

Online Education: Analysis of Interaction and Knowledge Building Patterns Among Foreign Language Teachers

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Abstract

In this article we discuss findings from a case-study related to the distance education of teachers of Italian as a second/foreign language. This case-study has examined interactions among teachers during their discussions in a web-forum exploiting the model of content analysis proposed in the *Practical Inquiry Model* by Garrison, Anderson, and Archer (2001). The results of the content analysis of emerging themes using descriptive data and qualitative data analysis, allows us to put forward additional remarks on planning, evaluating and managing an online education course for language teachers, focusing in particular on the role of on-line tutors and their training. Furthermore, the methodology we have adopted may shed light on new analytical tools coming from this work.

Resumé

Dans cet article, j'analyse les résultats d'une étude de cas menée pendant la formation à distance d'enseignants d'italien langue seconde/langue étrangère. Cette étude examine les interactions observées chez les enseignants au cours de leurs discussions dans les forums, en utilisant le modèle d'analyse de contenu proposé par le *Practical Inquiry Model* de Garrison, Anderson et Archer (2001). Les résultats d'analyse du contenu, ajoutés aux statistiques descriptives et aux analyses qualitatives par thèmes émergents, nous permettent d'émettre des constats à propos de la programmation, de l'évaluation et de la gestion d'un cours de formation en ligne pour enseignants de langues étrangères, en étudiant particulièrement le rôle des tuteurs en ligne et leur formation. En plus, cette analyse peut ajouter des renseignements sur les instruments d'analyse, qui émanent de la méthodologie adoptée.

Introduction

Since 1999 the *Laboratorio Itals* www.itals.it has offered distance education courses on teaching Italian as a second/foreign language. The target audience of these courses is in-service or pre-service teachers and educators. Some participants in these online courses have expressed interest in becoming future online tutors themselves. Thus, online courses, such as those discussed in this article, not only have the

responsibility of providing quality teacher education, but also of modelling effective approaches to online education. Our objectives for the study were to analyze the interaction patterns taking place in Master Itals online classes and use the findings to design pedagogical interventions that could increase collaboration in online learning.

Theoretical Framework

In online education one of the most difficult issues is the prevalence of “serial monologues” (Henri, 1991) which answer the task assigned by the tutor but lack interaction. Nevertheless, social constructivism theories (Bandura, 1971; Chickering & Ehrmann, 1996; Harasim, 1989; Lévy, 1996; Slavin, 1990) tell us that to meet present education needs learning must be collaborative and social, rather than isolated and competitive. Online patterns should aim for these objectives. Many studies related to learning in virtual environments (Hathorn & Ingram, 2002; Hara, Bonk & Angeli, 1998; Henri, 1992; Henri & Rigault, 1996) reveal that e-learning experiences, even if intended to produce effective, deep and reflective learning, leave tutors and students feeling insecure or reluctant to engage fully.

The study by Pawan, Paulus, Yalcin and Chang (2003) was the starting point for this research project. That study analyzes critical thinking processes in interactions developed through computer conferencing among in-service language teachers using Garrison, Anderson and Archer's (2000; 2001) framework of analysis. This social constructivist framework, referred to as the Practical Inquiry model, provides an effective instrument to investigate and understand cognitive presence, defined by Garrison et al. (2001) as “the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse in a critical community of inquiry” (p.5).

In order to examine interaction within a social constructivist framework, we have identified four assumptions that were essential to the study and which are present in the Practical Inquiry model:

- A pedagogical structure based on constructivism;
- A form of education built on interaction;
- The use of web-forums to promote exchange between learners;
- A functional definition of the concept “knowledge building”.

The frameworks of analysis and the studies which take these themes into account often use an instrument of analysis which is extraordinarily effective: content analysis applied to web-forum transcripts. Many researchers (Bullen, 1998; Gunawardena, Lowe & Anderson, 1997; Hara, Bonk, & Angeli, 1998; Henri, 1992; Kanuka & Anderson, 1998; Mason,

1992; Meyer, 2003, 2004; Newman, Johnson, Webb & Cochrane, 1997; Newman, Webb & Cochrane, 1995) have developed frameworks and instruments to make this analysis easier, but the studies reporting real and repeated applications are still limited.

