a virtual learning community, by applying mathematical models typical of Social Network Analysis. Through the analysis of formal and informal interactions between users that are part of a community of online learning[1], there are signs of building links in the group. The SNA thus becomes a useful tool for teachers and tutors to identify and compensate for problems in a community of online learning in order to facilitate the participation and collaboration among the students themselves.

In particular, the research objectives are:1. Locate the influx of students from

[1] The learning community detected is part of the project Master "Koinè. Professione formatore per la didattica della comunicazione" (Koinè. Profession trainer for teaching communication) with the Scientific Coordination and Teaching of Prof. Giselda Antonelli.

the Master to the online community; 2. Reconstruct the relational dimension in order to detect nodes that have most influenced the network; 3. Evaluate the effective compliance of the conversations to the topic of search; 4. Assess whether, in this case, the online interactive processes were useful for the education process.

4.1 Stages of Research and methodology

This field of research methodologically borrows an application from the ethnographic method. The ethnographic approach is a non-standard methodology that allows the researcher to analyse the culture and the interactions of social actors in a given context. It is based on three basic actions of the human being: observe, question and read that are accomplished through a set of tools based on direct observation of the phenomenon, in-depth interviews and use of documents (Alinejad, 2018).

The cyberspace as field of research is suitable for the application of ethnographic technique. In fact, it consists of virtual social interactions that unfold through different tools and different networks but which, in fact, generate communication structures, representations of identity and culture which is real and shared (Murthy, 2008; Russo, 2017).

In ethnographic method the stages of research are not strictly defined but they must be designed ad hoc time after time. The stages of research, in this case, are divided into five phases: 1. Observation of the field; hidden observation, individuals in the community are observed and the researcher is not actively involved in the relationship dynamics of the network, this type of observation is also called passive lurking; 2. crawling of the content; a computer process by which it is possible to download the contents of a computer database; 3. content Analysis of "the traces of growth" produced by users and connections; 4. reconstruction of the network interactions and Social Network Analysis; using open source software Gephi it is possible to rebuild the network of relationships and analyse its contents; 5. Identification, users of the Master and classification of influencers this step is important in order to identify the social formal and informal rules.

5 Analysis and observation

The forums are virtual discussions already existent at the time of Web 1.0 and they are constituted of a general topic divided by topics of conversation. These networks are operated by administrator users (Admin) which define procedure rules and, in connection with them, the administrators control the content of the discussions and the users' behaviour.

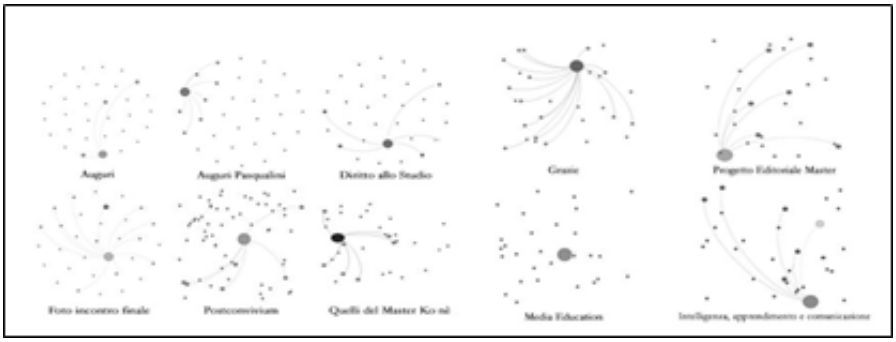

Fig. 1- Network mapping of Forum Cafè

The research started from "Forum Café" (Fig. 1) because we were interested in giving more importance to informal relationships among network users.

