Towards an efficient training of university faculty on ICTs

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Abstract
This article presents the results of a research study that took place during the 2007–2008 academic year at the University of the Basque Country (UPV/EHU in its Spanish and Basque acronyms). The research’s goal was to establish the guidelines for training opportunities in information and communication technologies (ICTs) that could better address the needs of the faculty at the aforementioned university. The conclusive results provide a picture of the necessary training in ICTs that the faculty requires for their teaching as well as for conducting research. This led us to develop some suggestions that are related to the modular organization of past and present training courses as well as improved guidelines that would help us to restructure the design of the training currently being offered. This restructuring is fundamental in order to include ICTs in the new European space of higher education (ESHE)⁴.

1. Introduction

The introduction of information and communication technologies (ICTs) and the expansion of their use in the educational field have forced the creation of training programs for faculty on the use of ICTs. The main obstacle for designing any ICT training program has to do with the lack of information on the actual needs of faculty members and the type of format that should be utilized for those training needs (Galanouli, Murphy, & Gardner, 2004). An adequate way to learn about those needs is to analyze the studies that have made a correct diagnosis of faculty’s training needs in the field of ICTs and the characteristics of the specific training that they receive.

By reviewing the existing literature on the needs analysis and use of faculty training, we found that there are a number of studies that focus on the use of new technologies in primary and secondary education (Williams, Coles, Wilson, Richardson, & Tuson, 2000). Those studies clearly stated that, in those two levels of education at the time the research was undertaken, the use of ICTs was very low. Additionally, there are significant studies on the integration of ICTs in classroom teaching, in which those tools complement and modify the pedagogical practice (Hennessy, Ruthven, & Brindley, 2005).

Since the time that those studies took place, we know that reality has changed. The training plans have borne fruit. For instance, new research centers on educational technology, with access to innovative processes and methods to teach and learn, have been created (CREET: Centre for Research in Education and Educational Technology, 2008). Also, new applications and specific observatories to study ICTs and education have been created (Púlsar u Observatorio e-learning de la Universidad del País Vasco, 2007), and those observatories report on the use of new technological tools by university professors. For example, in 2008, the ICT Sector Commission of the Spanish Universities’ Chancellors Conference carried out an exhaustive analysis of the introduction of ICTs in the Spanish university system. This study highlighted the fact that there is an increase in the use of emergent technologies in higher education. Furthermore, the 5th Horizon Report also stated that emergent technologies and their impact are increasingly greater in relation to the tasks undertaken by faculty in higher education. Moreover, the United Nations’ report on the global information society (Sheridan, 2008) evidenced an evolution of society.
regarding the use of ICTs worldwide, which is based on greater technological development as well as on a positive attitude towards educational technology.

We cannot forget that the application of ICTs in the educational field is also closely linked to pedagogical changes that are taking place. This relationship, mentioned in different articles (John & Sutherland, 2004; Stephenson, 2001), will determine the transition process of universities towards the information society (Burbules & Callister, 2000), as technology has the ability to transform the teaching and learning processes (Sutherland et al., 2004).

In relation to the studies published to this date, this present work attempts to identify criteria that would allow us to develop more efficient training methods on ICTs for university faculty by analyzing the training needs and preferences of the University of the Basque Country's faculty. That is to say, we attempt to put forward a series of recommendations about what and how to train university faculty in the field of ICTs. Our line of work follows up other studies such as Basis, orientations and criteria for the design of training programs for faculty (Braslavsky, 1999), which established its own criteria in the design of postgraduate courses in order to prepare university faculty. We hope that the conclusions presented here can be of use to other higher education institutions that have programs and plans in progress to train faculty on ICT applications.

2. Materials and methods

The nature of the present research study is descriptive according to Van Dalen and Meyer’s (1966) definition of these types of studies. In other words, we have attempted to collect detailed data that describe a situation, identify problems, make comparisons and evaluations, and plan future changes by facilitating the decision-making process.

Among the existing different methodological possibilities (Borg & Gall, 1976; Cohen & Manion, 1985), we opted for a web-based online questionnaire (White, Carey, & Dailey, 2001) that, from an integral perspective (Dendaluze, 1999), includes specific characteristics of the qualitative and quantitative research. When determining the steps to be taken in the execution of our research, we followed the ones specified by Floyd (2001).

We took into account Schwarz’s (1999) and Holt’s (1997) recommendations in designing the tools for the collection of data as well as the suggestions given by Norman, Friedman, Norman, and Stevenson (2001) in creating an online survey.

In order to accurately define the items and the perspective of the questionnaire, the authors of this article revised the different surveys used by the authors and institutions mentioned in the previous section. After designing the first draft, the authors consulted with the team in charge of faculty training at the UPV/EHU. According to the qualitative analysis of these meetings’ minutes, the workgroup thinks that, if teachers have to identify their ICT training needs instead of the knowledge that they already have about it, they will probably take more significant information into consideration, such as their real need of ICT use and the expectations that they have about the applications. For this reason, this survey focuses on the teachers’ training needs.

