

## Using The Social Network Analysis As A Pedagogical Tool To Enhance Online Interactions

Shireen Panchoo

University of Technology, Mauritius  
La Tour Koenig, Pte. aux Sables, Mauritius  
[s.panchoo@umail.utm.ac.mu](mailto:s.panchoo@umail.utm.ac.mu)

**Abstract**— No doubts subsist with regards to the capabilities of the Internet with its ever growing online communities. However, if the Web has provided fertile grounds for researches and collaborations, the education sector has not yet experienced threshold developments and dependencies on technology with matters relating to online teaching and learning. This paper is based on a doctoral research and the aim of this research is to study the tutor-students' interactions in order to unfold their way of interactions and their learning needs. The methodology used was based on the content analysis of the logged tutor-students textual interactions. Qualitative analysis based on the activity theory of Engeström at macro level, and the Panchoo/Jaillet grid at micro level, were used to analyze a thousand lines of interactions pertaining to a particular module at Master's level in the *UNIV-R<sup>ct</sup>* online campus. Surprisingly it has been found that the students interact less on cognitive issues and more on matters pertaining to rules and procedures. Considering the students' learning needs and the tutor's manner of supporting them at real time in their studies, it is desirable to exploit further the technological and the social network capabilities to help enhance the educational processes. For quality learning to take place, not only students should be given adequate pedagogical supports, but tutors should also be assisted to enable them give relevant feedback and guidance in time.

*Keywords*-Social network analysis; information retrieval; content analysis; virtual environment; elearning; interaction; knowledge management

### I. INTRODUCTION

The natural needs of individuals and groups to share, collaborate, interact and access information without any geographical barriers is witnessed today. The advent of the Internet has not only boost up sharing of information of all kinds and the setting up of various communities online, but it has also allowed for minds to work together in order to continuously develop better quality applications and systems. This has brought a new breath of hope to all: genius are motivated to show their new talents; experts around the world are collaborating; the unreached are now reachable [1]; e-businesses are looking for more opportunities and partnerships [2], and in the field of education, tutors are facing many challenges to keep pace with the active, multi-tasking and digital native students.

The Internet has shrunk the world and it has greatly impacted the education sector by making available a wider

variety of quality contents, case studies and thoughts provoking discussions in various media, suiting all types of students with their different learning styles. It is known that interactions promote learning [3, 4, 5, 6] and the students have opportunities to interact with rich contents [7], experts, tutors [4, 8], peers [9, 10, 11, 12, 13], virtual environments [14, 15, 16] including various synchronous and asynchronous tools [17, 18].

With the rapid expansions of the digital world and the ever increasing resources available online, tutors are now requested to play a more challenging role than before [4, 8]. Students expect specific and rapid feedbacks [3] to assist them do their assignments. Are there pertinent tools to help the educators and students? Most of the available communication tools available, such as, radio, television, forum, chat, were not developed specifically for educational purposes and, in many cases they are not used as pedagogical tools [4]. To build systems with the aim of giving timely supports to online students, it is imperative to understand the needs of the actors [19]. With regards to online students' interactions, this paper has the main purpose of studying their interactions so that their learning difficulties and requirements during the tutor-students interactions are revealed. Consequently, specific application software would be proposed to enable tutors support their students in a better and proactive manner.

### II. RESEARCH CONTEXT AND METHODS

Students with their different learning styles and cognitive levels would learn more efficiently if pertinent, specific guidance and feedback are given to them. The experiment of our research was held in an online campus, *UNIV-R<sup>ct</sup>* in which a completely online master's course entitled *UTICEF* (it is a French course given by the university of Cergy-Pontoise in Paris. The course is entitled: the use of ICT in education and training) took place. Logs of 10-12 online students' interactions were analyzed during four online synchronous tutorials, totaling an exchange of 998 lines of interactions between the tutor and the students. During the compulsory synchronous online meetings, tutor and students interacted twice a week.