The two dimensions that shape the Practical Inquiry model are deliberation and action. Perception and conception (awareness and ideas) operate at the interface of these two modes. The Practical Inquiry model describes the process of creating meaning from experience and the process of creating cognitive presence. The phases of the Practical Inquiry model, are as follows (Garrison et al., 2001, pp. 10 - 11):

Phase 1, a *triggering* event, begins the inquiry process. The trigger is a problem or dilemma, usually defined or identified initially in educational situations by the instructor/moderator; the process includes identifying and focusing on one trigger (sometimes explicitly rejecting or excluding others);

Phase 2, *exploration*, involves movement between the private, reflective world, and the shared, collaborative world, with participants alternating between reflection and discourse as they strive to grasp or perceive the problem and understand its nature; this phase is typified by brainstorming, questioning, and free exchanges of information; the authors warn that learners may resist moving out of this phase into the next unless prodded by the instructor/moderator;

Phase 3, *integration*, is the phase where meaning is constructed from the ideas generated in the previous phase; ideas are evaluated on the basis of how well they connect with and describe the problem; in this phase of the inquiry process participants may continue to move repeatedly from private reflection to public discourse;

Phase 4, *resolution*, is signified by the appearance of indirect or direct action; resolution requires "clear expectations and opportunities to apply newly created knowledge" (p. 11); if the resolution is perceived as incomplete or inadequate in any way, or a new problem is identified, the process may be repeated.

Research Questions

The following research questions have guided this study:

1. Is it possible to single out interaction models realized in online discussions?
2. Does a web-forum online discussion result in the outcomes expected from collaborative learning, i.e., are all phases of the Practical Inquiry Cycle met?

3. Which are the instructional factors that may affect the level and the type of collaborative discourse among learners in online discussion web-forums?
4. How important is a tutor (or any kind of guide) in the development of online discussions?
5. Starting from the instructional factors revealed from the answer to question 3, which pedagogical strategies can be implemented to enhance collaborative learning outcomes in online discussions?

Research Methodology

To answer these questions (and to verify the hypotheses) we have used a case study methodology.

Research Participants

Master Itals is a two-year education course for teachers of Italian as a foreign/second language. It uses a blended learning modality and is presented through a secure site. The learners of *Master Itals* are mostly in-service teachers (although some of them are still in pre-service education) and they differ widely in many ways, such as geographical place of origin or of work, previous education, communicative competence in Italian (non native and native speakers are mixed), and technological background.

This case-study examined online discussions from three on-line courses in the 2nd term of the 5th cycle of *Master Itals* (academic year 2003/2004): Courses 1 and 2 were based on the module "Linguistic evaluation" while course 3 concerned "Italian contemporary sociolinguistics" (see Table 1). The technology used in the three web-forums was the same: a threaded asynchronous discussion tool, which could be consulted and implemented only online by both learners and tutors, and received as e-mail messages only by the tutors. Some of the materials used in the discussion were available on the *Master Itals* website before the course began; others were uploaded during the discussion either by the tutors or by the learners in the form of attachments to messages. The courses followed a standard format designed by the pedagogical coordinator of the *Master Itals*: the tutor gave the learners at least three discussion topics, which were distributed over the duration of the course. The learners, to obtain credit for the course, had to send at least three meaningful messages during each week of the course. While a week was added to course 2; the tutor asked learners to post the same number (3) of discussion topics.

Both tutors had a good knowledge of the subject and previous experience in managing on-line discussions. One tutor managed the forums for courses 1 and 2; the other led course 3 discussions.

Table 1
Description of Three Online Courses

<i>Course</i>	<i>Course 1</i>	<i>Course 2</i>	<i>Course 3</i>
Title of web forum	Linguistic evaluation	Linguistic evaluation	Sociolinguistics of contemporary Italian language
Tutor	T1	T1	T2
Period of attendance	19/04 - 23/05	24/05 - 27/06	24/05 - 27/06
Total duration of course	35 days	39 days	34 days
# days of discussion	19 days	26 days	19 days
# participants	26	25	22
# messages	395	413	192
Genre	employs characteristics of other familiar genres: letter, short story, book report		
Topics of discussion	1) Student and self-evaluation 2) Written production with: evaluation criteria 3) "Authentic Evaluation": the the Portfolio	1) Student and self-evaluation 2) Oral production: with with: evaluation criteria 3) "Authentic " Evaluation": the the Portfolio	1) Description and reflection on personal "sociolinguistic autobiography" 2) Analysis of sociolinguistic related sites and of their possible use in language teaching 3) Sociolinguistic comparisons between Italian and other languages and suggestions for use in language teaching
Course topics	Theoretical topic - with daily practical applications already known by teachers		Prevalently theoretical topic with daily practical applications less known by teachers

Data Collection and Analysis

Analyses were undertaken by means of the tools described below. This article will discuss only the results emerging from the application of the Practical Inquiry model.

