

Measuring faculty learning in curriculum and teaching competence online courses

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Online education is used for a variety of purposes in higher education. Two such purposes are improving one's performance over time and understanding one's professional development in the context of online teaching and learning. Relying on data from online staff development courses delivered in five Spanish universities, this article explores online faculty learning through the lens of staff development theory. This theoretical perspective emphasizes the universities' quality assurance contexts and offers an empirical examination of the ways in which faculty members learn curriculum and teaching competencies (CTCs) in online staff development programmes. At the core of this analysis is the contention that faculty members understand and respond to quality teaching lessons and activities. Finally, this study highlights the points deemed important when designing, implementing, and evaluating Internet CTC training courses.

Keywords: online education; faculty development; curriculum and teaching capacities; online faculty development assessment

Introduction

According to the *Standards and guidelines for quality assurance in the European higher education area* report, released by the European Association for Quality Assurance in Higher Education (2005), academic staff are:

the single most important learning resource available to most students. It is important that those who teach have a full knowledge and understanding of the subject they are teaching, have the necessary skills and experience to transmit their knowledge and understanding effectively to students in a range of teaching contexts, and can access feedback on their own performance.

Internet learning is a growing trend in today's educational systems. The definition of learning encompasses a quantitative increase in knowledge, memorization, the acquisition of facts or methods, the abstraction of meanings, and an interpretative process leading to the comprehension of reality. Learning should also be regarded as

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a social process of interaction. It is one of the many psychological constructs featured in textbooks, and one that has recently become a metaphor for the modern vision of the university as an organization (Brockbank & McGill, 1998; Oliver & Herrington, 2003).

One of the essential characteristics of a learning organization is that it should be knowledgeable about the strengths required for and the internal tasks involved in constructing the ability to learn. This can be synthesized in the idea of integration that unites the mission and vision in the values expressed by the organization, the leadership, experimentation, transfer of knowledge, teamwork, and cooperation. The university as an organization learns through creating, acquiring, and transferring new information and knowledge, and changes its actions to reflect these (Patterson, 1999). In a learning organization no one shrinks from the task of collecting information about the gap that exists between present actions and desired performance. On the contrary, organizational curiosity keeps the door wide open and is concerned with measuring the key factors within the institution (including student satisfaction) (Allan, 1996). The learning organization offers its end users the key to keep the door permanently open through new means of communication, including the Internet. To understand learning activities in online environments we therefore need to locate those activities within degree programme contexts that endow them with value, status, and expectations (Raz & Fadlon, 2006).

From faculty quality to quality teaching

When it truly becomes part of the fabric of a human organization quality, in the form of experimentation and improvement, turns itself into the real text of the university context. The assessment of quality in universities represents an attempt to discover the opportunities available through teaching, research, and management to respond to the prescribed institutional objective of promoting the personal development of students. Its purpose is to identify those elements in an apparently diverse flow of organizations, developments, and teaching meanings that are in or out of tune for the individual student.

The present study of online staff development courses in five Spanish universities is the product of a scientific need, the emergence of a wealth of research in programme quality assurance (Harman, 1998). Fine strands of quality interweave in a process of staff development based on a style of learning that solves problems, learns from past experience and from the experience of others, and which transfers knowledge quickly and efficiently throughout the organization.

On the whole, each of these evaluation models suffers from conceptual shortcomings. Consequently, the European Association for Quality Assurance in Higher Education is calling for more research and training on principles and methods regarding quality assurance.

Hence, professionalization is an important issue in the field of faculty evaluation and degree programme quality assurance. Besides, an understanding of a formal system of university quality policy is complex and multilayered. Moreover, theoretical underpinnings are needed in order to understand such processes as the planning, enactment, and personnel commitment in a degree programme review, as well as analysis of the results of implementation of the pertinent changes (Lennie, 2005). This article presents experiences of being involved in an online learning format from a faculty perspective.

Aims

Designed as a multiple case study, we try to replicate the online course and thus make use of the research evidence gained from a cross-analysis of all the multiple cases (Yin, 1994). This study assesses changes in the new and old public universities' landscape, particularly those effected by quality-led accreditation demands, by the rising demand for faculty evaluation and improvement, by convergence with European universities, and by recent developments in web-based technologies. Furthermore, other researchers have explored online activities and justified their use at the community college level in the USA (Cox, 2005).