The "Forum Caffè" is an informal space into the master forum designed for the development of informal interactions among social actors of the master and it consists of ten rooms of conversation. In all cases the detected threads were consistent with the topic of the room: *Foto Incontro Finale; Auguri Pasqualini; Auguri; Diritto allo Studio; Grazie; Intelligenza Apprendimento e comunicazione educativa; Media Education; Postconvivium; Progetto editoriale Master; Quelli del Master Koinè.*

In order to ensure anonymity of social actors the name were replaced by number labels for students and letters for master's tutors.

The activities in Forum Caffé were divided in active partecipation and passive partecipation. Active partecipation was for example the creation of contents and discussions into the forum, instead passive partecipation was just the answer to posts.

Ten topics of relations were indentified into Forum Caffè and the structures of network were analized for everyone, in relation to *density graph* and *average connections*.

The *density graph* measures efficiency in the exchange of information and utility for individuals. A smaller graph (as forum topics) with greater density represents a very structured community and it may be less useful than "weak-band networks", as the latter are more flexible, thus providing a better exchange of ideas and opportunities *Average connection* is a parameter that indicates the extent to which the nodes of a graph tend to be connected to each other. A network with a high average connection shows a social community with a well-defined structure.

The analysis of affinity network in "Forum Caffè" points out a community with a communication system very strong. In fact, the structures of graph and

label types are defined and structured.

Furthermore, the communication into Forum Caffè, at an informal level, is managed by a clique of users in an oligarchic mode.

5.1 The Clique and informal rules

The remark made through the reports graphs has highlighted the development of a clique of informal relations. The subgroup is made of 12 students and two tutors who interact with each other based on the arguments typical of the Master topic (Fig. 2).

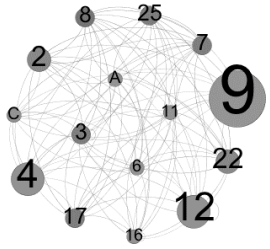

Fig. 2- Informal clique of Forum Caffè

In particular, it must be highlighted the activities of 9, 4, 12 and 22.

Number 9, among all members of the clique, is the most interesting element: it is a real hub in the network of Forum Caffè because he is linked with all members of community. The behaviour of n.9 is compatible with roles of informal teacher; in fact, his content post deals with a clarification and an explanation of the lessons themes.

If number 9 is an informal leader, number 4 is an informal "antagonist leader"; he usually is argumentative and critical of the topics discussed in the forum but he doesn't have the same influence as number 9.

Finally, it is important to underline the roles of numbers 12 and 22. These are two social actors labeled as "debaters" because they usually insist on discussions about lesson's themes.

6 Results

The turnout at the Web Forum by students is very high (75%) but only about the comments to posts. While the active creation of chat rooms concerns only about 21.8% of users of the Forum.

The study of the relational dimension has noted the existence of a clique of relations. The subgroup is dominant within the Network but puts in place behaviours in favour of the process of learning lessons.

The flow of communication within the rooms of the research was always consistent with the topic of reference.

Specifically, in this case study, it was found that the development of a CMC online proved to be functional to the communication process, which is in turn functional to learning.

The SNA thus becomes a useful tool for teachers and tutors to identify and address the problems within a community of online learning, in order to facilitate the participation and collaboration among the students.

Conclusions and future perspectives

Some past studies evaluated student's activity on Facebook as a blended learning environment: McCarthy (2010) found that course engagement increased and students could socialize more easily with peers. It seems that the social dimension is one of the most appreciated by students, indeed results from another study (Irwin *et al.,* 2012) showed that students were more engaged in learning activities thanks to the social interactions offered by the social network platform.

In addition, some variables can influence the effectiveness of Facebook as a learning system: the role of the teacher, the discussion subject, the timing and the order of posts (Lim & Ismail, 2010).

In line with previous researches our results report that online interactions are essential for an effective education; also confirming the assumptions of social cognitive theory (Bandura, 2012).

Communities of practice online through a computer mediated communication can foster interactions and collaborations among students, as already stated by Sun (2014) communication and social interactions are precious elements for an effective learning process.