1. *Descriptive data of participation levels in web-forums.*

The entire message as a unit of analysis was taken into consideration. All messages posted in the web-forum were taken into account, even those to which content analysis hadn't been applied. Data were collected by means of the following indicators: progressive number of the messages, author's name, author's role (tutor, co-tutor), and posting date of the message.

2. *Quantitative content analysis in the web-forums.*

The content of the web-forums was coded according to the Practical Inquiry model proposed by Garrison et al. (2001) and the following modifications suggested by Pawan et al. (2003). Messages concerning the course final exam (not relevant to the aims of our research) and "wrong" messages (the ones posted by mistake more than once in the web-forum) were not coded, as they might have altered the results of the coding process.

Transcripts of the discussions were divided into units of analysis called "speech segments," defined by Henri and Rigault (1996) as "the smallest unit of delivery linked to a single theme, directed at the same addressee (all, individual, subgroup), identified by a single type (illocutionary act), having a single function (focus)" (p.62). This kind of analysis is considered more effective in analyzing discussion where a message often answers more than a question or presents more phases of the same contribution. In all, 1,000 units were coded.

Table 2 reports the descriptors used for the coding process. This work is a continuation of Pawan et al. (2003). For this reason we have tried to take into account their observations by modifying their coding framework; for example, we have added a special code for off-task messages, which were considered to be unrelated to the development of the phases of critical thinking. Messages were simultaneously coded by two coders, and the results merged to reach final and shared assignments. The result of this "scanning" has been a sort of "translation" of qualitative aspects of the messages into nominal categories (variables). A statistical elaboration was applied to these variables in order to reach a quantitative content analysis.

Table 2
Practical Inquiry Model Descriptors (adapted from Garrison et al., 2001)

<i>Descriptor</i>	<i>Indicators</i>	<i>Socio-cognitive Processes</i>
No phase	0.0 Off-task	0.0.0 Posts aimed only at socializing and sharing information not related to the specific subject of discussion; posts aimed at creating/modifying/ maintaining personal identity 0.0.1 Posts concerning web-forum management and indications about study program
Phase 1 Trigger events (<i>Evocative</i>)	1.1. Recognizing the problem 1.2 Sense of puzzlement	1.1.1 Presenting background information that culminates in a question 1.2.1 Asking questions 1.2.2 Messages that take discussion in new direction
Phase 2 Exploration (<i>Inquisitive</i>)	2.1 Divergence within the online community 2.2 Information exchange and brainstorming 2.3 Suggestions for consideration	2.1.1 Unsubstantiated contradiction of previous ideas (namely, that does not invalidate triggering phase) 2.2.1 Personal narratives/descriptions/ facts (not used as evidence to support a conclusion) and adds to established points which does not systematically defend/justify/develop addition ("I agree because + personal opinions"); signalling web-sites only through description 2.3.1 Author explicitly characterizes message as exploration; e.g., "Does that seem about right?","Am I way off the mark?","What do you think about?"
Phase 3 Integration (<i>Tentative</i>)	3.1 Convergence	3.1.1 Building on, adding to others' ideas ("I agree because + references that are not opinions: for example, to what has been said by others, to previous discussions, etc."); web-sites with tips for language teaching

Table 2 (cont'd)
 Practical Inquiry Model Descriptors (adapted from Garrison et al., 2001)

<i>Descriptor</i>	<i>Indicators</i>	<i>Socio-cognitive Processes</i>
Phase 3 Integration (<i>Tentative</i>)	3.2 Convergence	3.2.1 Justified, developed, defensible, yet tentative (tentative solutions) hypotheses
	3.3. Connecting ideas, synthesis	3.3.1 Integrating information from various sources (textbooks, articles, personal experience)
	3.4 Creating solutions	3.4.1 Explicit characterization of a message as a solution by participant (teaching activities without specific indications, not "ready for use")
Phase 4 (<i>Resolution</i>)	4.1 Vicarious application to real world	4.1.1 Solutions "ready for use" (activities with specific indications (<i>Committed</i>) of the material and of the procedure)
	4.2 Testing solutions	4.2.1 Activities tested in class (description of what was done)
	4.3 Defending solutions	4.3.1 Justifying choices operated in a real context

3. Qualitative "emerging design" approach in the analysis of web-forums.

To single out the kind of issues that shape the development of online discussions we have used an analysis focussed on the emerging themes of discussion. This kind of analysis takes into account the pedagogical factors affecting collaborative discourse and the implementation of instructional strategies that could enhance collaborative learning.