One other outcome of the meetings was the definition of the survey’s items. Taking into consideration the faculty’s tasks and functions in the teaching and research fields, the workgroup separates the resources and application technologies that can be used at the university into two groups: on one hand, there are the basic resources (identified in the first part of the questionnaire) and, on the other hand, there are the advanced resources (identified in the second part of the questionnaire). So, every item of the survey refers to an ICT application that can be used by any faculty member in the development of any teaching and/or research tasks.

After these meetings, the questionnaire was validated, and two groups of experts supervised the validation. The first group was composed of high-ranking administrators of the Campus of Gipuzkoa, and the second one consisted of specialists on the application of ICTs in higher education. Moreover, a pilot study was done in order to test the questionnaire and to collect the opinions of teachers about its validity.

The improved questionnaire was digitized by the Microsoft FrontPage program and was uploaded to a public directory on the University of the Basque Country’s main website (www.ehu.es/tic). The faculty members were asked to evaluate the ICT applications according to their individual training needs following a Likert scale from 1 to 4: nothing, something, enough, much.

Questionnaire part 1: basic resources

01.1. Computerized resources:
  01.1.1. Projector.
  01.1.2. Computer.
01.2. USB memory sticks (pen drives).
01.3. DVD reproduction programs (PowerDVD).
01.4. Platforms for faculty use:
  01.4.1. Moodle (virtual teaching system).
  01.4.2. E-kasi (UPV/EHU’s e-learning platform).
01.5. Mailing lists.
01.6. Blogs.
01.7. Online teaching (virtual university).
01.8. Others.
01.9. Internet browsing.
01.10. Electronic mail.
01.11. Word processing software (word or writer, etc.).
01.12. Presentation software (PowerPoint or Impress, etc.).
01.13. Database software (Access, Filemaker, etc.).
01.14. Spreadsheet software (Excel, etc.).
01.15. Graphic design software (Photoshop, etc.).
01.16. Web page design software.
01.17. Digital video editing software (Premiere, Pinacle, etc.).
01.18. Other resources.

Questionnaire part 2: advanced resources

02.1. Online applications for scholarships (Ikertu, Ramón and Cajal, etc.).
02.2. Statistical package software (SPSS, Nudist, Invest, etc.).
02.3. Computer resources provided by UPV/EHU’s different libraries.
02.4. Communication and interaction platforms (Messenger, Skype, etc.).
02.5. Video conferences.
02.6. Creation of pdf pages (Adobe Acrobat, etc.).
02.7. ISI web of knowledge (database of journals).
02.8. Online access to other libraries.
02.9. Reference managers (bibliographical references).
02.10. UPV/EHU’s password.
02.11. Microsoft project (project management).
02.12. Other resources.

Although the questionnaire provides significant information about numerous applications, the authors have not processed quantitative data about some applications related to Web 2.0 (wikis, social networks, etc.) or new resources (whiteboards, PC tablets, digital books, etc.), because when the questionnaire was designed – the previous year to the research, – these applications were not commonly used by the faculty members. But, the information collected through open questions indicates that the use of these applications is growing, so any future revisions of this questionnaire by those seeking to evaluate teachers’ training needs must take into account these new resources and applications. Additionally, the designed questionnaire could be improved by adding specific applications for different fields of knowledge (teaching sciences, foreign languages, chemistry, journalism, etc.)

2.1. Participants

The survey was sent via a personalized e-mail invitation to 1074 faculty members working at the UPV/EHU’s Campus of Gipuzkoa. We received 472 completed surveys, which constitutes 43.74% of the total faculty. In statistical terms, the sample is representative of the faculty campus, with a level of reliability of 95% and an error margin of 3.45.

The grade of reliability of the global scale used was Alpha of Crombach = 0.90. For each of the questionnaire’s two parts, we also obtained very high grades of reliability of the subscales in relation to the training needs in the teaching field (Alpha = 0.929) as well as in the research field (Alpha = 0.923). All of the items in each subscale were correlated in a positive and significant manner with the rest of the items—i.e., a statistically significant limit of 0.01 (correlation test of Pearson).

We used the statistical program SPSS 15.0 to analyze the statistics. According to Allen and Seaman (2007), the Likert scale is ordinal in nature, and for this reason, we conducted non-parametric procedures like frequencies and percentages in order to determine the faculty’s training needs. We have also carried out a factorial analysis to establish useful criteria for organizing future ICT programs regarding teaching.

3. Results and discussion

3.1. Training needs in teaching

In the factorial analysis of the established resources within the framework of teaching, we observe that there is a first element that explains 47.16% of the variance of the results and a second factor that explains 10.45% of the variance. To those two elements, a third factor is added that explains 7% of the variance. For us, it was particularly interesting to know how the training needs that the faculty members have in each of the evaluated technological resources are situated in the rotated space (by Varimax method). Therefore, we drew a graphical representation of the spatial situation of each of the resources in relation to the two components that better explain the variance (see graphic). At the center of the graphic, we observe two well-differentiated groups of resources.