Indeed, the result of the current study leads to the conclusion that the communication process implemented by the community of practice online is functional to learning.

To conclude we see practical impact and insights deriving by the present study for what concern the planning and the design of online learning activities; furthermore, we suppose that more researches on this field are needed, as the human computer interaction is continuously changing and also the online learning process can be affected by latest innovations in the technological area.

For this reason, the future research perspectives will continue with the application of the presented analysis tool to other learning communities in order

to define a multiple case study (Gustafsson, 2017).

The constitution of an analytic system of network applications will converge in a real time evaluation and monitoring model of the learning process in the Communities of practice online.

REFERENCES

Alinejad D. (2018*),* Digital Ethnography: Principles and practice*, Media & Society*, 20(1), 428-431.

Bandura, A. (2012), Social cognitive theory. *Handbook of theories of social psychology: Vol 1* (349-374).

Beldarrain Y. (2006), Distance education trends: Integrating new technologies to foster student interaction and collaboration, *Distance Education, 27*(2), 139-153.

Dziuban C., Graham C. R., Moskal P. D., Norberg A., & Sicilia N. (2018), Blended learning: The new normal and emerging technologies, *International Journal of Educational Technology in Higher Education*, 15(1).

Duret D., Christley R., Denny P., & Senior, A. (2018). Collaborative learning with peerwise, *Research in Learning Technology, 26*, 1-13

Gustafsson J. (2017), Single case studies vs. multiple case studies: A comparative study, http://www.diva-portal.org/smash/get/diva2:1064378/FULLTEXT01.pdf

Fantinelli, S. & Cortini, M. (2018), Informational power and perceived collective benefit affecting the users' preference for a mobile technology: Evidences from a survey study, *Frontiers in Psychology, 9*(JUN).

Hammad R., Odeh M. & Khan Z. (2017), eLEM: A novel e-learner experience model, *International Arab Journal of Information Technology, 14*(4A, 586-597.

Irwin C., Ball L., Desbrow B. & Leveritt, M. (2012), Students' perception of using Facebook as an interactive learning resource at university, Australasian Journal of Educational Technology, 28(7), 1221-1232.

Kara A. (2009), The effect of a learning theories unit on students' attitudes toward learning. *Australian Journal of Teacher Education, 34*(3), 100-113.

Lim T. & Ismail J. T. (2010), The use of Facebook for online discussions among distance learners, Turkish Online Journal of Distance Education, 11(4), 72-81.

McCarthy J. (2010), Blended learning environments: Using social networking site to enhance the first year experience, Australasian Journal of Educational Technology, 26(6), 729-740.

Murthy D. (2008), Digital Ethnography: An Examination of the Use of New Technologies for Social Research, SAGE Publications BSA, Publications Ltd®, 42(5), 837–855.

Richardson J.T.E. & Jelfs A. (2013), Access and Attitudes to Digital Technologies Across the Adult Lifespan: Evidence from Distance Education. In L. Rosen, N. Cheever, L. Carrier (Eds.), *The Wiley handbook of Psychology, Technology and Society* (89-104). Wiley Blackwell.

Russo V. (2017), Digital Ethnography: Theories, Model and Case Studies, in S. Hoskova-Mayerova, F. Maturo, J. Kacprzyk, (Eds.) *Mathematical-Statistical Models and Qualitative Theories for Economic and Social Science*, Springer International Publishing.

Scott J. (2017), *Social Network Analysis*, Sage, London.

Sun S.Y.H. (2014). Learner perspectives on fully online language learning, *Distance Education, 35*(1), 18-42.

Wenger E., McDermott R. & Snyder W.M., (2002), *Cultivating communities of practice*, Boston, Harvard University Press.

Zhang D., Zhao J.L., Zhou L. & Nunamaker Jr., J.F. (2004), Can e-learning replace classroom learning? Communications of the ACM, 47(5), 75-79.