We have used a qualitative approach defined as an "emerging design" approach (Lincoln & Guba, 1986) which enables the determination of the themes emerging from transcriptions, without predetermining what such themes should be. By using this context-bound approach in our research, we have identified recurring themes that seem to shape interactive behaviour in online discussions. We have then merged these observations with the results emerging from the descriptive statistics.

Table 3
Coefficients of Inter-rater Reliability

	<i>Holsti's Coefficient</i>	<i>Cohen's Kappa</i>
<i>Reference Value</i>	≥ 0.800	≥ 0.750
<i>course 1</i>	0.886	0.837
<i>course 2</i>	0.870	0.799
<i>course 3</i>	0.858	0.798

Reliability and Validity of Coding Using the Practical Inquiry Framework

To increase reliability of the coding process, two coders separately coded all the messages of the three web-forums. Inter-rater agreement, defined as agreement between coders in relation to the content classification, was expressed by calculating Holsti's coefficient (1969) and Cohen's Kappa. Final inter-rater agreement coefficients are listed in Table 3. Every disagreement in the coding process decision was discussed and negotiated between the coders until they reached mutual agreement on the final coding adopted for the discussion of results and conclusions.

Findings

Levels of Participation

In terms of length, course 1 had the highest number of messages per day (course 1: 11.3; course 2: 10.6; course 3: 5.6) and the highest percentage of posts sent by the tutor (course 1: 18.2%, course 2: 15.5%, course 3: 16.7%). Course 2 had the highest number of units (435) and was the longest (39 days). During course 3, while participation was very regular, the tutor sent a lower number of messages than the tutor in courses 1 and 2; also, the average number of messages sent by each learner was very low, ranging from 4.69 in week 2 of course 1 to 0.67 in week 5 of course 3.

Practical Inquiry Framework Phases

Table 4 shows the number and percentage of messages in the three courses distributed among the off-task phase and the Practical Inquiry phases.

Table 4
Phases of Practical Inquiry Model by Course and Week

Course	Week	# Units	Phase 1 Triggers		Phase 2 Exploration		Phase 3 Integration		Phase 4 Resolution		Off-task	
			N	%	N	%	N	%	N	%	N	%
One	19-25/4	162	12	7.4	60	37.0	25	15.5	0	0	65	40.1
	26/4-2/5	186	9	4.8	71	38.2	33	17.7	15	8.1	58	3.2
	3-9/5	109	10	9.2	51	46.8	24	22.0	0	0	24	22.0
	10-16/5	18	1	5.6	6	33.3	5	27.8	0	0	6	33.3
	17-23/5	10	0	0	0	0	0	0	0	0	10	100
Total		485	32	6.6	188	38.8	87	17.9	15	3.1	163	33.6
Two	23-30/5	142	7	4.9	64	45.1	14	9.8	0	0	58	40.8
	31/5-6/6	84	6	7.2	41	48.8	19	22.6	0	0	18	21.4
	7-13/6	89	5	5.6	31	34.8	22	24.7	3	3.4	28	31.5
	14-20/6	105	13	12.4	37	35.2	25	23.9	1	0.9	29	27.6
	21-27/6	11	0	0	2	18.2	0	0	0	0	9	81.8
	28-30/6	3	0	0	0	0	0	0	0	0	3	100
Total:		435	31	7.1	174	40.2	80	18.3	4	0.9	145	33.3
Three	24-30/5	68	5	7.4	23	33.8	0	0	0	0	40	58.8
	31/5-6/6	67	2	3.0	26	38.8	25	37.3	5	7.5	9	13.4
	7-13/6	83	2	2.4	24	28.9	23	27.7	4	4.8	30	36.1
	14-20/6	17	0	0	3	17.6	5	29.4	0	0	9	53.0
	21-26/6	2	0	0	0	0	0	0	0	0	2	100
Total:		435	9	3.8	77	40.2	53	22.36	9	3.8	90	37.9

In course 1, as in course 3, there was a very high percentage of units pertaining to Phase 1 (Trigger Events), most sent by the tutor (course 1: 13/32; course 3: 6/9). In relation to course 3, the higher number of posts by the tutor pertained to Phase 3 (Integration) (course 1: 18/87; course 3: 4/53) as a synthesis of the discussion.