We espouse a theory of teaching as a learning enabler, which goes beyond the transmission of academic content towards a cooperative process in which faculty and students are encouraged to engage actively in the subject matter. Curriculum and teaching competence (CTC) involves teaching the subject at hand, being acquainted with students and classroom situations, and having personal knowledge as factors that underpin competent performance (Uhlenbeck, Verloop, & Beijaard, 2002). Here, the proposed set of CTCs should revolve as much around authoritative training as around speculative questioning and inquiry, with academics becoming reflective practitioners who interact and listen to their classroom students (and online training course colleagues) regarding teaching and learning issues that require revision, for instance links between student workload and competencies in any subject area. They are broad descriptions of what academics need to know and be able to master: (1) knowledge of student motivation and ability to promote students' positive attitudes; (2) awareness of students' diversity in all its forms; (3) competence to solve students' problems; (4) competence to develop metacognitive skills in the trainee; (5) competence to provide effective and free curriculum time; (6) knowledge of the area being supervised (learning tasks, research, assessment, etc.); (7) teaching and didactic skills for large groups; (8) a grasp of questioning skills; (9) knowledge of formative and summative evaluation; (10) competence to conduct one's own self-assessment process.

This programme facilitates the development of competencies tailored to teaching functions. Thus, teaching is seen as context-related, recognizing different ways of encouraging individual students to learn to use a variety of learning tasks (Badley, 2000).

As the focus of this study success in faculty online training needs to be specifically evaluated through the learning activity performance of participants. Therefore, the general research question for a online CTC faculty development study is as follows:

- How are old and new Spanish faculty members responding to the challenges of online CTC learning courses? The online curriculum and teaching competencies programme concerns careful professional judgements made by committed participants and requires universities to develop new learning tools and expertise.

Method

Context

We have divided the five public universities into two main categories to compare participants' attitudes and CTC learning. Old universities are considered to be those established between 1505 and 1988—Seville (1505) and La Laguna (1701)—while new universities comprised those established between 1989 and 1994—Las Palmas de Gran

Canaria (1989), Jaén (1993), and Burgos (1994). This comparative approach has been followed by different researchers in previous studies as a means to report variables according to university type (Tytherleigh, Webba, Cooper, & Rickettsa, 2005). We expected that new university participants would be more eager to learn online CTCs than old university faculty members, because they have more opportunities for promotion, pressure to attract external research funds, and also a belief in job insecurity.

Participants

One-hundred-and-sixty-two faculty members (88 men and 74 women) enrolled on five online CTC courses participated in the study: 40.1% ($n = 65$) from the University of Jaén, 18.5% ($n = 30$) from the University of Las Palmas de Gran Canaria, 17.9% ($n = 29$) from the University of La Laguna, 13.6% ($n = 22$) from the University of Seville, and 9.9% ($n = 16$) from the University of Burgos. Academics are intrinsically motivated to participate in the online courses by context factors such as insufficient CTC knowledge: 84.6% ($n = 134$) of the participants had not attended previous teaching courses and only 15.4% ($n = 25$) of the respondents had some prior knowledge. The role of academics is nowadays faced with demands for greater accountability, efficiency, and quality, particularly due to some of the principles of the 1999 Bologna Declaration, which was a solemn pledge signed by 29 European countries to reform the structures of their higher education systems in a convergent way, in the sense of adopting a European Credit Transfer System covering lifelong learning activities: 88.9% ($n = 144$) of the faculty members did not have previous European convergence knowledge and only 11.1% ($n = 18$) had some knowledge. We consider that these faculty members tend to be teaching innovators or aim to adopt a teaching quality described in the innovation literature as “aliocentrism,” a process in which “professors-as-teachers come to see themselves primarily as *facilitators of learning* rather than as *disseminators of knowledge*” (Robertson, 1999, p. 280, emphasis in original). In this study demographic and professional measures are used as independent variables in the analyses. The online courses took place during the year 2005, and lasted 11 weeks each.