Prior to the mentioned meetings, for each module, students were requested to study the uploaded course materials and the problem based assignment. Based on the socio-constructivist approach, for the formative assessment,

the learning strategy requests for the students to work in small groups of 3-4 students and they were evaluated based on both their individual and collaborative input.

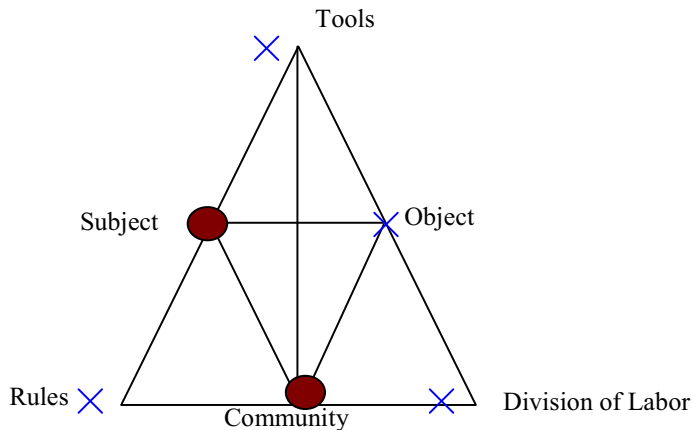


Figure 1: Activity Theory

To understand the type of supports that students looked for during their e-learning, content analysis was done on the synchronous textual interactions. Content analysis was used, at macro level, based on the activity theory [20] which is composed of several triangles (fig. 1) describing specific actions.

As the context in which the interactions took place privileged collaboration, the activity theory proved to be pertinent in analyzing the tutor-students interactions. The limitation with the conventional methodologies (waterfall model, spiral model) is that the human and collaborative aspects are lacking [4]. Researchers [21, 22] use activity theory for the analysis of collaborative systems. This model was used to describe the online tutor-students interactions at macro level.

The activity theory in fig. 1 shows that the *subject* (tutor and student), with the help of appropriate *tools*, aims at meeting the set *objective*. For successful result, the *rules* need be respected by the community to enable them work in collaboration and cooperation (*division of labor*). As our research is based on a socio-constructivist approach, the poles *subject* (tutor and students) and *Community* (the collaboration) are dominant in all the exchanges and we have used them as the basis in identifying the relevant triads for our content analysis [4, 23].

Thus six main triads were identified and used to qualify the interactions. They are shown in the table I:

TABLE I. SIX TRIADS FOR CONTENT ANALYSIS

<b>Subject</b>	Object	<b>Community</b>	SOC
<b>Subject</b>	Rules	<b>Community</b>	SRC
<b>Subject</b>	Tool	<b>Community</b>	SOTC
<b>Subject</b>	Division of Labor	<b>Community</b>	SDC
Object	Division of Labor	<b>Community</b>	COD
Object	Rules	<b>Community</b>	COR

The four chats, comprising of 998 lines of interactions, were analyzed and coded based on the methodology described. For instance, at the beginning of *chats*, the actors greeted each other and this type of interaction was coded by SRC. This coding process was validated by two independent coders [4].

The activity theory qualifies the interactions with regards to the main themes only (rules, object, tools, and division of labor). It was also important to understand how and in which terms the interactions were exchanged. The Panchoo/Jaillet grid was thus developed, explained and justified in another paper [24]. Therefore the 998 interactions were again analyzed and coded in terms of 10 sub-themes (table II) and, because it is important to keep track of the evolution of the meetings with regards to who intervenes (student or tutor) across time, the 10 sub-themes were further sub-divided: t for the tutor and a for the student (The thesis was done in French and the “a” represents the student-*apprenant* in French). They are as described below:

TABLE II. SUB-THEMES OF PANCHOO/JAILLET GRID

	<b>Sub-themes</b>	<b>Tutor</b>	<b>Student</b>
1	Socialization	t.socl	a.socl
2	Organization	t.org	a.org
3	Request for information	t.dinfo	a.eclr
4	Response	t.rep	a.rep
5	Technical Problem	PT	PT
6	Approval	t.apprb	a.apprb
7	Remark	t.remarq	a.remarq
8	Reference	t.ref	a.ref
9	pedagogical supports	t.supp	
10	Communication	t.commn	

Each of the 998 lines of interactions was coded at both the macro and micro levels.

