A protocol for multidimensional assessment in university online courses

Nadia Sansone[a], Maria Beatrice Ligorio[b]

[a]Sapienza University, Italy, nadia.sansone@uniroma1.it
[b]University of Bari "Aldo Moro", Italy, b.ligorio@psico.uniba.it

Abstract

This paper presents a protocol developed for multidimensional assessment for e-learning experiences based on socioconstructivist principles. First, we describe the structure of an e-learning course where the protocol has been developed and tested; second, we describe the protocol and how it has been used in that course.

We believe this protocol is a useful tool for a twofold reason: on the one hand, it takes into account the complexity of the pedagogical architecture of socioconstructivist courses – where many teaching models and learning strategies are mixed, different individual and collaborative activities are proposed and students are asked to build a variety of final products. On the other hand, it promotes students' assumption of responsibility and active role, with a particular reference to self-assessment competences. Instances of how we have applied the protocol will be described in the paper. The assessment protocol we present here is complex, nevertheless flexible. Therefore, although we have tested it in a specific course, it could also be used in similar or simpler courses.

Keywords: assessment, socioconstructivism, higher education, self-assessment

Introduction

As the literature (Clark & Mayer, 2007; Horton, 2006) has widely proved, e-learning enhances its effects when based on socioconstructivist models such as Knowledge Building (Scardamalia & Bereiter, 1994), Community of Learners (Brown & Campione, 1990) and Community of Practices (Wenger, 1998). These models imply a complex orchestration of both individual and group activity, supporting students in the construction of many types of artefacts.

This complexity calls for the overcoming of traditional assessment. Assessment, in fact, should take into account the overall activities, interactions, products and processes of these kinds of courses. Moreover, it should sustain students' responsibility and active role by becoming an integral part of the learning process, shifting from an *assessment of learning* to an *assessment for learning* (Segers, Dochy & Cascallar, 2003).

In this paper, we will present the protocol we have developed to promote a multidimensional assessment of e-learning courses based on socioconstructivist principles and to sustain students' self-assessment. The protocol is the result of over ten years of testing. At the conclusion of each edition, feedbacks from students, teachers and tutors have been gathered and used to improve the protocol for the subsequent year.

1. Socioconstructivist e-learning courses

The socioconstructivist approach introduces technology into educational contexts with exactly the aim to promote collaborative, constructive and meaningful learning through students' active role (Scardamalia & Bereiter, 2003). However, to reach this goal it is necessary to re-think the educational contexts and to plan activities based on specific teaching and learning strategies.

Researches of the last decades, indeed, have shown that:

- a high-level of interaction promotes higher levels of cognitive knowledge (Schellens, Van Keer & Valcke, 2005);
- the combination of learning and collaboration resides on well-designed intra-group interaction (Strijbos, Martens, Jochems & Jochems, 2007);
- representational guidance can aid collaboration (Suthers & Hundhausen, 2002).

The course architecture here presented has its roots exactly in the socioconstructivist framework, with a particular reference to the recent Trialogical Approach to Learning (TLA) (Paavola & Hakkarainen, 2014). TLA builds on the knowledge-creation metaphor, with a special focus on the mediation of modern technologies. The term 'trialogical' (or 'trialogic') is proposed to refer to those processes in which people – collaboratively and systematically – develop and share concrete "objects" (Paavola & Hakkarainen, 2009). "Objects" (conceptual or material artefacts, practices, ideas), indeed, are considered as crucial parts of the learning process, together with the individuals and the group-work. Therefore, collaboration should be organised to jointly develop some authentic and meaningful shared object, which allow students to externalise their knowledge creation efforts.

TLA aims to promote students' development of the so-called 21st century's competencies, which are – among the others: Information and Communication Technology and community-related skills, critical thinking, the capability to self-direct and, eventually, re-direct one's own learning processes.

