

Networked interaction to stimulate reflection, argumentation and synthesis

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1. The context

In online education, the most useful strategy for stimulating students' active participation is undoubtedly the collaborative type. Such strategies involve two complementary activities: interpersonal communication and co-construction of artefacts.

Giving students, for example, the task of collaboratively creating an artefact which represents the synthesis of a study activity, has often been found to facilitate their aggregation into learning groups; the process of construction captures group members' attention and enhances synergic action, opinion exchange and argumentation when decisions need to be made and divergences within the group need to be solved.

While the new mobile technologies have fostered the diffusion of synchronous communication, there is no doubt that asynchronous communication is still the main mode of interacting within online learning groups, particularly the type of text communication used in "formal" training courses which (also) include collaborative strategies.

Bearing all this in mind, the key issues now become: how to achieve the most fruitful combination of the potential tools of Networked Collaborative Learning (NCL) (Trentin, 2010) and written online communication? How to channel them towards the achievement of the declared goals of a specific training course? How to organise collaborative interaction so that it is stimulating and at the same time productive of reflection, argumentation and synthesis in the students?

As can be seen, these issues are closely connected to the pedagogical dimension, i.e. how to organise/construct didactic communication, particularly of the written and/or graphic type, in order to enhance students' learning.

This type of issue must however be pondered together with those regarding assessment, i.e. how to use this communication to analyse (a) if and how we are actually moving towards the declared learning goals and (b) the

contribution of individual students to the collaborative process which develops within the learning groups.

This all points to the need for efficient planning of the collaborative activities, which will allow, on the one hand, the achievement of the declared learning goals, and, on the other, the assessment of the extent to which these goals have been achieved and of the collaborative process adopted.

These two processes (teaching/learning and assessment) must necessarily interact with each other, so the teaching activity must be planned to ensure that the path to be followed by the students is both “observable” and “traceable”, allowing useful information to be gathered from their individual and/or group actions for the assessment process.

Assessment may concern: the individual student (e.g. levels of learning, of active contribution to group work etc.); the products developed during the proposed activities (artefacts, problem-solving, exercises etc.); the teaching process used by the teacher to achieve the declared goals.

“Observable” refers to any activity which can actually be observed by the teacher, such as a forum discussion, allowing conclusions to be drawn not so much (or not only) about each individual student’s level of active participation, but also about how they use the subject-specific terminology, how they argue their opinions and/or their choices, etc. These are very important elements for helping the teacher understand what progress the students are making in the acquisition of subject-specific knowledge or transversal knowledge (group work, manner of expressing oneself, arguing one’s opinion etc.).

“Traceable” refers to any activity leaving “digital traces” which can be analysed asynchronously by the teacher, such as the results of an online test, or the above-mentioned forum. Besides being observable, these are also traceable, in the sense that they leave a written trace which can be read afterwards by the teacher and assessed according to the level of active contribution to the discussion.

Other digital traces which are useful for assessment purposes are those recorded by the social media, for example the chronology of the modifications of a group-generated document (e.g. a wiki). This allows analysis of the series of modifications made by each student and their level of contribution to the co-construction of an artefact (Trentin, 2009).

At this point it is clear that the planning of instructional design cannot take place separately from the planning of the monitoring system (and more generally of the assessment process) if we wish to fully exploit the observability and traceability of the students’ actions for the assessment of the learning process.

In this sense, the design procedure might even be usefully reversed, i.e. first establish the monitoring system for the assessment, then construct the teaching activity in such a way as to favour the collection of the data and information which will feed said system.

This is the approach in fact followed in the “*Polaris*” *instructional design methodology* (Trentin, 2001), developed within the project of that name for the online training of school teachers, and subsequently refined in *Web-Enhanced Learning* projects in several Italian universities (Repetto and Trentin, 2011).

The methodology is based on a detailed planning of the collaborative activity by means of a *script* (Dillenbourg and Tchounikine, 2007), a kind of music score written by the teacher, which the students are asked to “play”, and where the orchestra conductor may be the composer himself (the teacher) or another actor in the process (e.g. the leader of the learning group).

The second part of this paper will describe, for the sake of example, (a) the script used for a collaborative study activity with university students from the University of Turin¹, and (b) the assessment process used with it.