### III. RESULTS AND DISCUSSION

It was compulsory for the students to meet their tutor online for around an hour twice a week. During the four meetings, the tutor had the responsibility of guiding the students to work out their problem based assignments. To start with, the tutor normally communicated important information regarding the course contents and the assignments. It is worth noting that tutors have their own tutoring styles but they lead the conversations. Students, on the other hand, interacted actively and vehemently by asking questions and they promptly replied to queries of the tutor and of their peers.

Results at macro level showed that the students’ interactions were mainly related to the *rules* (SRC) type of interaction as shown in table III. As shows, there was no interaction based on the COD (Community-Object-Division of labor) triad. This means that the students did not coordinate nor collaborate at this stage of their chat. There were also very few interactions which relate to SDC (Subject-Division of Labor-Community) and COR (Community-Object-Rules) triads with their tutor.

TABLE III. RESULTS (%) AT MACRO LEVEL

Chats (%)	SOC	SRC	SOTC	SDC	COD	COR
1 <sup>st</sup>	19	79	1	0	0	1
2 <sup>nd</sup>	30	69	0	1	0	0
3 <sup>rd</sup>	28	67	0	2	0	3
4 <sup>th</sup>	21	75	0	1	0	2

It was found that those missing triads were active while the students interacted among themselves in small groups (3-4 students). The interactions qualified by SOTC (Subject-Object-Community) were absent which showed that there were no problems with regards to technical problems (connection problems or misuse of chats, forum or related tools) in the online campus. It is worth mentioning that the students were given face-to-face training on the use of the campus prior to the start of the course.

The triad SRC-Subject-Rules-Community was even more dominant than SOC-Subject-Object-Community. This means that, to a large extent, the students were very concerned to know about the rules and policies of what was expected from them. With the e-learning mode, because the students were physically alone, they felt unsecured and they had the tendency to ask questions to confirm the given facts (how to work in groups, when the assignment was due, what exactly was expected from them with regards to the logistics of the assignment). They also looked for approval on the work they were doing and the knowledge they were in process of acquiring. They wanted to progress in their work with confidence.

Surprisingly, their prime concern was not related to the content of the course or the assignment (SOC: 19% to 30%). This showed that the students did not interact much on their assignment. The presence of their tutor, specific queries, references and guidelines were enough to enable them evolve in their assignment with certainty. This part could be enhanced by having a visual representation (fig. 2) of the previous interactions of the students to enable the tutor understand their progress before meeting the students online. This would also allow the tutor to give pertinent feedbacks to the different teams. Fig. 2 shows that based on the first meeting, there were more continuous discussions (0.67) on rules than on the objective of the course and the assignment (0.19).

In our case, this state diagram could indicate the students' concerns and difficulties. Based on the needs of the assignment, tutors would also be in a position to identify the areas whereby more emphasis should be laid. For instance, as most of the discussions were related to SRC (rules) tutors could have encouraged deep thinking, cognitive relative discussions pertaining to the assignment or course contents (SOC).