Procedure

The critical design issues behind the rationale of all five courses include online CTC planning, organization, structuring, implementation, tracking, impact reporting to institutions, communicating assessments to participants, and many other principles that take time and require orderliness on the part of the online programme advisers (Nijhuis & Collis, 2003). Thus, is the online programme used to deliver educational training that supports teaching efficiency, degree programme changes, and classroom strategic capabilities for agents to manage and implement CTC changes in university organizational cultures, with classroom-based activities being considered of high value (Homan & Macpherson, 2005). Each course consists of 10 CTCs that correspond to the typical 11 week semester. Each CTC had been pilot tested by several university teachers in previous online courses to ensure the connectivity of the hyperlinks, appropriateness of the CTC assignments, and accessibility to the Microsoft PowerPoint slides and online tests. The course is password protected, so only registered faculty members have access to the course materials, Microsoft PowerPoint slides, and online tests. A CTC consists of an instructional sequence of activities structured around a problem-solving model that serves to guide participants through the learning experience. The problem-solving model

constitutes the CTC learning object and prescribes the instructional sequence through a series of 10 phases. Also, the online course is scalable and requires design activities to accommodate the range in the number of faculty members or university groups (Murphy, 2000).

The CTC learning model is illustrated in Figure 1. Here, learning is viewed in terms of “situated action,” where meaning is embedded in classroom contexts and teaching knowledge is not “objective,” but rather inter-subjective. Learning a CTC emphasizes basic adult learning views of: (1) encouraging active participation in reading CTC lessons and answering activities and quizzes; (2) learning to acquire pedagogical knowledge for practical use in enquiry tasks; (3) building CTCs on the prior experience of faculty by reflecting on colleagues’ case studies or teaching vignettes; (4) developing a virtual environment of respectful communication between mentor-participants; (5) employing collaborative asynchronous forum discussions of curriculum and teaching innovations; (6) reinforcing participants’ enquiry tasks, practices, or strategies by instant feedback. Supporting, motivating, and developing are the aims of this sequential learning process that allows participants to understand teaching (Sosik & Godshalk, 2000; King, 2002).

Throughout the duration of the 11 week course faculty members sent many emails that were not a part of their assignments. Mentors responded to each email and printed out copies so as to accumulate qualitative data. Text information received from all five courses (quizzes, assignments, and general feedback about the courses) was combined and is presented cumulatively. The authors used data analysis methods, such as data reduction, data display, and interpretation, to ensure data consistency and verification (Perrin & Mayhew, 2000).

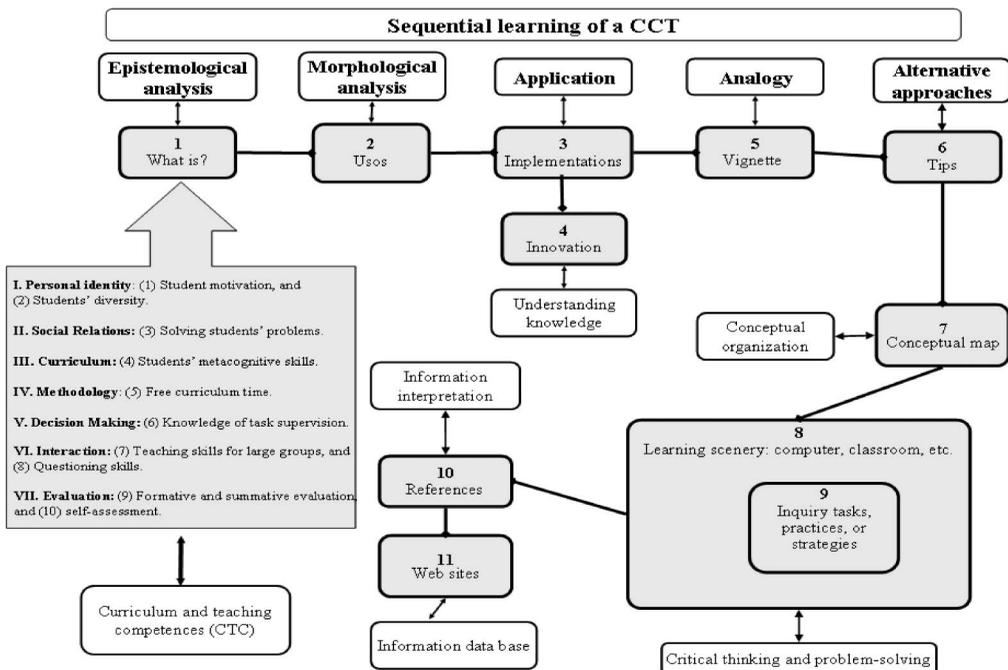


Figure 1. Learning development stages of a curriculum and teaching competence (CTC).

