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Developing Codebooks as a New Tool to Analyze Students' ePortfolios

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This paper describes a three-step method for the construction of codebooks meant for analyzing ePortfolio content. The first step produces a prototype based on qualitative analysis of very different ePortfolios from the same course. During the second step, the initial version of the codebook is tested on a larger sample and subsequently revised. Finally, during the third phase the codebook is applied to analyze ePortfolios' contents and to chart trends of usage. We tested the codebook on the ePortfolios of 16 students attending a university blended course. This codebook and the method for building it enabled us to follow the ePortfolios' evolution over the course, to observe students' individual differences, to understand and guide students' self-assessment, and to customize teachers' and/or tutors' interventions. Our method produces a tailored codebook for the examination of ePortfolio contents.

The Need for the Analysis of ePortfolio Content

The relevance of portfolios has been discussed extensively in the field of education, and portfolios have been used in "the broader areas of education and training, including work-based learning and the school" (Attwell, 2007, p. 40). The reference to an organized collection of documents produced by students is a recurrent, if not universal, feature of definitions of *portfolio* in the literature (Batson, 2002; Falls, 2001). Nevertheless, different types of portfolios are designed to reach diverse educational goals, such as supporting professional skills and documenting, evaluating, or presenting personal works. With the advent of new technologies, the portfolio evolved into *ePortfolio*, finding new areas of enrichment and novel contexts of implementation. Although there are some conflicting findings about the comparison of web-based and electronic portfolios' usage (van Wesel & Prop, 2008), ePortfolios can transform portfolios from a thing to a process, to a content-management system for collecting, reflecting on, and sharing learning outcomes (Fitch, Reed, Peet, & Tolman, 2008). Much research conducted on the use of ePortfolios in education is aimed at analyzing how students perceive them (Bolliger, & Shepherd, 2010; Ritzhaupt, Singh, Seyferth, & Dedrick, 2008) or how they are used for assessment (Mason, Pegler, & Weller, 2004; Pelliccione & Dixon, 2008).

Some research has also analyzed the process of interpreting and scoring ePortfolios by teachers (Schutz & Moss, 2004). Such research has shown how teachers create a "reasonable story" from the contents of ePortfolios and grade them according to such a story. However, the literature lacks a systematic identification of the emergence of core themes in ePortfolios. Indeed, the research by Schutz and Moss (2004) provided an insightful account of teachers' interpretation of ePortfolios' contents, but does not investigate directly the actual contents of the ePortfolios, which is a complementary methodology for understanding what the story contained in each ePortfolio is about. In particular, readers' strategies may not guarantee an awareness of the least noted themes within the ePortfolios.

The literature on assessment also provides good evidence for the value of rubrics (i.e., matrices containing assessment criteria and benchmarks of performance) in diverse settings (Hafner & Hafner, 2003; Lasater, 2007; Roblyer & Wiencke, 2003; Saddler & Andrade, 2004). Rubrics may also be used for evaluating students (and educational activities) through a rubric-based ePortfolio assessment, especially considering self-regulation, critical skills, and active participation. However, the use of rubrics is not exempt from issues related to the validity of assessment (Moskal & Leydens, 2000). Mabry (1999) claimed that rubrics may raise validity problems similar to those raised by test-based assessment. The author argued convincingly that rubric-based assessment generally prescribes what counts as satisfactory performance before a performance is realized, even when it is not easy to predict what the students would execute (Mabry, 1999). Therefore, any performance that differs from the predicted standard is discouraged (Mabry, 1999). One possible (partial) solution to this problem is to monitor periodically the range of contents/performances collected in the ePortfolios and to tune the rubric criteria and benchmarks to the observed context. In this article, we describe the construction of a codebook as a useful tool for monitoring the core themes of the ePortfolios created by students. Particular attention is paid to the students' metacognitive process; this is a crucial aspect in the implementation of an ePortfolio as a tool for reflection about the learning process. Indeed, using ePortfolios for reflection is a very effective strategy in education (Kabicher, Kriglstein, Figl, & Motschnig-Pitrik, 2008). Even though the resulting final codebook that we present in this paper is tailored to

the specific course we observed, the method we propose to construct can be considered as a model for developing a customized codebook in any context where portfolios is considered as an important part of the learning experience.

The ePortfolio and its Contents

Through the analysis of ePortfolios, it is possible to track the progress and evolution of the learning processes (Barrett, 2001). We consider ePortfolios to be organized collections of artifacts, produced either individually or collectively using various formats (e.g., video, graphics, or text). In students' hands, ePortfolios can be reflexive tools for self-assessment, self-regulation, critical skills, and active participation (Jenson, 2011). We agree that ePortfolios are valuable tools for making students "active in formative assessment rather than passive receivers of graded results" (Pelliccione & Dixon, 2008, p. 752). In this sense, ePortfolios may encourage assessment for learning rather than assessment of learning (Stiggins, 2002).