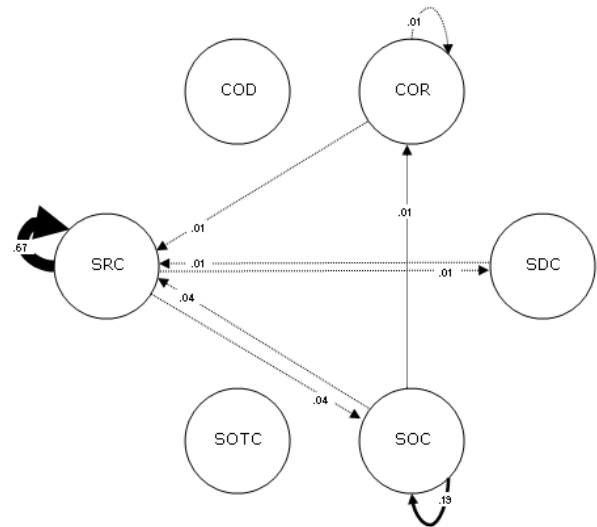


Figure 2: State diagram showing interactions of one meeting

Moore (1989) stressed on the importance of tutor-students interactions in order to encourage students persist in their distance education course. For quality interactions, it is thus important to help tutors understand past interactions of students. Moreover, this model could also be used to track the lurkers and the active students.

The tutor, during the one hour interactions in a meeting, led the chat by communicating important information to the students. The tutor also asked questions in order to understand the state of minds and the progress of the students. As can be seen in the table IV, he asked questions (4%) with the aim of knowing the student's status with respect to their studies. All questions were primarily directed to him (15%). His role was challenging: he needed to find rapid solutions and this reminds us of what Cousinet [25] said: the good master is the one has solutions, tricks and methods at hand. The tutor also replied (10%) to queries from the students. For the mentioned themes, the Panchoo/Jaillet grid was used and the result is shown in table IV.

As for the students, they proved to be good mannered, they greeted each other and socialized (15%). As can be seen in the table IV, the students communicated in a normal communication cycle 'question (15%) – Answer (30%) – Approval/feedback (10%)'. Online the students asked questions and it has been observed that they did not hesitate to participate in discussions, even though the questions were not directed to them. The approval was very well present in all chats as, in absence of face to face interactions, it completed the communication cycle. Thus, the confirmation of the tutor was well sought because of the element of uncertainty that prevailed online: students wanted to progress confidently in their learning processes. The presence of the tutor and of students as well as the interactions contributed in reassuring the students online.

TABLE IV. RESULTS (%) AT MACRO AND MICRO LEVELS

Var.(%)	COD	COR	SDC	SOC	SOTC	SRC	Total
a.apprb	0	0	0	2	0	7	10
a.eclr	0	0	0	4	0	10	15
a.org	0	0	0	0	0	3	4
a.remarq	0	0	0	1	0	3	4
a.rep	0	0	0	11	0	19	30
a.socl	0	0	0	0	0	15	15
commn	0	0	0	0	0	2	2
Supp	0	0	0	2	0	1	3
t.apprb	0	0	0	0	0	1	1
t.dinfo	0	0	0	1	0	3	4
t.org	0	0	0	0	0	0	1
t.ref	0	0	0	0	0	0	0
t.remarq	0	0	0	0	0	1	1
t.rep	0	1	0	2	0	7	10
t.socl	0	0	0	0	0	1	1
Total	0	2	1	24	0	73	100

The social network below (fig. 3) represents the interactions among the tutor and the students during the first meeting. There was a high participation among the students which is not normally the case in classroom interactions [8]. During the discussion one interaction pertaining to a simple remark (4%) of a student can generate many interactions on behalf of the community. Those interactions should be encouraged for learning purposes. The chats consisted of a series of questions and answers.

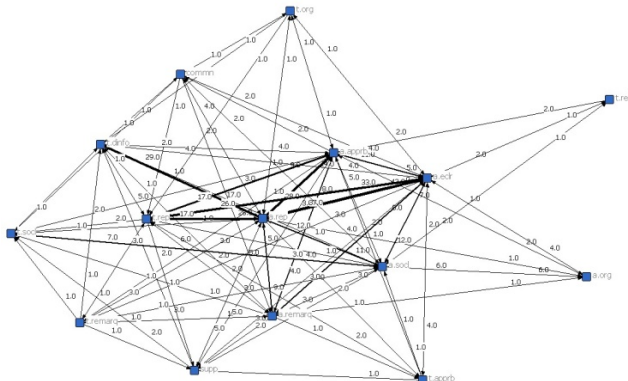


Figure 3: Group discussion characterized by Panchoo/Jaillet grid

It is worth noting that the e-tutor had the power to lead, orient and direct the chat as per his preferences. Online, as a group, the students did not hesitate to interact: they answered to queries from the tutor, they asked questions and they did not hesitate to discuss on queries of their friends as well.