2. An example of a script

The collaborative activity used as an example here required students to produce an artefact (specifically a wiki) which summarised what had been learned in the study of one of the key topics in the syllabus of the course (Online Community of Professionals - OCPs). A mixed collaborative strategy was used to conduct the experiment, combining:

- a *shared mind* (Schrage, 1990) approach through application of the *pyramid method* (Biuk-Aghai, 2003) in the study stage and the stage of collaborative planning of the artefact structure;
- a *division of labour* (Schrage, 1990) approach in the collaborative writing stage for the actual creation of the wiki.

Table 1 shows a summary of the general script based on the pyramid method governing the development of first part of the collaborative task, the part we have defined as “shared mind”.

¹ Specifically during the course “Network Technologies and Knowledge Flows” held in the last year of the second-level degree course in “Public and Political Communication” at the Faculty of Political Science of the University of Turin.

Table 1 – Summary of the script governing the development of the collaborative activity in “shared mind” mode.

<i>Activity</i>	<i>Organisation</i>	<i>Resources used</i>
<i>Teacher’s Introductory lesson</i> [2h] on study topic with explanation of the methods for carrying out the experiment and of the tools used for data collection.	<ul style="list-style-type: none"> • Face-to-face intervention and discussion on organisational rules of next step. • Division of students into 8 learning groups of 8-10 members each. 	
<i>Stage 1 of the pyramid</i> [5 days]: individual study of material provided by teacher, online search for further material and summary of what they have learnt with structured representation using concept maps.	<ul style="list-style-type: none"> • Individual activity without interaction with other students except through the module forum moderated by the teacher. • Network activity aimed (a) at integrating the material provided by the teacher with other material from the web, (b) at pinpointing OCPs, classifying them according to some parameters agreed on with the teacher. • Individual development of the map. • Teacher role: waiting for requests (<i>pull</i> mode). 	<ul style="list-style-type: none"> • Forum for teacher support on Learning Management System (LMS). • LMS from which to access material uploaded by the teacher. • Any other type of NMT to access other web document resources and the COPs. • A Google Forum to collect and classify OCPs intercepted. • Mindomo online editor of concept maps.
<i>Stage 2 of pyramid</i> [2 days]: comparison in pairs of the structured representations and agreement on a single representation.	<ul style="list-style-type: none"> • Division of each learning group into pairs. • Wholly online activity. • Sharing of individual maps and materials found on the web by each student. • Teacher role: waiting for requests (<i>pull</i> mode). 	<ul style="list-style-type: none"> • As above, with addition of any other NMT (synchronous and asynchronous) for interacting 1:1 with one’s partner in the pair and for sharing information and documentation (via DropBox, Google Drive, etc.) found on the web by each one during previous step.
<i>Stage 3 of pyramid</i> [3 days]: group comparison in pairs (4-5 groups of pairs for each learning group) of the maps produced by the single pairs and agreement on one map.	<ul style="list-style-type: none"> • Whole group activity to compare the 4 maps produced by the single pairs. • Online activity for preliminary viewing of the productions of the other 3-4 pairs and first exchange of opinions preparatory to classroom meeting. • Final face-to-face comparison [4h] with the 8 groups operating in parallel. • Teacher role: waiting for requests (<i>pull</i> mode). Occasionally <i>push</i> in the 	<ul style="list-style-type: none"> • As above with addition of any other NMT and web service for group interaction (synchronous and asynchronous) and sharing (via DropBox, Google Drive, etc.) of information and documents found on the web by each member of the group in the previous steps. • NMT continue to be used also during face-to-face group work.

As we said earlier, the concrete goal of the activity was the creation of a wiki by each of the 8 groups involved. For the teacher to have better control of the process, all groups were asked to proceed in the same way in (a) organisation of the group work and (b) the actual writing of the wiki. This activity, developed exclusively online, was divided into 3 steps:

1. a first proposal of an index of topics (8-10 chapters of at least 3 paragraphs each);
2. group discussion of the proposal and agreement on single version;
3. validation of the index by the teacher, and the sending by him/her of any comments, suggestions and corrections to the single groups. This was to avoid any serious errors which might negatively condition the development of the document.

PBWorks was the environment chosen for the development of the wiki. The “comments” box on the homepage of the wiki under construction was used both for discussion of the index by the group and for the sending of suggestions and corrections by the teacher.

Finally, each member of the group was assigned a chapter of the index from which to develop a branch of the wiki.

Once the different chapters of the shared document had been written, the co-writers were asked to peer-review 2-3 chapters other than their own and suggest to their colleagues how to integrate and improve their respective pages. This type of interaction was again developed within the “comments” box found on every page of PBWorks.