To reach this goal, the learning activities have to be carefully designed, the assessment should become an integral part of the learning process as a competence students' should learn and become able to apply during the learning path. Sambell, McDowell and Brown (1997) outlined the several advantages of this strategy, since it:

- promotes an integrated assessment of teaching and learning by actively involving students;
- facilitates the use of authentic tasks, meaningful and motivating for students;
- keeps the focus at the same time on the processes and on the products of learning;
- enhances a wide range of skills and competencies.

2. The Blended Collaborative and Constructive Participation model

Before presenting the protocol, we shall describe the structure of the courses within which the protocol has been developed and tested. The courses are based on a model that we called Blended Collaborative and Constructive Participation (BCCP) (Ligorio et al, 2010), since it is specifically devoted to sustain and enhance collaborative and constructive participation in blended contexts.

The model was first introduced – though in a quite different version – in 2005 to fill the absence of blended courses in our University (Bari – IT), especially of courses promoting students' active and constructive role and not just conceiving the online environment as a depository of learning materials. Moreover, within our university, educational platforms were – and still are – not so commonly used and social environments such as web-forums or social networks are still considered as distractive and too much informal. Sustaining and scaffolding online interactions aimed at educational purposes and finding ways to feed a cross-fertilisation between online and face to face appeared to us an innovation worthy to be tested.

The model has been tested to deliver specialist courses on E-Learning Psychology for Work Psychologists. To empower the blended dimension, the course was not conceived as a mere alternation of on- and offline learning, instead as a thoughtful mix of diverse teaching models, individual and collaborative activities and a variety of objects that students are asked to build (Ligorio & Sansone, 2009). The current version of the BCCP model is the result of repeated trials covering ten years. Following the Research-Based approach (The Design-Based Research Collective, 2003), we collected and analysed students, teachers and tutors' feedback along with data from each course, looking for strong points and weaknesses, so to improve the subsequent edition.

The course generally lasts 15 weeks and it is structured in five modules, lasting about three weeks each. The first four modules cover the curricular content, while the last module is always dedicated to the collective construction of a meaningful object, starting from the activities and products realised during the previous modules. At the outset of the course, the teacher clusters the students into groups of minimum 6 and maximum 10 participants. Each module starts with a lecture delivered face-to-face by the teacher. During such introductory lecture, the teacher proposes a number of study materials (e.g. chapters, articles, power point presentations, web sites, etc.) corresponding to the number of students forming the groups. This implies that different materials will be assigned within the same group and, concurrently, that the same material will be studied by as many students as the number of the groups formed. Inspired by the Jigsaw method (Aronson, 1978), the students having the same material are called "expert groups", and the groups of students with different materials assigned are named "learning groups". The lecture ends by negotiating a challenging and motivating research question, which will guide each subsequent activity. The ultimate aim of the module is to collaboratively articulate an answer to such question, reached through dedicated discussions and reported into different group-products.

During the modules, students:

- study the material assigned to them and write individual reviews meant to highlight contents useful to answer the research question. Each study material is posted online so that the expert groups can discuss about its contents via web-forum or chat – as they prefer;

- post their reviews online, read and comment their group-mates' reviews;
- starting from their own review, they discuss both via web-forum and face to face, searching for a shared answer to the research question;
- create collaborative products (conceptual maps, group discussion analysis, critical report) with the aim to combine the knowledge acquired through the individually studied material and the various answers to the research question that they reported in their reviews;
- organise their personal e-portfolio, by filling in a personal self-assessment sheet. They also select and post the best artefacts they produced during the module and set their personal goals for the subsequent module (see below);
- cover some specific roles, based on the Role Taking theory (Topping, 2005); for instance, leader of the expert group, leader of the learning group, responsible of collaborative products, etc. Students cover the roles in turn through the modules. After dismissed a role, they are invited to post their reflections on a dedicated web-forum together with suggestions about how to perform the role for the next students covering the role.