Some other key features of the multimediuim platform follow (<http://gid.us.es:8083>). According to this model faculty must carry out the following tasks. (1) Use a CTC handbook (Villar, 2004) which reviews several sources on college teaching and identifies the critical CTCs related to class preparation, classroom structure, and organization, with a focus on teaching innovation and student learning. (2) Interpret materials (CTCs) which are segmented into 10 weekly lessons and released on a weekly basis with ongoing updates. All 156 pdf and html documents, 114 web sites, and 10 Microsoft PowerPoint presentations are hyperlinked. (3) Discuss two topics in asynchronous forums, "European convergence issues" and "Student mental effort to cope with the new European credit system." These are organized and released on a fortnightly basis, but remain accessible throughout the course. The last forum includes postings posing reflective questions (Socratic questions). We also believe that faculty participation is crucial for learning on asynchronous online training courses. Regarding faculty postings to asynchronous discussions in online courses, Blignaut and Trollip (2003, p. 152) remarked: "Determining the elements of faculty participation and involvement can lead to the development of improved skills, which in turn may lead to improved learner satisfaction, instructor satisfaction, and the lowering of attrition rates." (4) Access e-mail from the browser for one-on-one interactions with mentors or other participant instructors. (5) Browse the curriculum materials containing URL links to related articles and institutions, notes and grades from any location, on flexible time schedules. (5) Download Microsoft PowerPoint presentations, key concept maps, and study guides and resources onto their personal computer. (6) Submit online learning activity assignments using web form interfaces or via e-mail; these assignments are meaningful activities that have real university relevance and present complex teaching/learning tasks to be completed over a sustained period of time. (7) Assess activities with the aim of presenting realistic representations of the tasks we want to assess competence in; allow faculty substantial freedom in selecting activities, as they are features of authentic assessment, according to Uhlenbeck et al. (2002). (8) Complete 10 online tests using web forms with answers recorded in the appropriate database on the server. Each CTC test is programmed (random selection) to be unique and to provide instant feedback with the results to the participants. In other words, there is an authentic assessment which is seamlessly integrated into the learning activity assignments and which provides a formative assessment of their understanding of basic concepts, aiding them to gain a sense of progress. (9) Assess the quality of materials and of the training process as a formative evaluation for course revision.

Data sources and analytical methods

The data providing information on quality online courses come from three primary sources. First of all, the authors administered a CTC needs scale to compare participants' demographics. Second, the authors designed and analysed CTC online quality scales. Third, the authors assessed a variety of CTC activities underlining the importance of learning, as a kind of digital portfolio. Finally, the authors analysed online CTC test results of the participants.

The focus on quality teaching has resulted in a more formative evaluation for the purpose of improving teaching and learning (for example classroom assessment techniques, student focus groups, virtual environment evaluation inventories). The convergence of technology and teaching improvement has spurred the development of online student ratings of instruction and online faculty opinion questionnaires across

disciplines or universities (Pratt, 1997; Supovitz, 2002). Scales that are used as the basis for investigation are briefly described below.

- (1) CTC needs scale (10 items). Assess the extent to which faculty members need CTCs to improve their curriculum and teaching expertise.
- (2) CTC quality scale (10 items). Measure participants' attitudes, abilities to understand, and the degree to which individuals or groups wish to use the CTCs.
- (3) CTC activities (4 items). Assess the level at which an individual faculty members understand knowledge and skills and the values underpinning activities.
- (4) CTC learning tests (10 items). Appraise participants' performance with respect to knowledge and understanding of CTCs.