The use of ePortfolios promotes so-called "folio thinking," a term coined by Helen Chen (2004) to indicate the mental habit of building connections among experiences, skills, and artifacts and of making these connections visible to readers, but especially to the students authoring the ePortfolios. Students occupy a central position because by creating ePortfolios they are actually encouraged to take responsibility for their own learning (Paulson, Paulson, & Meyer, 1991). The personal and informal communication that may be embedded in the ePortfolios can support motivation and can act as further leverage for learning. At the same time, the teacher can monitor, direct, and guide the learning process, since the ePortfolio also gives information about the areas to be improved.

ePortfolios can be structured around three distinct, yet interrelated themes: the first one is dedicated to reflection, the second one to documentation, and the third one to collaboration/mentoring (Zubizarreta, 2004). Accordingly, the contents of ePortfolios may regard: (1) the philosophy of learning or narrative reflection upon the processes in progress, (2) the products of learning (e.g., course descriptions, curriculum, tutoring), (3) the evidence of learning (e.g., research articles, critical essays), (4) the assessment of learning (e.g., feedback, scores from tests), (5) the importance of learning (e.g., practical applications, personal growth, emotional value of learning), (6) learning objectives (e.g., improvement plans, goals), and (7) appendices (e.g., selected documentation of didactic materials). However, research seems to focus on the use of ePortfolios for assessment without dealing directly with their contents, so that few empirical studies investigate systematically the contents of ePortfolios. For example, Chang, Tseng, Chou, and Chen (2011) examined the reliability and validity of peer assessment for web-based portfolios, discussing the limits of peer assessment and the need to develop peer assessment skills. Mason et al. (2004) discussed the use of ePortfolios for assessment tools application. Considering that ePortfolios and learning objects involve the same fundamental technology and rely on the same capabilities for selection and re-use, ePortfolios are here proposed as the final assessment of a course designed around learning objects. Buzzetto-More (2010) tested the efficacy of ePortfolios and investigated students' perceptions of ePortfolios as a tool for enhancing the understanding of learning goals and reflection on their own knowledge and skills.

Although these studies are interesting, none of them deals directly with the contents of ePortfolios. The few studies extant that analyze the content of portfolios are designed to gain "insight into students' rhetorical approaches to portfolio composition; their decisions related to selection of content, and the organization and design of their portfolio" (D'Angelo, 2009, p. 1) or to obtain feedback about how students use ePortfolios (Kabicher et al., 2008). The specificity of our contribution is to identify and classify the issues emerging from students' ePortfolios while they are under development, considering both the temporal dimension and students' individual differences. We describe, therefore, the process of building a codebook that may be used to identify themes emerging from content analysis of ePortfolios. Such analysis will provide an overview of students' reflections contained in their ePortfolios.

A Blended University Course: The Context of this Study

The course analyzed in this paper was delivered in a blended learning mode (BL), in which computer-mediated learning and teaching in presence were integrated and combined (Bersin, 2004). In addition, the course used different teaching methods, diverse modes of study (e.g., individual, dyads, small group, and plenary activities), and a variety of tasks and artifacts (e.g., see Ligorio & Cucchiara, 2011; Ligorio, Loperfido, Sansone, & Spadaro, 2010).

The course was divided into five modules covering the following contents: online educational models, learning objects, online identity, new trends, and a final module dedicated to the collaborative construction of a grid of indicators meant to analyze online courses. Each of the modules, lasting a week, was introduced by the teacher's lecture, followed by a discussion via web-forum that was coordinated by an e-tutor. The lectures were usually scheduled as follows: (a) discussion of

the topic covered during the previous module (during the first meeting the teacher presented an overview of the organization of the course), (b) introduction of a new topic for the next module, (c) discussion of the progress of on-line activities (during the first meeting the teacher introduced the functions of the e-learning platform), and (d) assignments for the following module.

The platform used, Synergeia (http://bscl.fit.fraunhofer.de), was designed to support online collaborative learning (e.g., Ligorio & Veermans, 2005). This platform allows both synchronous (chat) and asynchronous (web forum) communication and contains tools for the construction of concept maps (i.e., Map Tool), a shared calendar, and spaces for uploading and sharing files. In Synergeia, each module was represented by a folder containing the readings selected by the teacher (e.g., digital documents, slides, links to websites), and several areas for discussion via web-forums where students could discuss the materials and topics in the modules.

Considering the relevance of working in groups for obtaining collaborative learning (Dillenbourg, 1999), the participants were divided into two groups that were formed randomly, each consisting of eight students. The groups were asked first to discuss online the educational materials and then to build collaboratively a concept map that summarized the contents of the module and a document describing their collaborative learning process. Each student was required to be active in the group and to take responsibility for achieving common goals, interpreting a role designed in reference to the tasks (e.g., leader responsible for the cognitive map, tutor of the group discussion) that had been assigned by the teacher. At the third module, in order to promote socialization among all participants, the groups were re-combined, and two new groups, again consisting of eight students each, were formed.