At the end of the course, groups are required to work all together to produce a collective and meaningful object, as requested from the TLA. During the course, students are supported by some e-Tutors, namely students from previous courses now playing this role as part of their internship. E-Tutors receive a specific training about tutoring, with a particular focus on the assessment tasks they will be in charge of.

The online activities are held on a free platform called Synergeia[1], which is provided with many tools able to support knowledge building and critical thinking. Participation in online activities took place on a voluntary basis. Students, not interested or not motivated to follow the blended course, may attend just the face-to-face lectures and carry out the examination in the traditional way, through an oral interview.

Conversely, students that cannot attend the lectures are allowed to follow the online activities, receiving a continuous up-date of what happens in the classroom through their classmates' notes posted online. Moreover, reading those notes the teacher can check whether the contents delivered in the classroom have been fully understood from the students and, eventually, further clarifications are offered either online or face-to-face. As matter of fact, these notes enter the set of elements assessed by our protocol.

2.1. The e-Portfolio: building the self-assessment competences

In order to promote students' competences to self-assess their own learning and to outline personal strengths and weaknesses, a specific attention is devoted to the e-Portfolios, that is, personal folders each student is requested to open and personally manage online (Attwell, 2007; Chen, Chang, Chen, Huang, & Chen, 2012). In these folders, students can upload:
- informal information about themselves, such as of photos, notes, links;
- their expectations concerning the course, their personal learning goals;
- the selection of the best objects and activities they have performed during each module together with the competencies they think they have acquired. Having to select the most representative examples of their work leads students to a deeper understanding of the learning content, to a clearer focus on key concepts and, finally, to a better definition of the criteria they use to select certain products rather than others (Ligorio & Cacciamani, 2013).

Clear instructions are given about the structure of the e-portfolio, together with how and when to fulfil it. Students are also requested to compile a self-assessment questionnaire (see Table 1) at the end of each module, composed of several questions. The questionnaire contains items about the various activities performed (paper reviews, collaborative products, e-portfolio, role taking, notes taking and discussions). Students have to mark how much each of these activities contributed to their learning, in terms of both content and skills, and how much they think they personally contributed to each activity.

Table 1. Excerpt of the self-assessment sheet: items that the students fulfill for each activity.

Learning groups' discussions self-assessment – Module 1 (0 = Not at all; 4: Very much)	
I have participated actively to the Learning groups' discussion	
Participation to the Learning groups' discussion helped me to learn the content of the module	
Participation to the Learning groups' discussion helped me to develop my abilities of studying	
The Learning groups' discussion was useful for the group knowledge building	
My contribution to the Learning groups' discussion was valuable	
With reference to the Learning groups' discussion, I believe to be able to assess myself	

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[1] In Internet, URL: http://bscl.fit.fraunhofer.de.

The aims of the self-assessment sheet are to stimulate students' meta-cognitive processes and reflection on their own abilities and performance, as well as to support the development of critical self-evaluation. This self-assessment is repeated at the end of each module, allowing students to follow their own learning and participation throughout the course by simply comparing their scores across the modules.

3. The protocol

Over the years, we have defined a multidimensional assessment protocol (see Table 2) able to take into account the specific architecture of the course, its complexity and, at the same time, to promote students' assumption of responsibility and active role, according to socioconstructivist principles. This protocol, indeed, allows different levels of assessment. Individual assessment is possible through the qualitative analysis of the reviews (Ligorio, 2012), the Role-Taking (Sansone, Ligorio & Dillenbourg, 2011) and the e-Portfolios (Impedovo, Ritella & Ligorio, 2013). Group assessment is based, instead, on the quality of the collective objects and of the group discussions.

The protocol we have developed is applied through a grid containing the following items: group and module identification, individual and collaborative artefacts/processes to be assessed, the person assessing (that could be the teacher or the tutor) (see Table 2).

Table 2. The Protocol grid.