The choice of using a wiki to support the collaborative writing is justified by the various possibilities this tool offers for observing and tracing students’ activities (versioning of the pages; discussion in the “comments” box or associated forum; tagging; creation of reticular link structures, etc.). These possibilities can be effectively exploited for monitoring and assessment, not only of the final product, but also of the process which has led to its production, and of the level of participation and active contribution of the single members of the work group.

3. An example of an approach to script assessment

Table 2 shows examples of some possible combinations of: (1) teaching objectives formulated according to *Bloom Taxonomy* (1956); (2) assessment mode for gauging achievement of these goals; (3-4) suggested activities for the students.

Table 2. Possible relations among objectives, assessment strategies and contents/activities in NCL design.

1. Objective	2. Assessment	3-4. Contents and Activities
Knowledge <i>Ability to evoke knowledge</i>	Objective-assessment tests	Classroom lectures and individual study of course contents.
Comprehension <i>Ability to re-use acquired knowledge</i>	Subjective-assessment test of re-use	Individual development of a conceptual map which highlights what students consider to be key topics, as well as connections between them; socialisation of the various maps and subsequent classroom discussion of them.
Application <i>Ability to re-apply and re-use acquired knowledge to solve new problems</i>	Problem-solving	Individual creation of index for the mini-thesis based on the above representations.
Analysis <i>Ability to separate the elements, identifying the relations between them</i>	Assessment of the elements considered and of the analysis conducted on the basis of these elements. Assessment of the arguments used in conducting the analysis	Socialisation of the various indexes, online group cross analysis and discussion of indexes in order to identify convergences and divergences.
Synthesis <i>Ability to combine elements to form a new organised coherent structure</i>	Assessment of: (a) final product using predefined criteria; (b) transversal skills; (c) active participation	Online discussion aimed at defining a single version of the index agreed on by each group; socialisation of the various indexes produced by the groups and teacher-moderated discussion (in the classroom) aimed at agreement on a single version of the index; final synthesis of the various indexes prepared by the various groups.
Evaluation <i>Ability to formulate critical judgments of value and method</i>	Assessing the arguments on which the critical judgment is based	First step - Development of wikis using a parallel type of collaborative strategy (division of labour), which involves each student developing a section of the overall document. During this activity each co-writer is asked to constantly check the development of the other sections of the wiki, both to avoid repetitions (pages with similar contents) and to identify connections between their own page and those of the co-writers.
		Second step - Once the different sections of the shared document have been written, the co-writers are asked to peer-review all the pages and suggest to their

		<p>colleagues how to integrate and improve their respective texts (<i>evaluation</i>).</p> <p>In this case, the aim is to encourage interaction between the author (the co-writer who generated the page) and the users (all the other co-writers accessing it) on the chosen subject. This interaction is facilitated by the “comments” function associated with each wiki page, through which short dialogues can take place among the different co-authors/users of the hypertext.</p>
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4. And (almost) all of this through writing and/or graphics!

Most of the communication which developed in the “performance” of the script prepared for the collaborative study activity presented here as an example was of an asynchronous type (via writing and graphics). Actually there were also sporadic synchronous interactions (face-to-face and video chat). These almost always had the aim of shortening the time required to reach decisions about how to conduct the study and to solve any disagreements regarding development of the document.

The type of collaborative activity proposed, as already seen in earlier studies, generally produces transversal type effects which extend the scope of the educational action beyond the learning of subject-specific content (Trentin, 2002). Take for example the development of students’ understanding of how to use new technologies for study and continuous learning, how to organise collaboration through mediated communication, how to negotiate decisions and argue their own choices and standpoints; and of their multi-perspective observation, education in interdisciplinarity, etc.

If we add to this that in activities like those described in the above exemplary script about 75-80% of the interaction occurs via writing, it is clear that the educational action intersects with other specific skills connected to writing, reading and critical analysis of the text.

Interacting at a distance (for mediation, argument etc.) means exercising the various expressive skills required both for interacting with the “other” (“if I want the other person to understand me, I should write what I want to say in a clear, unambiguous way; the positive outcome of our collaboration will depend on this”), and for constructing texts (documents, reports, etc.). At the same time, interaction via writing requires skills of comprehension and of critical analysis of the material received from one’s interlocutor.

In other words, formulating and verbalising ideas and reflecting on and answering other people’s arguments are extremely important cognitive skills. Developing all this in a classroom context might be considered an “art” ... doing it at a distance (via writing) a “highly sophisticated art” indeed!

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