The Structure of the ePortfolio

Throughout the course, students were required to create and manage a personal ePortfolio that adhered to the following structure and contained:

- A folder named The Best of Me in which, at the end of each module, students uploaded a selection of the artifacts produced throughout the module, either individually or collaboratively. Such an artifact might be a post in a discussion that the student considered to be particularly relevant, a written review of the material read, a contribution to a map, or other significant elements that represented the best of their participation in the module. This was a limited selection of not more than four artifacts per module. In addition, each artifact had to be accompanied by a comment that explained why it had been selected. The Best of Me folder was the core of our ePortfolios.
- A folder titled Personal Space, through which students could present themselves to their teachers, tutors, and peers through links, images, video, and text (e.g., self-descriptions, expectations, free thoughts, links to personal blogs or Facebook profiles). Students could expand and enrich this space as they liked throughout the entire course.
- A self-evaluation form, to be updated at the end of each module, with information about the role the student served during the module (e.g., responsible for the map, tutor of the group discussion) and his or her self-assessment regarding the individual and collaborative tasks completed (see Appendix A);
- A folder called Balance of the Modules containing one web-forum for each module covered during the course. These web-forums contain discussion statements, impressions, and ideas about the various activities and about the ePortfolio itself. The Balance of the First Module asked about how students approached the course. In the second module, students were asked to reflect on their self-assessment—in particular, on the relationship between participation/learning, about the role they played during the course, and about collaboration within the group during the first module. In the third module, the task was to reflect on specific activities the students had performed, such as discussions around the readings, the construction of the cognitive map, and the description of the process of collaboration. In the fourth module, the assignment asked students to reflect on the role-play and on the re-composition of groups. The balance of the fifth module was included in the forum for the final discussion, described below.
- Finally, a forum called Big Balance featured a global and final reflection on the course. Here the task was to discuss freely the Course of Psychology of E-Learning, and each student was asked to describe her or his final impressions.

To build the codebook, we analyzed the notes posted in all of these sections. Each student entered a different number of notes; some students, furthermore, carefully developed all of the sections, while others left some sections empty.

Objectives

The objective of this paper is to describe the development of a procedure for building a tailored codebook to analyze ePortfolios built in an e-learning or blended course. In general, codebooks can be used to enhance teachers' awareness of the issues reflected on by students and to obtain feedback on students' experiences and perceptions. Codebooks can also constitute a working tool for the development/improvement of a rubric for the ePortfolios' assessment, while overcoming the validity issues that may be associated with the rubric's usage, as discussed by Mabry (1999). Through the codebook, it is possible to obtain an overview of the range of themes that students actually select; this allows the codebook to become a tool able to guide the construction of the rubric. Finally, codebooks are good tools for research on ePortfolios, facilitating analysis of the contents that students include in them. In this paper, we refer mainly to this latter option by describing the creation, development, and use of codebooks as tools in the researcher's hands. We consider the method used to create a codebook as the main outcome of this study. The codebook should be regarded as a tool for inquiry about ePortfolios' content and, more specifically, for:

- analyzing the distribution of themes and categories across the different sections of ePortfolios,
- observing the evolution of the themes over time in order to have a diachronic vision of the ePortfolios,
- facilitating the review and analysis of ePortfolios in following iterations of the same course, and
- triggering the construction of codebooks in similar e-learning and/or blended courses.

The content of ePortfolios built during the university course described above is the object of our analysis.

Method

The method we propose is based on an inductive approach inspired by grounded theory and content analysis. We consider such approaches useful for an exploratory analysis of the type of data we collected. Glaser and Strauss (1967) proposed grounded theory as a set of procedures for the inductive development of theoretical propositions of an increasing level of abstraction, starting from the analysis of data. In this framework, theory is developed from the data through an iterative process of defining, modifying, and redefining the categories of analysis of the empirical data (Glaser & Strauss, 1967). The term *grounded* emphasizes the idea of a theory generated through an interactive process, in which the theory is developed from data (Glaser & Strauss, 1967). Data analysis is carried out through a coding process that seeks to find the conceptual category that best expresses the meaning of a piece of data (Glaser & Strauss, 1967). Systematically comparing the different conceptual categories, one is able to abstract a more general meaning. This process should not be done linearly, but circularly (Glaser & Strauss, 1967). The coding of the data leads to the formulation of new hypotheses that may differ from the initial ones; the circularity is considered to be a strong point of the grounded theory approach, as it forces the researcher into a continuous process of interpretation and reflection on every step (Glaser & Strauss, 1967).

Content analysis is a methodology for the objective, systematic, and quantitative analysis of the content of communication (Ghiglione & Blanchet, 1991; Hsieh & Shannon, 2005). This research method is based on the subjective interpretation of the content of text data through a systematic classification process of coding and identifying themes or patterns (Hsieh & Shannon, 2005). A widely adopted operating procedure for content analysis breaks down communicative units into simple elements (called units of classification) that are then categorized (Hsieh & Shannon, 2005). The choice of categories is crucial and difficult, since meanings are directly dependent on the context, while coding is de-contextualizing and is implemented through a recording of data to obtain a codebook (Hsieh & Shannon, 2005). A codebook usually consists of categories of analysis that can be established *a priori* based on theoretical references, or *a posteriori* when extrapolated from the data using a grounded theory approach, as in our case. Specifically, we went through the process of coding, which means that we searched for a word or a short sentence to which it was possible to assign a summative, salient, essence-capturing, and/or evocative attribute (Saldana, 2009). By systematically comparing the different conceptual codes that had been assigned, it was possible to abstract from the data more general categories or themes. This process was done through a circular route.