#### IV. CONCLUSION

Students enrolled in distance education courses face problems in persisting in their studies. There is a high rate of students' failing or abandoning their studies [4, 8] due the lack of supports given to them. The Internet allows for the actors to be virtually located in a common environment with different tools to enable them communicate and collaborate. Pedagogical supports are also needed to encourage every student to perform better. Personalized supports are therefore necessary. The master's course described in this paper is successful due to various supports given to the students [4, 15]. The next step therefore is to find out how to give personalized supports and motivations to students so that quality exchanges are encouraged, enabling more learning to take place. The successful implementation of the e-campus, along with the appropriate learning strategies, has enabled French speaking students around the world to acquire knowledge and skills. Results confirm the important roles that the tutors played in helping students reach their goals. However, results from our studies showed that tutors can still guide the students towards better cognitive learning. It would be advantageous for the tutors to know past interactions of the students in order to assess their progress. Hence, quality and relevant feedback would help the students improve their results [4, 8]. This experiment can further be enhanced by taking into account the type of interactions exchanged by the students from other tools (email, forum etc).

Based on this result, the routine structured queries of the students could be studied and programmed. It is worth noting that students want to progress confidently and in all the different chats, they ask for routine information (submission date, format of the expected work) which were already communicated to them. A virtual tutor would then help them obtain rapid feedback. For the non-structured, non routine queries, the help of artificial intelligence is required. It is high time for specific needs applications to be developed for the purpose of teaching and learning. For this, the collaborations of technical IT related experts to work in close collaboration with the pedagogues so that specific applications are developed based on the needs of tutors and students.

#### REFERENCES

- [1] K. S. Sukon, D Boojihawon, G. Gatsha, and S. Panchoo, "Using ODL and ICT to develop the skills of the unreached: a contribution to the ADEA triennial of the Working Group on Distance Education and Open Learning", ADEA, Ouagadougou, Burkina Faso, 12-17 Feb. 2012.
- [2] E. Turban, D King, and J. Lang, "Introduction to Electronic Commerce", Pearson, Third, International Edition, 2011.
- [3] R. Foogooa, and S. Panchoo, "Use of ICT teaching aids in tertiary education – a case study of Moodle implementation", Proceedings, Higher Education and Economic Development, Mauritius, 03-05 September 2012.
- [4] S. Panchoo, « Interagir pour collaborer et apprendre à distance avec les Technologies de l'Information et de la Communication: Approche méthodologique d'étude des interactions d'une formation à