					MODULE 1				
GROUP 1	*Individual artefacts*		*Collaborative artefacts*		*Individual processes*	*Collaborative processes*			
	Review	e-Portfolio	Conceptual maps, group discussion analysis, critical report (columns repeated for each collaborative artefact)		Role Taking	Expert groups' discussions		Learning groups' discussions	
Evaluator	*Teacher*	*e-Tutor*	*e-Tutor*	*Teacher*	*e-Tutor*	*Teacher*	*e-Tutor*	*Teacher*	*e-Tutor*
Student 1									
Student 2									
Student …									
Student N									

Looking at the table, it is clear that some activities are assessed by both the teacher and the e-Tutor, while other activities are assessed by either the teacher or the e-Tutor. The teacher assesses activities mainly based on the course content. Conversely, activities performed mainly online are assessed by the e-Tutor. Complex activities, for instance the construction of collaborative products, are assessed by both the teacher and the e-Tutor, by considering different aspects.

In particular:

- reviews are individually written after students have studied and discussed the assigned material. These products are explicitly based on the learning contents, therefore are assessed by the teacher only, as content expert;
- r-Portfolios contain informal information and metacognitive entries. This is an activity mainly online, therefore assessed exclusively by the e-Tutor;
- role-Taking is assessed by the e-Tutor in charge of monitoring the students covering specific roles and contributing to the reflexive web-forum about this activity all through the modules;
- each collaborative artefact or process is assessed both by the teacher and the e-Tutor. The teacher assesses the group product, thus the score obtained is assigned to each member composing the group. The e-Tutor assesses the contribution each student offers to the construction of the artefact. This latter score ponders the score given by the teacher to the group product;

As soon as an activity is completed, it is assessed and scored by a five-point Likert Scale. For instance:

- reviews are assessed based on the content and the correspondence to the template provided by the teacher during the first face-to-face lesson (see Table 3). The template proposes sections to be filled, prompts, and a suggested length for each section;

Table 3. The review template.

Key-words The keywords of this material are ...   (about 4-6 words) **Answer to the research question** This material answers to the research question because … (about 150 words) **Eventual unclear points** I found not clear … (about 50 words) **Personal opinion** In my opinion …. I think … (about 50 words) **Connections to other materials/concepts/authors (**from module 2 on, also references to the previous module/s) This concept makes me think of … This looks similar/different/conflicting comparing to ...   (about 50 words)

- e-Portfolios are assessed by considering the richness and variety of the elements requested – such as informal information, the self-assessment sheet, the expectations – and the meta-cognitive reflections about the artefacts selected as the best for each module;
- role Taking is assessed by considering students' commitment to the role in terms of time devoted to it and impact on the group mates – that is, whether they appreciated and used the information, suggestions, and comments provided by the students in charge of a specific role. For instance, the leader of the learning group discussion is assessed based on the quality and quantity of his/her interventions, the capability to involve the group mates and the richness of the meta-cognitive reflections about the role posted in the reflexive web-forum;
- collaborative artefacts are assessed by both the teacher and the e-Tutor:
  - the teacher assesses the result as a group product, focusing on how much and how well the content of the module has been elaborated. For instance, the conceptual map, is assessed considering the quality of the concepts reported in it – whether vague and unclearly connected to each other, or well elaborated with proper and original connections;
  - the e-Tutor assesses each student's contribution to the construction of the product, ranking from poor or no contribution to very useful and productive interventions.

At the end of each module, the filled assessment greed is uploaded on the platform, together with the score system description. Students are invited to read and comment on it by using a dedicated discussion web-forum. The aim of the protocol is to assess all the activities undertaken during the course; in this way, they receive feedback on time and their self-assessment competence is modelled. Indeed, as Segers, Dierick and Dochy (2001) suggested, assessment is important not only at the end of the learning process but also during it, so to become a formative assessment.