Participants

In this section, we describe briefly the students participating in our study. The participants were 16 students (12 female, four male) attending a specialist course for future Work and Organizational Psychologists. The mean student age was 25. The course was held at the University of Bari, and it was labeled Psychology of E-Learning. The students all came from the region where the city of Bari is located, in the South of Italy. This is a public university; the

students therefore came mostly from the middle social-class. The faculty of Psychology at the University of Bari has a good reputation, and the program generally attracts motivated students who are willing to invest time and energy in their education. In this course, the students already knew each other because they had attended the first segment of the university path (three years) that was mandated before they could enter the specialized level. To enroll in the class, they had to have passed an admissions test. The blended mode for delivering the course was optional, offered as an alternative to the traditional mode. Those students that, for any reason, did not want to join the course in the blended mode could attend lectures and have a final colloquium with the teachers without doing any activity online. In fact, this is the usual way of passing courses in Italy.

Description of the Process: Analyzing ePortfolios

The process of creating the codebook was divided into three steps: (a) an exploratory phase for obtaining a rough version of the codebook, (b) a phase during which the initial version of the codebook was tested on a larger sample of students from the same course and modified according to the results, and (c) the final phase in which the codebook was used to analyze the ePortfolios' contents and to chart trends in their usage.

First step: Building the prototype of the codebook. The first step was designing an outline of the desired codebook by qualitatively analyzing a small sample of ePortfolios. To accomplish this first phase, three different actions were performed. First of all, we selected and analyzed the two most diverse ePortfolios of the course. These ePortfolios were selected according to the following criteria:

- gender difference (male and female);
- different levels of computer skills and competence declared by the students at the beginning of the course in the self-assessment questionnaire, a five-point Likert scale ranging from 1 (*low competence*, defined as infrequent use of the computer in everyday life) to 5 (*high competence*, defined as very frequent use of the computer in everyday life); and,
- different levels of participation in the course, calculated from the number of notes posted in each ePortfolio.

Two students were selected as cases for testing our method. To protect their anonymity, we will call them Max and Lara. They posted a total of 20 notes: Max authored eight sets of notes, and Lara authored 12.

The second action consisted of segmenting the notes into units for analysis. Each unit corresponded to phrases having a recognizable meaning that was different from the preceding and from following phrases.

The third action was meant to define themes and categories. To accomplish this aim, we used a qualitative approach inspired by grounded theory and content analysis. This method allowed us to identify five main themes that emerged from the first two selected ePortfolios: Technology, Participation, Competences, Assessment, and Self. Each theme was composed of at least one, and up to three, categories. For example, the theme Self was composed of two categories: *individual characteristics*, or references made to personal characteristics and their implications for the activities performed during the course; and *emotional aspects*, referring to moods and expectations. The categories described how the theme was actually perceived by the students. Appendix B describes in detail the themes and categories that emerged from this first step.

A small percentage of sentences (5%) were excluded from the coding process because they were considered to be irrelevant or ambiguous. Therefore, 36 total segments were used as the corpus of data for this first phase of the codebook construction. Two researchers, after sharing the objectives of the research, assigned codes to the corpus of data and independently developed an initial set of themes. Afterwards, they discussed the codes and themes to obtain a shared coding scheme. The controversial cases (about 18%) were also coded by a third researcher and discussed until 100% agreement was reached.

Second step: Testing and modifying the first version. After identifying themes and categories, we tested the version of the codebook obtained at the end of the first phase on the remaining 14 ePortfolios produced during the course. The corpus of data used in this phase consisted of 117 notes, divided into 353 segments. In this phase, the analysis was performed by the same two judges who initially had worked independently. In this first step they reached an agreement of 75.71%. After discussing the controversial cases with a third researcher, an agreement of 98.3% was obtained. The few notes on which agreement was not reached were erased from the data set, since the researchers agreed that they were not relevant for this analysis. During this step, a few categories were revised as follows:

- The category Modality of Work was redefined to include considerations about the success or the problematic aspects of the entire course.
- The category Emotional Aspects was extended to incorporate references to expectations for the future.
- A new category called Phatic was introduced, which we then included in the participation

theme. This category refers to expressions intended to open a dialogue with other students or the teacher by asking, for instance, for feedback or inviting others to express opinions (e.g., "What do you think?").

- The theme of Sociality was extended to include aspects of pro-sociality, which is defined as an attempt to meet the needs of others (e.g., "this allows the others to better understand our point of view").

Appendix C shows the codebook in its final version, with the five themes and all the categories, accompanied by examples.