- distance », Thesis, University of Cergy-Pontoise, Paris, December 2010.
- [5] J. Mallet, « Intelligence collective, équipe apprenante et TICE. Les problèmes culturels sous-jacents », Proceedings, Tice Méditerranée, Marseille, France, 2007.
- [6] B. Muirhead, and C. Juwah, "Interactivity in computer-mediated college and university education: A recent review of the literature", *Educational Technology and Society*, 7(1), 2004, pp. 12-20.
- [7] F. Mangenot, « Analyser les interactions pédagogiques en ligne, pourquoi, comment ? ». Colloque La langue de la communication médiatisée par les technologies de l'information et de la communication, Bordeaux, France, 2006.
- [8] L. Audet, « Recherche sur les facteurs qui influencent la persévérance et la réussite scolaire en formation à distance », Réseau s'enseignement francophone à distance au canada-REFAD, 2008.
- [9] S. Vonderwell, "An examination of asynchronous communication experiences and perspectives of students in an online course: A case study", *The Internet and Higher Education*, 6, 2002, pp. 77-90.
- [10] R. Geer, "Initial communicating styles and their impact on further interactions in computer conferences", In G. Crisp, D. Thiele, I. Scholten, S. Barker and J. Baron (Eds), *Interact, Integrate, Impact: Proceedings 20th ASCILITE Conference*. Adelaide, 7-10, December 2003, <http://www.ascilite.org.au/conferences/adelaide03/docs/backup/706.pdf>.
- [11] M. Moore, "Three Types of Interaction", *The American Journal of Distance Education*, 1989, Vol. 3, No. 2, pp. 1-6.
- [12] T. Anderson and D. Garrison, "Learning in a networked world: New roles and responsibilities" In C. Gibson (Ed.), *Distance learning in higher education*, Madison WI: Atwood Publishing, 1998, pp 97-112.
- [13] A. Hirumi, "A framework for analyzing, designing and sequencing planned e-learning interactions", *the quarterly Review of Distance Education*, 2002, 3(2). pp. 141-160.
- [14] S. Protat, « Maladie d'Alzheimer et Environnements Virtuels évocateurs : évaluation de la Mémoire autobiographique et des apports thérapeutiques d'une nouvelle forme de thérapie de type revue de vie », *Cognitio*, 2006, Montréal, Aug. 19-21.
- [15] A. Jaillet, *L'école à l'ère numérique : des nouveaux espaces pédagogiques à l'Enseignement à Distance*. Editions harmattan, 2004, 260 p.
- [16] C. Depover, M. Giardina, and P. Marton, « Les environnements d'apprentissage multimédia: analyse et conception », L'harmattan, 1998, 263 p.
- [17] M. Hammond, "A Review of Recent Papers on Online Discussion in Teaching and Learning in Higher Education", *Journal of Asynchronous Learning Networks*, 2005, 9 (3), [http://www.sloan-c.org/publications/jaln/v9n3/pdf/v9n3\\_hammond.pdf](http://www.sloan-c.org/publications/jaln/v9n3/pdf/v9n3_hammond.pdf).
- [18] T. Karsenti, L. Savoie-Zajc, and F. Larose, « Les futurs enseignants confrontés aux TIC: Changements dans l'attitude, la motivation et les pratiques pédagogiques », *Education et Francophonie*, 2001, 29(1).
- [19] J. Hoffer, J. George, and J. Valacich, "Modern systems analysis and design". Prentice Hall, Edition 6, 2010.
- [20] Y. Engeström, "Learning by *expanding*", Helsinki: Orienta-Konsultit Oy", 1987.
- [21] L. Uden, A. Kumaresan, and, K. Salmenjoki, "Usable collaborative email requirements using activity theory", *Informatica* 31, 2007, pp. 71-83, [http://ai.ijs.si/informatica/PDF/31-1/18\\_Uden-Usable%20Collaborated...pdf](http://ai.ijs.si/informatica/PDF/31-1/18_Uden-Usable%20Collaborated...pdf), downloaded on Oct. 2012.
- [22] M. Roussou, M. Olivier, and M. Slater, "Exploring activity theory as a tool for evaluating interactivity and learning in virtual environments for children", Springer-Verlag, London Limited, 2007, pp.141-153.
- [23] S. Panchoo, and A. Jaillet, « Les démarches des acteurs lors des réunions synchrones à distance », XXIIe Congrès de l'AIPU, Publication d'actes sur Cédérom, Switzerland, 2005, 12-14 September.
- [24] S. Panchoo, and A. Jaillet, *L'analyse de contenu: Etat des lieux et présentation d'une méthodologie des interactions synchrones à distance*. Cemaforad4, Strasbourg, France, 9-11 April 2008, <http://edison.u-strasbg.fr/openconf/papers/175.doc>, downloaded in avril 2010.
- [25] R. Cousinet, « Une méthode de travail libre par groupes », 2nd édition, Les éditions du Cerf, Paris, 1949.