Using these needs and attitude scales and performance tests, a variety of analyses were completed using appropriate statistical methods. *t*-Tests were used to compare the means of participants' demographic variables. χ^2 analyses were used to examine differences in the proportions of participants and their levels of needs. Finally, analysis of variance (ANOVA) was used to uncover the main and interactive effects of categorical independent variables (demographic and professional measures) on interval-dependent variables.

Results

This section addresses the four specific and operational research questions of this article: (1) what are the differences in CTC needs among participants belonging to five Spanish universities; (2) how can online CTC training positively affect faculty members' attitudes and abilities; (3) how well do faculty members respond to various kinds of CTC online learning activities; (4) how different are faculty members from old and new Spanish universities in CTC performance tests?

All five online courses introduced faculty to the best training in CTC learning, by assessing online contributions and organizing useful online group activities: "Training, therefore, should result in the implementation of a programme that gives lecturers what they need when they need it" (Gerrard, 2005, p. 152).

The relationship between demographics and the CTC needs scale

The first CTC needs scale is an online 3-point scale of 10 declarative statements used as a CTC diagnostic tool. The scale is 1 – 3, with values of "1 = Not very necessary," "2 = Moderately necessary," and "3 = Very necessary." On average participants considered professional training in CTC 5 (Competence to provide effective and free curriculum time) and CTC 7 (Teaching and didactic skills for large groups) as moderately necessary.

χ^2 difference tests were used to compare whether two independent variables had significantly different distributions across participants' CTC needs. We found the following statistically significant differences in CTC need ($p < .05$): Competence to provide effective and free curriculum time was very necessary for participants from the University of Jaén, among faculty members 30 – 34 years of age, Social Sciences academics, and participants who did not have previous CTC knowledge. Also, faculty members in the 45 and over age range perceived a very necessary need in two CTCs: Awareness of students' diversity in all its forms, and Competence to solve students' problems. Finally, Social Sciences academics perceived a significant need in Knowledge of area being supervised (learning tasks, research, assessment, etc.). University teachers felt

that attending to the disciplinary or cultural or cognitive or content aspects of their teaching is the be-all and end-all of their responsibilities.

A *t*-test assessed that men and women were statistically different ($p < .05$) from each other in the following CTCs: Knowledge of student motivation and ability to promote students' positive attitudes, Competence to provide effective and free curriculum time, Knowledge of formative and summative evaluation, and Competence to conduct own self-assessment process. Participants with some previous CTC knowledge and those with no knowledge were statistically different from each other in the Competence to provide effective and free curriculum time.

The following results were statistically significant using ANOVA ($p < .05$). Participants' CTC needs were significantly different regarding 8 of the 10 CTCs: Knowledge of student motivation and ability to promote students' positive attitudes, Awareness of student diversity in all its forms, Competence to solve students' problems, Competence to develop metacognitive skills in the trainee, Competence to provide effective and free curriculum time, Knowledge of area being supervised (learning tasks, research, assessment, etc.), Knowledge of formative and summative evaluation, and Competence to conduct own self-assessment process. There was also a main effect depending on the participant's scientific area in the Competence to provide effective and free curriculum time and in Teaching and didactic skills for large groups. Finally, participants' workload proved to have a main effect with regard to Knowledge of formative and summative evaluation.

Practical knowledge—an integrated set of knowledge, conceptions, beliefs, and values faculty develop in the context of the teaching situation—varied among participants mainly due to the sociological conditions of gender and age.

Impact of online training on participants' attitudes and abilities measured by the CTC quality scale

All CTCs were assessed with the same CTC quality Likert scale (Cronbach's $\alpha = .969$). An ANOVA and the post-hoc Tukey-HSD test were applied to determine differences between groups with respect to CTC quality scale items. Participants from all universities had significantly different opinions with respect to CTC lesson and activity complexity readings. Also, participant's scientific area led to significantly different attitudes concerning CTC readings. A Tukey-HSD test revealed that there was a reliable mean difference between the Experimental Sciences and Humanities ($p < .041$). Finally, with regard to old and new university participants' opinions on CTC time consumption, the means show a significant difference. In particular, faculty from new universities felt that CTC learning (e.g. readings, activities, tests, etc.) took more time and was tiring.