Moreover, students have the chance to compare their performance to that of their group-mates. In this way, they can better understand the contribution each participant gave to the collaborative knowledge building processes. Finally, the grid helps students to reflect on the gap between their own self-assessment and that of the teacher and the e-Tutor.
By comparing the grid at the end of each module, students can also notice their development and consequently adjust their learning strategies, if needed. At the same time, they can recognize their own progress and the developments of the groups.

At the end of the course, the grid provides rich information useful for both the teacher and the e-Tutor. It contributes to define the students' final score and it can also be used to infer what are the activities best performed and the ones needing clarification or support, so to improve the quality and the effectiveness at the next edition of the course.

Conclusions

The BCCP model is meant as a set of activities able to put in practice collaborative learning and socioconstructivist principles. Nevertheless, the model is to be considered as a general guideline and so is its assessment protocol. Any step and any activity can be personalised, according to contextual issues such as age and the number of students enrolled, time span allotted for the course, available technology, and the specific educational goals.

Although the assessment protocol hereby described has been developed as part of the BCCP model, we believe it can be flexibly used in similar or simpler courses. It is a tool that is able to detect the individual profiles, the quality of the collaborative knowledge building and social interaction among students during the activities.

Finally, we greatly recommend the presence of one or more e-Tutors to support the teacher. Such tutors could be students previously attending the course or someone acquainting with the theoretical frame of the model and the technology selected for the course. Of course, a preliminary training is advisable and a constant monitoring of their online performance is needed from the teacher.

The protocol here proposed positively impressed the students with whom it has been used. We could gather their impressions by reading the notes posted in the "Evaluation forum", a dedicated discussion where they commented the evaluation received at each module. The students particularly appreciated:

- the transparency of the assessment system;
- the encouragement they received to be more reflective about their learning activities;
- the extremely analytic assessment. Finally, they considered the protocol as a tool pushing them to do always better. The following excerpts well represents students' general view about the assessment system:

[Student 1] *I fully acknowledge how hard it is to give us such detailed assessment. Often, we see a job of a few months liquidated in a few moments. For us it is much more useful to have an assessment in progress. This really helps us understanding our weak points and it helps the evaluators in adjusting "the shot", offering us an always better course. You really assessed each step and each activity! Tomorrow I will go back to my products and do a further analysis of them at the light of your assessment.*

This student is appreciating the detailed work behind the protocol, which seems to motivate her to go back to her products for "*a further analysis*". In other cases, the positive assessment worked as a stimulus for high commitment and motivation.

[Student 2] *Such a positive assessment is for me a further input to go on with commitment and enthusiasm.*

The protocol is also a tool to observe and reflect upon their own self-assessment ability, as it is stated in the following excerpt.

[Student 3] *I noticed how – more or less – the teacher' and tutors' evaluation overlaps with my own self-assessment. These assessments make us reflecting on the work we have done, but even more, they are motivating and encouraging us to do better and better! It was especially interesting to see the evaluations of the group products, since they make the group dynamics clearer.*

This student underlines the motivational value of this type of assessment. Furthermore, she refers to the capability of the protocol to take into account both the individual and the group dimension, accordingly with the socioconstructivist nature of the course.

In general, looking at the students' evaluation trend through the course, we reckoned that, at the first module, in average about 50% of the students ranked low. Considering the few dropout cases (from 5% to 10%), all those continuing the course reached high scores at the end of it. Of course, many factors could contribute to such results; nevertheless, many students – as we saw in the excerpts reported above – recognized this type of assessment helped them understanding their "weak points" and improving their performance, module after module.

As practical suggestions, we propose to carefully study the protocol before using it and to adjust it to the needs and aims of your own course. For instance, you can change the list of activities or implement the number of modules you find more suitable for your case. We also advise to test our protocol with other digital environments, although we recommend using platforms based on socioconstructivist principles.

We are convinced that this tool can offer useful cues for those teachers and trainers who want to adopt a more encompassing and holistic assessment, able to grasp the complexity and richness of blended courses based on socioconstructivism demands.

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