Third step: Application of the codebook. Finally, we used this version of the codebook to investigate the structure of the ePortfolio and its contents, the distribution of the themes across the different sections, and the evolution of the contents over time, in order to achieve a diachronic understanding of the students' self-evaluation. In the following paragraphs, we recount briefly our findings.

Results

The most frequent theme we found in our data was Assessment, which comprised 36% of the total frequency, confirming that ePortfolios play a role connected to self-evaluation and self-assessment. Participation (29%) was the second most frequent theme, followed by Self (16%), Competence (11%), and finally Technologies (8%). We expected this latter theme to be more dominant in students' reflections, because of both the contents of the course and the required online activities, but surprisingly it was discussed only briefly at the beginning of the course. Probably students quickly became used to technology, so that it became an invisible part of the course. Other research proves that there is no significant difference between online and offline portfolios (Lunt, 2009). It is the activity of maintaining a portfolio, regardless of its format, and the formative feedback received that permit students to improve their performance in terms of self-assessment and reflection.

According to Figure 1, Self-Assessment appeared with the greatest frequency (18%). This result is not surprising, considering that this category contains student reflections, which probably were perceived to be the core aspect of the ePortfolio.

Figure 1 also shows that the second most frequent category was Individual Activities (13%), which remains an important aspect of the course, whereas "Group activities" had a relatively low frequency (4%). However, we noticed that often the contents categorized as Individual Activities referred to activities that were meant to support the groups. For instance, students often talked about role-taking, which was technically an individual activity but in fact was intended to support group activities, discussions, and the collaborative construction of products (Brown & Campione, 1990; Hare, 1994; Slavin, 1999). In general, students considered the role-taking to be very relevant, acting as a hinge between the individuals and the group. In the light of this result, during the planning of the following edition of the course, the teacher valued role-playing as a scaffold to improve students' participation.

The category Modality of Work had a frequency of 12%. The Modality of Work category referred in particular to the introduction of the blended mode of course delivery, which implied for these students a set of novelties, such as different time management, the alternation between online and offline contexts, and the need to develop new learning strategies. We found this result very interesting for teachers, who might want to invite students to discuss explicitly their learning strategies.

The Emotional Aspects (9%) appeared to work as a glue linking personal expectations, pressure for performance, and personal interests. The remaining categories showed a fairly low rate of less than 7%.

The Themes in Different Sections

The various sections of the ePortfolio (e.g., personal space, web forum, Big Balance, self-evaluation form) differed from one another in terms of requests and aims; therefore, we expected to find among them different distributions of core themes. Indeed, some themes proved to be central in some sections and rare in others (see Figure 2).

This analysis allowed us to see what functions each section covered within the ePortfolios. Our results show that:

- In the web-forum, notes about Participation (31%) and Assessment (27%) prevailed.
- In the Big Balance used at the end of the course, the most frequent themes were the same as those in the web-forum, but in an inverse ratio: the most prevalent theme was Assessment (37%), followed by Participation (26%). The theme Competence reached here its highest percentage in comparison to other sections (19%), probably as a general recognition of the competencies acquired thorough the entire course.
- The self-evaluation form, completed at the end of each module, contained a large percentage of Assessment (52%) and contained rather numerous references to Participation (33%). Both social and individual learning were recognized by the students as important