Course 2 had the lowest percentage of units pertaining to Phase 4 (Resolution) (0.9%) but the highest percentage pertaining to Phase 2 (Exploration) (40.2%); Despite the longer length of time, the discussion seemed to stop at Phase 2 and to lead to a lower number of posts which was typical of Phase 4.

Emerging Design Approach Content Analysis

Applying the emerging design analysis approach we found that some themes (proposed as compulsory activity by the tutor or spontaneously produced by the discussion) generated a high number of answers by the learners, highlighting their specific interest. Topics such as “Authentic evaluation” and “Process instruments and criteria to assess students’ work” generated the highest number of postings, while topics such as “self-evaluation grids”, reflections on mistake and correction strategies and a questionnaire on beliefs and attitudes generated very few responses.

Analysis of Findings

In this section we examine the findings of the three courses in more detail, and make some suggestions about instructional factors that may contribute to the outcomes.

Participation was different in the courses: some learners contributed with the minimum of compulsory posts (3), others sent up to 29 posts each. Also the participation of tutors was different: the tutor of courses 1 and 2 contributed more often than the tutor of course 3. However, in each course there was the same percentage of off-task units out of the total number.

Concerning the predominant typology of posts, we conclude that:

1. As in Garrison et al. (2001) and Pawan et al. (2003), the discussions were centred in Phase 2 (from 32 to 40%); however, differently from these studies, a larger number of units were situated in Phase 3 (from 17 to 22%), and some units (even if a few) situated in Phase 4 (from 1 to 4%);
2. The percentage of off-task units was much higher than in the other studies (34-38% instead of 3% of Meyer, 2004, and Pawan, 2003); this may be due to:
 - a. The length of the discussion time considered here (which also requires a more structured work organisation and therefore, learners need more “technical” tips and more motivational support);
 - b. The central role of the web-forum in the education plan (learners are requested to interact with the tutor only through the web-forum and to use private e-mail exchanges only for strictly personal communications);
3. The increasing percentage of off-task posts coincided with the increasing percentage of messages in Phase 3 and Phase 4; this strengthens the fundamental hypothesis of the social presence

- theory in the Community of Inquiry Framework, even if a confirmation could come only from an analysis of the specific indicators;
4. Units pertaining to Phase 2 generally included personal narratives, descriptions, facts, and information; learners were primarily sharing information and brainstorming their ideas and reflections in relation to the issues posted by the tutors;
 5. In comparison to Pawan et al. (2003), in the study reported here there was a larger number of units related to previous messages (Phase 3 - Integration) where learners attempted to build upon ideas and information suggested by others;
 6. Only a few units were situated in the divergent phase (code 2.1) and were actually in conflict with what had been introduced by previous messages: even if learners from time to time referred to other posts, they seldom engaged in argument/counter-argument discussions;
 7. As underlined by Meyer (2004), units situated in Phase 4 were prevalently generated by tasks which explicitly asked learners to create solutions; therefore, the nature of the triggering event influenced the level of the answers of learners.

To find out how we might encourage a more collaborative discourse, we need to take a closer look at what happened in each of our online courses (Table 4).

Findings in Course 3

Of the three courses, course 3 had the fewest number of units (237) and the highest percentage of off-task units (38%) and of Phase 4 units (4%). A majority of the units fell into Phase 2 and Phase 3 (in total, 54%), while Phase 1 had a lower percentage than other courses (only 4%).