Faculty members' participation in and assessment of various types of learning activities

Authentic assessment calls for participants to demonstrate their skills through engaging in deliberation and reasoning about activities (Uhlenbeck et al., 2002). Underlying proficiency is inferred from the activity. Activities/tasks assessment, the scoring criteria and the rubrics used by the mentors reflected the complexity of the activities/tasks. Faculty from two new universities (Jaén and Las Palmas) showed a high fulfilment rate for activities.

To determine whether there was a difference in university participants' activity qualifications, an ANOVA was performed among university groups on the average activity grades of each CTC at $p < .05$. The findings revealed differences in Knowledge of

student motivation and ability to promote students' positive attitudes, Awareness of student diversity in all its forms, Competence to solve students' problems to develop metacognitive skills in the trainee, Knowledge of area being supervised (learning tasks, research, assessment, etc.), Teaching and didactic skills for large groups, Grasp of questioning skills, Knowledge of formative and summative evaluation, and Competence to conduct own self-assessment process. A Tuckey-HSD test also revealed that all five university means differed from each other. Also, for Knowledge of student motivation and ability to promote students' positive attitudes there was a difference between participants by age, gender, and teaching experience. Competencies as practical knowledge can be seen as the core of a faculty's professionalism. We agree that these competences are person- and context-bound. They are also affected by the faculty's concerns about their own university context.

Academics are curriculum makers: they filter their personal experiences through their personal practical knowledge. When participants respond to activities they provide information on their curriculum making and reveal their personal practical knowledge in action (Van Driel, Verloop, Van Werven, & Dekkers, 1997). Faculty professional knowledge landscapes for all participants in this study are summarized in 8245 completed activities or fragmented personal stories. A learning activity is a kind of narrative, a mode of academic thought that is in a constant state of formulation and reformulation. Seven-hundred-and-eighty-four stories were narrated while mastering the competence to provide effective and free curriculum time. A Statistics and Operations Research participant from the University of La Laguna engaged in a form of reflective corroboration and reported a time-free curriculum activity linked to his discipline:

It is my intention to take my subject matter—Sampling—and give it a functional purpose. A visit to a zoological park, botanical garden, or thematic park where animals and plants are protected is a multi-phase endeavour. During the visit, students will gather data on animals and their number, behaviour, etc. All plans incorporate numbers. This note-taking can be the very foundation for a later brainstorming with the purpose of designing a statistical piece of research for inquiring about the characteristics of animal or plant populations that might have aroused the interest of students during the first visit to the park. It would be necessary to select a sample design on this population, in order to design a sample and a questionnaire for, in later visits to the park, gathering more precise data. This would enable the student to develop a deep statistical study, which would be of very good practice for the Sampling discipline. This free activity removes the student from the confines of learning within the enclosed traditional university milieu to the outside environment.

Effects of demographics on faculty CTC learning performance

Faculty judge their own learning performance at the end of each of the 10 CTC lessons by means of performance tests. An online test consists of 10 items, which outline those performance capabilities that participants should possess if successfully taught (Cronbach's $\alpha = .988$). Online tests require academics to select the best answer. Answers are scored right or wrong. Reported scores in all CTC performance tests are averaged to generate a composite score. This dependent variable is used to identify CTC course attainment. No significant differences were found between participants when demographic and professional variables were compared. Participants from old and new universities only exhibited differences in two competencies: Knowledge of student motivation and ability to promote students' positive attitudes and Knowledge of formative and summative evaluation. They differ in integrated knowledge (e.g. scientific or formal knowledge).

This finding also suggests that everyday knowledge, including norms and values, as well as experiential knowledge, are part of their practical knowledge.

Discussion

These online CTC courses considered the kinds of teaching knowledge and learning that are emerging from innovative sites at which higher education is delivered. With regard to a degree programme, the faculty's Competence to provide effective and free curriculum time ought to focus on "action learning" involving the professional working world. This needed CTC develops a degree programme allowing academics to commit to the creation of new learning opportunities and the expansion of those opportunities (Davies, 1998). This teaching competence is important and relevant for the European Credit Transfer and Accumulation System, which is a student-centred system based on the student workload required to achieve the objectives of a degree programme, objectives preferably specified in terms of the learning outcomes and competencies to be acquired.