Figure 1
Percentage of Distribution of the Categories

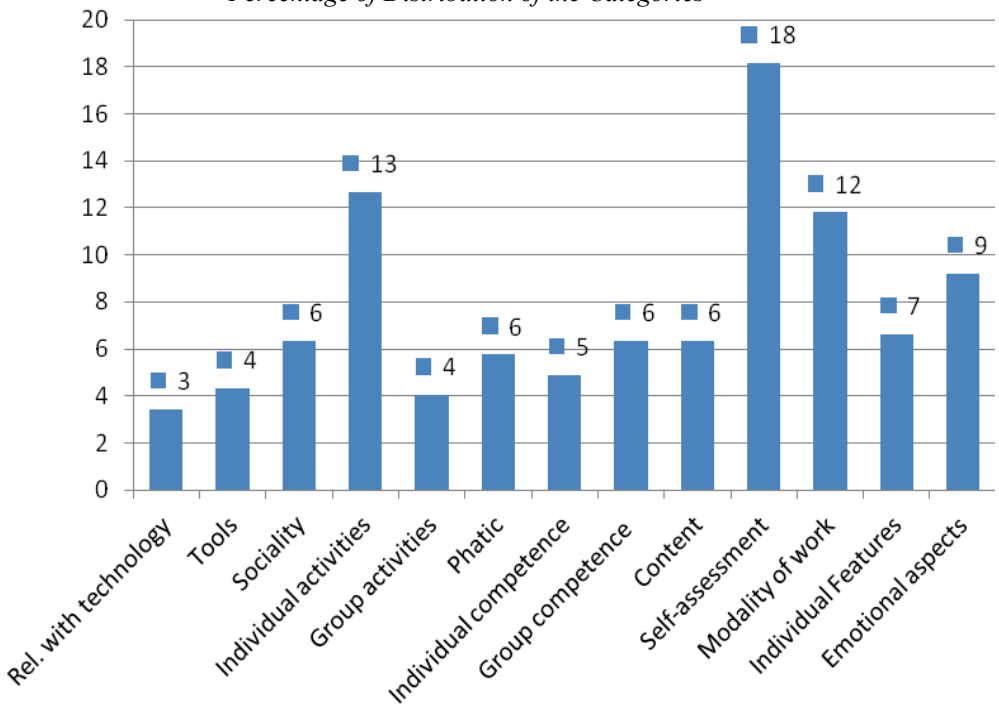
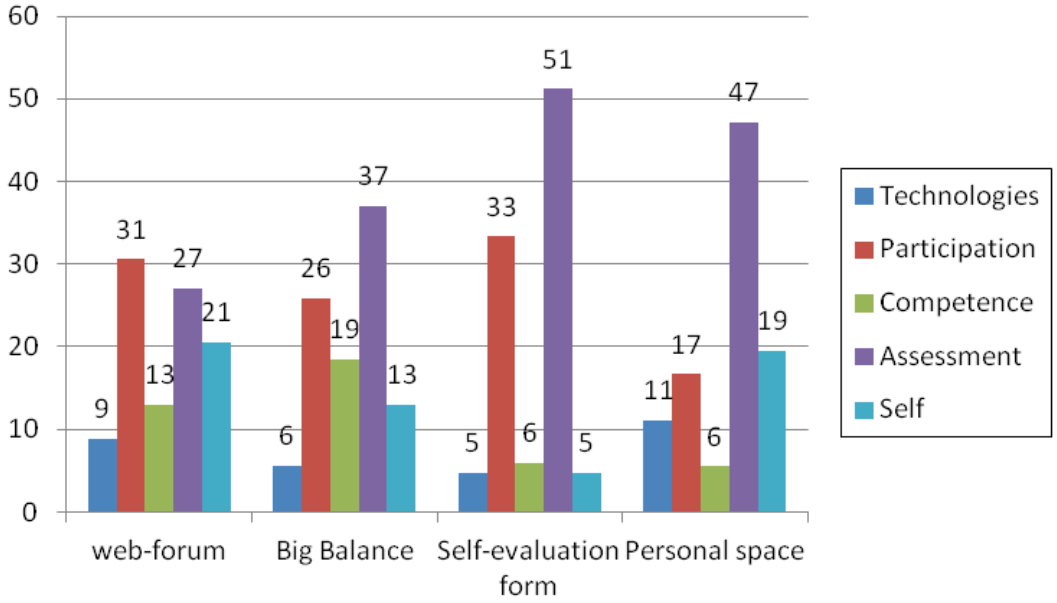


Figure 2
Distribution of the Themes Through the Sections of ePortfolios



aspects of this learning experience. Participation and assessment were also perceived by students as connected aspects of the self-evaluation. On the contrary, the dimension Self reached only 5% of the frequency, indicating that it was not so obvious for these students to express personal issues or emotional experiences.

- The personal space was focused on Assessment (47%), while Participation seemed to be less relevant (17%); here the focus was on self-reflection. This result was unexpected, given that the personal space was designed to focus more on self-presentation and sharing of emotions.