In our opinion, this kind of development is related to the tutorial style, characterized by short and very specific input messages which asked specialist considerations (possible applications to language teaching) from the very beginning of the discussion. In addition, the tutor didn't play an active role throughout the development of the discussion (the tutor posted only 10% of the messages) and feed-back was limited to the activities proposed by the learners. This may explain the development of a high percentage of units in Phase 4 and a lower percentage of units in Phase 2 and in Phase 3 combined when compared to courses 1 and 2 (only 54% vs. 56% of course 1 and 59% of course 2). By checking the distribution of the units among the learners, we noted that most units situated in the highest phases of the framework were posted by very few people. This suggests that, in comparison with courses 1 and 2, a smaller number of

learners reached the highest phases of development of critical thinking. Learners who didn't reach these phases can benefit from other people's results, but are less involved in the "building" discourse. For this reason they are more likely to remain in Phase 2.

Findings in Course 1

As to duration, course 1 had the highest number of absolute units (485) and of units per day (13.86). The tutor was the same as for course 2, but the duration was shorter (course 1 was 5 days shorter than course 2). Course 1 was the course with the highest percentage of tutor messages (16.5%). The average number of messages sent per learner was higher than in course 3 (12.5 vs. 7) and also the range of the messages posted by the learners was wider (in course 3, the range was 3-13, in course 1, 1-29). In comparison with course 3, there was a higher percentage of units in Phase 1, most of which were posted by the tutor whose style was marked by a main discussion input for the week; however, the input here was extremely articulated and rich in background information, and culminated in a group of "provocative" or intentionally "conflicting" questions. Besides, the tutor sent a lot of postings (even within the same day) to give further stimulus or to comment upon the learners' postings. Compared to course 3, a larger number of the tutor's postings were situated in Phase 3 and were a synopsis of the ideas put forward by the learners.

The development of the discussion over the weeks (see Table 4) shows that the main phase was Phase 2, especially during the first and the second week. Phase 3 followed the same pattern, but remained at considerably lower levels. A very exceptional occurrence happened when the units of Phase 4 emerged during the second week of discussion (and not during the last week, as might be expected). The emerging design analysis helped us to understand this phenomenon. The topic of discussion for the second week was the process instruments and criteria by which to evaluate written work. This topic moved the learners to evaluate their students' written work using the rubrics elaborated by themselves and/or negotiated through the web-forum, with a final validation of the rubrics and of the relevant results.

Findings in course 2

Course 2 had the second highest number of units (435) the longest duration (39 days) and the lowest percentage of units in Phase 4 (1%) but the highest percentage of units in Phase 2 (41%). Despite the fact that the duration was longer, discussion seemed to get stranded in Phase 2 and reflected the least development of resolution postings, typical of Phase 4. By checking the kind of units posted by each learner we found that a higher number of learners than those in course 3 posted units in both Phases 2 and

3. There seems, therefore, to be a greater development of “common” knowledge. In comparison with course 3, we may suppose that there was a higher level of knowledge building within the web-forum and the postings of some learners worked as a “diving board” to access the next phase for a greater number of learners. However, this investment in negotiation and integration didn't allow a strengthening of Phase 4.

Limitations

There are several limitations to this study. The first set of limitations relates to the Practical Inquiry model that we have used.

As already noted (Garrison et al., 2001; Pawan et al., 2003), the greatest difficulty was to point out the movement from Phase 2 (Exploration) to Phase 3 (Integration). The tutors' posts, which gave feedback to the discussion, were easily identifiable as a synthesis; however, other posts weren't so easily identifiable. In particular, it was difficult to distinguish simple agreement (2.2.1) from substantiated agreement that really added something to the discussion (3.1.1).

In both kinds of courses tutors proposed activities aimed at solving problems connected to language teaching and learning. The learners' answers weren't easy to codify. After a number of comparisons, the coders decided to codify posts as follows: 3.2.1 for messages proposing solution hypothesis, without “practical” indications; 3.4.1 for messages proposing more detailed solutions, which couldn't however be directly applied; and 4.1.1 for messages proposing “ready for use” solutions.

The framework of analysis hasn't faced the issue of attachments to messages (this option wasn't taken into consideration in the virtual environments used for the courses analysed in previous studies). The coders agreed to codify the attachments as if they were part of the postings and to create new units of analysis only when the text of the attachment was different from the posting.

The coders attributed code 2.1.1 when the postings contained an “I don't agree” statement that constituted a topic of discussion, even if it wasn't substantiated. This decision was taken since this kind of message, essential for the development of the discussion in the web-forum, wouldn't otherwise have been codified. Furthermore, in the courses analysed, every disagreement was substantiated by the author.