This study reveals that online system reliability (accessibility 24 hours a day) is an important factor in the flexibility of CTC learning. It also shows that faculty are concerned with learning activities: text readings seem to be excessive, taking into account that many of them are delivered to faculty in a second language (English). Online lesson reading and activities learning has not yet emerged among some participants, partly due to the unsettled nature of pedagogy in the effort to establish distance learning (Natriello, 2005). The faculty with whom we had correspondence felt that the online course involved a lot of work, although others felt that faculty work became more meaningful and self-initiated ("empowered") (Wong & Tierney, 2001). They also claimed merit (diplomas) or external motivations (overtime) for attending this intensified online course. Some participants said in e-mails that their academic workload and the online course expectations had a strong emotional impact on their teaching. In this sense, future research should measure the interaction between two sets of variables: occupational expectations of contracted university staff and emotional anxiety brought about by intensified online courses (Ogbonna & Harris, 2004).

When discovery learning activities are carefully planned and structured faculty are led to correctly interpret information and are provided with prompt feedback by the advisers. The study shows a huge number of training activities (8245) carried out by participants ($n = 162$) indicating a more than an "adequate" faculty involvement, which is one of the components of the basic online competence of a college or university (Cox, 2005). Fifty-one faculty participants from the old universities, Seville and La Laguna, engaged in 2172 activities, while 111 faculty of the new universities, Jaén, Las Palmas, and Burgos, were involved in 3373 activities. For each CTC lesson we combined extended and more time-consuming tasks, practices, and strategies that assessed depth of understanding with shorter CTC activities, in order to reach acceptable levels of CTC content validity (Uhlenbeck et al., 2002). Activity assessment to provide consistent estimates of CTCs was guaranteed by the use of a pair of trained assessors with extensive knowledge of the CTC online course. Improving and renewing activities are an approach to quality assurance management (Harman, 1998).

This multiple case study provides some evidence that learning is transformational, i.e. the online CTC organization operates proactively in the classroom learning environment involving a process of deconstruction and reconstruction. Accessibility to grades, online forum discussions and constant and immediate feedback were key characteristics.

Participants frequently checked the web site for updates on grades and qualification comments and questioned missing grades: “I like to check my progress to know where I stand and where I need to improve” was a common participant’s remark. Voluntary faculty participation in online CTC courses is regarded as good teaching practice as a means of constructing teaching excellence identities (Raz & Fadlon, 2006).

Academics have acquired and transferred new CTC knowledge to their classrooms and have changed their behaviour to reflect these changes. Moreover, this study assumes the ‘collaborative model’ approach, because all university groups benefited from the same online training programme (Patterson, 1999). This new course environment is shifting the university organizational culture, illustrating a movement towards social responsibility and academic renewal (Middlehurst, 2004).

Conclusion

Broad demographic and academic characteristics provide the basis for profiling the “typical” online faculty participant in Spanish higher education. Speaking as a whole, faculty need training in CTCs. Hypotheses regarding differences in CTC needs based on demographic and academic variables gain some support from the empirical information.

The authors note some limitations to the study. The faculty and universities who participated in our study did so voluntarily. Therefore, generalizations of the findings to other Spanish universities should be made with caution. Nevertheless, suggestions for future research are: (1) to enlarge the multi-institutional faculty sample to support sophisticated statistical analyses; (2) to maintain a longitudinal research study involving the participants; (3) to analyse text activities more thoroughly with respect to the qualitatively scientific and technological aspects.

This study has several strengths, however. Mutual interactions between autonomous, persistent and independent participants and mentors, CTCs, technology and related platform resources is the key to acceptance of the Internet course. Faculty participants talked about what they were learning about selected CTCs, wrote about CTC activities, related them to their previous teaching experiences, and applied them to their content knowledge. Training faculty in classroom CTCs, in handling collaborative forum discussions with colleagues, and raising awareness of the diversity of learning approaches creates a positive virtual environment and helps find the deep meaning behind learning to teach. In building scientific knowledge faculty commitment to teaching plays a very important role. In summary, online competence learning as pedagogical content knowledge has been introduced as an element of the knowledge base for teaching.

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