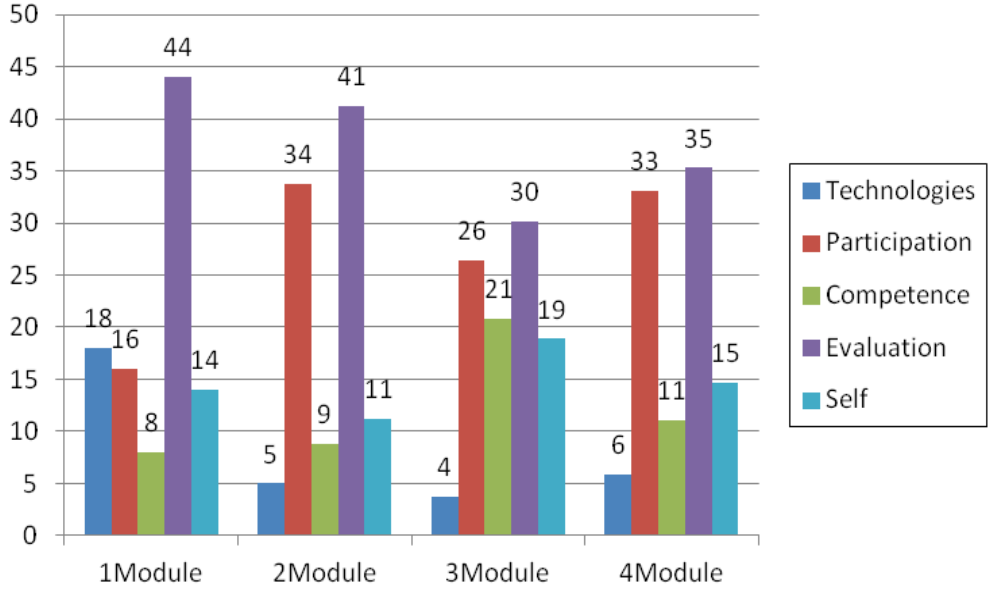
Evolution of Themes Through the Course

One of the characteristics of an ePortfolio is its temporal evolution. In this course, the flow of time was marked by the portfolio's modular structure. In order to investigate the variation over time, the forums called Statement and Evaluation and the self-evaluation forms, both active at the end of each module, were compared. The Big Balance, which was aggregated to the fourth module, coincidentally was completed at the course's conclusion. The personal space was not considered, as it was a personal activity and was not structured in modules. Figure 3 shows the distribution of the themes in relation to time, comparing the sections completed at the end of each module.

Figure 3 shows that the theme Technology had a higher frequency at the beginning of the course (18%) but became less relevant in subsequent modules. Our interpretation of this trend is that students reflected on the use of technology at the beginning of the process of instrumental genesis, which required students to appropriate technological tools and integrate them into their practices (Ritella & Hakkarainen, 2012); however, afterwards technology generally became an invisible background for other activities (Engeström, 1987). It is interesting to note that in modules 1 and 2, Evaluation exceeded 40% of frequency but dropped to 30%-35% in subsequent modules. In contrast, Participation was low in the first module (16%), but reached 34% in the second module and remained between 26% and 33% in subsequent modules, probably because, after the initial modules, students introduced the narrative of their learning and their participation as part of their reflection. This aspect seems in line with the folio thinking idea (Chen, 2004), suggesting that the ePortfolio triggered the construction of a narrative in which experiences (in terms of participation) and skills (of which students became aware through the evaluation) were linked.

The theme of Competence reached its peak in the third module (21%), as did the theme of the Self (19%). It is worthwhile to recall that for the third module, groups were remixed; this probably gave students the opportunity to strengthen in a new group the competencies acquired in the previous group, and, consequently, their attention to their competencies was reinforced.

Figure 3
Frequencies of Theme in Each Module



The analysis of the temporal evolution of ePortfolios allows the researcher, as well as the teacher and/or tutor, to understand the trajectory along which an ePortfolio is evolving. This information can be used to regulate the activity of maintaining the ePortfolio, as well as for understanding where and when there is a need for intervention or adjustments.

Individual Style

The codebook can be used to sort out the themes used by each student and, consequently, to reflect about individual learning paths. For example, considering the two initial ePortfolios examined, the majority of notes from Max (who was accustomed to using technology) fell into the emotional aspects category (42%), with references to moods and expectations. Lara (unfamiliar with the use of technology) had a greater focus on content (24%), with many references to the educational materials she read during the course. Future research might use the codebook to investigate more thoroughly the personal style that emerges from students' ePortfolios.

Discussion

The three-step process of building a codebook that we developed has been applied to analyzing the core themes referred to by students when they completed the various sections of an ePortfolio in a blended university course. In particular, we analyzed differences across the ePortfolios' sections, both throughout the course and in individual students' ePortfolios. Such analysis permits monitoring the sections of the ePortfolios at different moments of the course. The process of building a codebook is summarized in Table 1, along with some suggestions about how it can be used in other courses.

As indicated in Table 1, the application of the codebook to other contexts must be tailored to fit different curricula and assessment goals. Furthermore, it is useful to consider that the codebook, as we used it, did not contain all possible aspects analyzable in ePortfolios. In our case, some aspects were neglected because they were not relevant within the structure of the course (e.g., level of team interaction, relevance to learning objectives, media effectiveness). In particular, the reflection in our ePortfolios remained mostly individual, whereas the assessment of group and collective activity was implemented in other parts of the course, in connection with the group activities.

In general, we can conclude that although we recognize that the literature does not clearly point to the need for a codebook, we believe this tool enables a full examination of ePortfolio contents, since any aspect considered when planning and developing the ePortfolios can be taken into account. Such a tool can be considered as a new lens for understanding what content students use when creating and maintaining ePortfolios and how this content changes over time and across the ePortfolios' sections.

Table 1
The Process of Building a Personalized Codebook: Three Steps

Steps	Aims	Application	How it can be applied in other courses
1: Building a prototype	Creating a first draft of the codebook	Selecting and analyzing two very different ePortfolios	With a larger sample, more than two different ePortfolios could be selected
2: Testing the initial version of the codebook on a larger sample and modifying it according to the results	Verifying the solidity of the categories and finalizing the codebook	Analyzing all the students' ePortfolios, changing labels and the content of categories and adding new categories when needed	Adapting the categories to the aims of the course and to the activities composing the ePortfolios (e.g., task, skills, level of group versus individual performances, creativity).
3: Using the codebook to analyze ePortfolios' contents	Using the codebook to assess the content of the various sections of the ePortfolios and its evolution	Analyzing the distribution of the frequencies at different times and into the various spaces of ePortfolios, analyzing individual codebooks	Statistical analysis of all the ePortfolios obtained, comparing different sections, different times, individual performances, group performances, media effectiveness, and etc.