The second set of limitations stemmed from having analysed data only by means of the Practical Inquiry model, without thoroughly analysing the social and teaching dimensions. The use of transcripts also limited the amount of information. Future research could include information gathered from additional sources, such as interviews with learners and tutors.

Discussion

The aim here is to highlight the strategies and approaches that could turn an online virtual learning environment into a more collaborative and constructivist one. Our suggestions are based on the phases of critical thinking and the role of the tutor.

1. *Interaction among learners in web-forums can lead to the building of new knowledge.*

This first research question was fully verified in this study. In all the web-forums analyzed, the participants went beyond the simple exchange of knowledge and information based on their personal experience to integrate them into new forms of knowledge and design new solutions (not always validated, but, in any case, shared).

The Practical Inquiry model also allowed a numerical quantification of these results to underline the percentage of units pertaining to Phase 3 (and the first attempts to reach Phase 4, identifiable in all courses).

In comparison with other studies realized through this framework, we may say that the results we reached underline a greater expansion of Phase 3 and 4. In our opinion this great expansion is strictly related to the role of the tutor. In other studies the tutor's participation (even if not exactly quantified) was less frequent and above all, less "technical" (i.e., less action-oriented).

2. *The quantity of messages in a web-forum is not connected to the quality of the learning, because messages could also be "monologues".*

We can state quite strongly that quantity is not an index of quality, at least as concerning high levels of critical thinking (which is the specific subject of our research). The web-forum with the lowest number of units and messages is the one that reached the highest level of percent development of Phases 3 and 4 (web-forum of course 3). Web-forums of course 1 and course 2 had a considerably higher total number of units and messages and, in absolute values, had also a higher quantity of units pertaining to Phases 3 and 4. However, in the proportional dynamic of development of phases, these web-forums remain at considerably lower levels (course 2 and course 3 are separated by 7 points).

3. *Frequent reference from one message to other is needed to build new knowledge, both in tutors' and in learners' messages.*

In the Practical Inquiry model the concept of interaction is realized through two modalities: a first modality in Phase 2 and a second modality in Phase 3; they have been codified in the framework we have adapted (see Table 2) as 2.1.1 - 2.2.1 - 3.1.1 - 3.3.1. This way of codification classifies interaction focussing on intensity of interaction (does a learner recover previous information only to mention it or in order to build further reflections?) rather than on frequency of interaction (is information the subject of an argument/ counter-argument discussion that involves at least three messages?). Starting from this operative concept of interaction by Garrison et al. (2001), we found that interaction was quite high in the web-forums we analyzed. Units codified as pertaining to Phase 3 are a consistent percentage of the total number and codes 3.1.1 and 3.3.1 are highly represented in web-forums of courses 1 and 2. It is not by chance that in these courses we can see greater knowledge building within the web-forum and, at the end of the courses, learners expressed a greater sense of "enrichment" coming from the group.

The peaks of postings of Phase 3 units were compared with the results of the "emerging design" analysis. Topics enhancing greater interaction were those connected to the daily work of teachers (evaluation criteria, school reforms, use of Internet resources for language teaching, etc.), which directly asked neither a description of personal situations and/or experience (Phase 2), nor the creation of a complete teaching activity (Phase 4). The level of interaction, therefore, seems to be influenced by the kind of input given by the tutor.

We would like to underline that to reach high levels of critical thinking, deep interaction (as Phase 3 in Garrison et al.'s model) is not needed at all moments of discussion. Indeed, there are stages in the process of the development of knowledge where learners go through a private reflection and the exhibition of personal considerations (Phase 2). Only at a later stage, is it essential that this knowledge, which is a kind of "monologue", be integrated into a wider frame (usually by means of the instructor).

4. *Tutorial guidance enhances the achievement of higher levels of meaningful learning and, depending on the kind of guide, the process of building new knowledge will have different outcomes.*

In course 3 most learning happened outside the web-forum and postings were the results of external reflections and building processes. In courses 1 and 2, instead, everything happened inside the web-forums. This didn't result in raising critical thinking levels, but probably encouraged a wider sharing of knowledge among all participants. For this reason, in courses 1 and 2 we didn't reach higher levels in absolute, but everyone reached a higher level, when compared to course 3. This may depend upon a social factor: the tutor of course 3 didn't activate the same socialization dynamics created by the tutor of courses 1 and 2. It would be interesting to widen this research by analysing patterns of social interaction, because the theoretical framework of the Community of Inquiry (Garrison et al. 2001) considers social interaction a basic factor to sustain learning. By observing these findings, it could be deduced that in order to build real knowledge during the discussion the tutor should post different kinds of messages. In all courses the tutor sent a high number of postings pertaining to Off-Task and Phase 1. The tutor was not always very active in Phase 2, but was always very active during Phase 3.

By observing the emerging themes of discussion and the trend of the interactions, it is suggested that these integrative postings, typical of Phase 3, are necessary to "push" the reflection further and increase the maturity of the learners, which otherwise will remain in "comfortable" Phase 2. Garrison et al. (2001), and Pawan et al. (2003) too, found that students are more comfortable during Phase 2 (information sharing). For this reason tutors ought to move the postings of the learners towards higher levels of critical thinking, enhancing, in this way, the building on other people's postings and/or asking for resolutions.

5. *Time is a key-factor in the achievement of higher levels of meaningful learning; a longer time available for education means reaching a higher level of knowledge.*

Application of the Practical Inquiry model clearly shows that by increasing the time available for discussion and preserving the other variables (tutor, topic, number of inputs given by the tutor, number of compulsory postings, way of management, material to study, etc.), critical thinking levels reached by the learners don't increase, but, rather, decrease (Table 4).

These results raise the question of whether longer times are actually an advantage. Discussion in course 2 seemed to get stranded in

Phase 2 and to reach Phase 4 with difficulty. This is possibly an apparent stop as the percentage of units pertaining to Phase 3 is actually higher than in course 1. Moreover, the distribution of posting codes among learners causes us to think that in course 2 there is greater consolidation in Phase 3 than in course 1. In this way, in course 2 there is better knowledge sharing (referring to Phase 3, Integration).

Why didn't longer time help to reach higher critical thinking levels? Why, on the contrary, did critical thinking levels go down? Different interpretations are possible. If course 2 had had more available time, learners may have reached the same levels in Phase 4 as those in course 1, perhaps distributing them among a higher number of participants. On the other hand, it may have been counterproductive to maintain the same number of tutor-assigned topics (3) while lengthening the available time: learners may have felt it as time dilution and, for this reason they may have lessened their concentration. A greater density of inputs (even if simpler) may have increased discussion.

Recommendations for Practice

Observations connected to pedagogical ways of managing web-forums have been made previously. These are summarized below in order to suggest some temporary methodological coordinates. It is our intention to expand these considerations in future studies, enriching them with examples and further investigations. The emerging discussion and the ways adopted by the tutors to manage the web-forums, may point out some effective strategies. From this study it is suggested that a tutor should:

1. Structure class discussions by clearly outlining participation requirements, pedagogical targets, and modalities used to attend the course, and the evaluation criteria;
2. Model messages, by sending postings whose length and articulation agree with the effectiveness and agility requirements needed for on-line education;
3. Clarify requests, by placing them in the field of Integration and Resolution (Phases 3 and 4 of the Practical Inquiry model);
4. Promote meta-cognitive reflection by making learners aware of the purposes and of the potential of interactive collaboration;
5. Respect different learning styles, by diversifying the tasks and the ways of posting.

Further Research

Henri (1992) thinks that one of the worst dangers of computer text-based discussions is the “serial monologues”, i.e., lists of messages on the same subject that don't integrate each other. By means of this study we have seen how online discussions don't automatically become interactive: there must be a strong moderating presence of the tutor.

The inquiry model adopted has proved effective and has provided useful results for a qualitative analysis of interactions in web-forums. It was necessary to modify some codes, partially due to the specific subject of the courses (foreign language teaching).

Many questions remain open:

- Does the critical thinking level of a class rise during the program of study or is it strictly connected to the tutorial management style?
- Does the same tutor reach comparable critical thinking levels with different classes?
- Are learners who are used to a tutor who is very good at making the class reach high critical thinking levels able to replicate this ability in other contexts?
- In this study a great percentage of units fell into Phase 2: for this reason, should we consider a web-forum as an instrument more apt to share information than to work out solutions?
- Does a “provocative” tutor, i.e., a tutor promoting cognitive conflicts in learners (see Piaget) make the whole class reach higher critical thinking levels? Or does the tutor sustain only some learners (due to their particular cognitive style), while others stop at lower levels?

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