Although the codebook has many advantages, applying it in a course is a rather difficult and long process; involvement by at least two experts is advisable. By experts we mean researchers, tutors, or even teachers who have a clear understanding of the structure of the ePortfolio and its general function within the course. Furthermore, knowledge about content analysis and grounded theory is required. Time is needed to establish the themes and categories, to cover the three steps we have outlined, and to discuss and negotiate the results.

Nevertheless, we are convinced that this tool can support a good understanding of how students perceive and use the ePortfolios. Additional, more extensive applications of the codebook (e.g., looking at personal profiles) may guide students' self-assessment as part of the learning process and customize teachers' and tutors' intervention in an appropriate manner. At the same time, considering the set of ePortfolios produced in a course, a story told from different personal observation points about learning experiences in the course could emerge. Therefore, the codebook could also be used to define specific profiles of participation and to observe differences and similarities among members of the same group. Further instantiations of the codebook in other courses and contexts could improve its power and make it more solid and reliable.

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Appendix A
The Self-Evaluation Form

Student First and Last Name: _____

Instructions: This form should be updated at the end of each module. Please fill in the column corresponding to the module just completed by assessing yourself about the statement reported on the left along a scale from 0 to 4 (0 = *not at all*, 1 = *slightly*, 2 = *somewhat*, 3 = *moderately* 4 = *extremely*).

	MODULE 1: Learning and Technology	MODLE 2: Learning Object, Open source	MODULE 3: Digital Identity	MODULE 4: New trends
Role-play (Self-evaluation of the role played. Do not answer if you did not play any role.)				
How much do you think the role supported your participation in the activities?				
How much do you think the role helped you in learning the contents of the module?				
How much do you think the role helped you acquire learning skills?				
Writing Reviews				
How much do you think writing a review on the reading material helped the knowledge building of your group?				
How much do you think you learned from writing the review?				
How much do you think writing the review helped you acquire learning skills?				
Web-forum discussion				
How much do you think you participated in the discussion?				
How much do you think the discussion helped you in learning the content of the module?				
How much do you think the participation in the discussion helped you acquire learning skills?				
Classroom activities				
How much do you think classroom activities helped you in learning the content of the module?				
How much do you think classroom activities helped you acquire learning skills?				
Building cognitive maps				
How much do you think you contributed in building the cognitive map?				
How much do you think participating in the construction of the map helped you acquire learning skills?				

Group activities				
How much did you feel part of your group?				
How much did you feel part of the larger group?				
Self-evaluation				
How well do you think you are capable of assessing yourself?				
List the contribution you consider the most important for the module (a note of a discussion, a product, etc.).				

Appendix B
First Themes and Categories

Theme	Description	Categories
1. *Technology*	Reference to difficulties regarding the online environment and reflection on their technological skills	Relationship with technology Tools
2. *Participation*	How students reflect on the modality of participation and interaction, and how they perceive group dynamics	Sociality Individual activities Group activities
3. *Competence*	How students reflect on their skills	Individual competence Group competence
4. *Assessment*	How students evaluate themselves and the activities of the course (metacognition)	Content Self-assessment Modality of work
5. *Self*	Personal and emotional aspects emerging from participation	Individual features Emotional aspects

Appendix C
The Final Codebook

Themes	Categories	Description	Examples
1. Technologies	1.a. Relationship with technology	Reference to the relationship with the technology	"I never had any talent for technology."
	1.b. Tools	Reference to a specific tool	"I created a wiki note for discussion."
2. Participation	2.a. Sociality	Reference to the social aspects of participation such as sharing, mutual exchange, pro-social attitudes	"I felt encouraged to participate."
	2.b. Individual activities	References to individual activities.	"To me, it was very interesting to play the role of the synthesizer."
	2.c. Group activities	References to the composition, organization and group dynamics	"The identity of the group was strong."
	2.d. Phatic	Supporting discussion and asking for feedback	"Well, what about it?"
3. Competence	3.a. Individual competence	References to personal skills	"This role develops the ability to extract the key elements of a module."
	3.b. Group competence	References to skills gained while working in a group or used to carry out group work	"We developed analytic skills."
4. Assessment	4.a. Content	References to the contents of the educational materials	"It was very interesting to understand what really is the aim of e-learning."
	4.b. Self-assessment	Critical reflections on their own work	"Now that my ePortfolio is completed, I realize the progress I've made."
	4.c. Modality of work	References to the method used to perform an activity, even concerning the problematic aspects	"I have the impression that this discussion has been too short for the type of argument."
5. Self	5.a. Individual characteristics	References to personal characteristics and to the implications for the activities	"I love to be able to draw conclusions because, in general, in my life I like to stop and observe myself and what I did."
	5.b. Emotional aspects	References to moods (anxiety, fatigue, difficulty) and expectations	"This role has generated anxiety in me; it was a hard work."