The first group is constituted by those components that are on the left side of the second quadrant. Those make a lower contribution to the first element and an unequal contribution to the second one. The first group is formed by programs for digital video editing, graphic design software, spreadsheets, databases, programs to create web pages, mailing lists, blogs, virtual teaching, and the platforms Moodle and E-kasi.

The second group is placed on the right side of the second quadrant and makes a great contribution to the first element and very little to the second one. Within this group, we found the following resources: presentation programs such as PowerPoint, word processing software, e-mail, Internet browsing, computers, USB flash drives, projectors, and DVD reproduction programs.

If we take into account this first division and we transfer it to a graphical representation of the distribution of training needs, we find out that each of the groups has specific characteristics. For instance, in the first group, there are those resources that require relatively high training needs, while the resources that present low training needs are found in the second group (see Table 1).

If we do a more a detailed analysis of the variables in the rotated space in the graphic, we can establish subgroups within each group in relation to their closeness to the variables. In addition, those subgroups have a theoretical base.

For example, within the technological resources group that has a high training need, mailing lists, blogs, virtual teaching, and Moodle and E-kasi are in close proximity in the rotated space. All those resources are relatively new Internet applications, which, on a theoretical level, are part of the so-called Web 2.0.
The second subgroup of resources with high training needs is less compact in the graphical representation, and it is formed by advanced programs in data, text, and still and motion images, such as digital video editing, graphic design, spreadsheets, databases, and web page design (see Figs. 1 and 2).

Within the group of resources that have a low training need (i.e., those on the right side of the quadrant) in the distribution table, we can do a further division regarding the position that those resources occupy in the graphical representation of the rotated space.

We can observe a very compact group formed by those Internet and office automation applications that are basic: PowerPoint, word processors, e-mail, internet browsing, as well as the computer. We do not believe that it is a coincidence that the computer is found in this category.

Within a second subgroup, we include all those resources that are close to the previous group. Two of them are related to hardware elements (USB memory sticks and the projector), while a third one is related to DVD reproduction programs.

### 3.2. Research training needs

The distribution of the results obtained in the scale that references the resources classified in the research field has a series of specific characteristics.

The training needs of those resources are widely dispersed among all the given options (nothing, something, enough, much). In our opinion, it implies a more diversified training need than in the teaching resources field, where the dispersion of the answers is lower.

The similar valuation of the training needs of all technological resources categorized in this field makes the grouping of such needs difficult. However, in relation to project management programs (e.g., Microsoft Project) and data analysis programs (quantitative programs such as SPSS or qualitative programs such as Nudist), we found a greater training need for programs in which the statistical mode is 4.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Training needs in relation to technological teaching resources: representation of percentages.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nothing (%)</td>
</tr>
<tr>
<td>Projector</td>
<td>57.4</td>
</tr>
<tr>
<td>Computer</td>
<td>44.4</td>
</tr>
<tr>
<td>USB flash drive</td>
<td>73.5</td>
</tr>
<tr>
<td>DVD reproduction software</td>
<td>34.5</td>
</tr>
<tr>
<td>Moodle</td>
<td>7.3</td>
</tr>
<tr>
<td>E-kasi</td>
<td>21.2</td>
</tr>
<tr>
<td>Distribution list</td>
<td>24.5</td>
</tr>
<tr>
<td>Blogs</td>
<td>18.9</td>
</tr>
<tr>
<td>Virtual teaching</td>
<td>10.6</td>
</tr>
<tr>
<td>Surfing the net</td>
<td>49.0</td>
</tr>
<tr>
<td>E-mail</td>
<td>56.9</td>
</tr>
<tr>
<td>Word processing software</td>
<td>55.5</td>
</tr>
<tr>
<td>Presentation like PowerPoint</td>
<td>36.9</td>
</tr>
<tr>
<td>Database</td>
<td>20.5</td>
</tr>
<tr>
<td>Spreadsheet</td>
<td>22.7</td>
</tr>
<tr>
<td>Graphic design programs</td>
<td>20.9</td>
</tr>
<tr>
<td>Web design software</td>
<td>14.5</td>
</tr>
<tr>
<td>Video editing software</td>
<td>19.8</td>
</tr>
</tbody>
</table>

Fig. 1. Arrangement of the teaching training needs in the factorial analysis II.
With the goal of finding criteria to group those resources, we did a factorial analysis of the variables classified within the field of re-
search, and we obtained two factors that explain 56% and 9% of the variance of the results.

Similar to the previous section, we drew a graphical representation of the position of the variables in the rotated space (via Varimax
method). We found out that, close to the position of management project programs and programs that analyze data, there are also others
such as communication platforms, the use of video-conference systems, and the use of programs that create pdf documents.

At the other end of the graphic, we found those training needs that are related to the management of bibliographies. The distribution of
these training needs is also very similar to the following items: libraries’ computer resources, impact magazines’ databases, libraries’ access
websites, and bibliography management programs. In all of them, the statistical mode is the second option (something) followed very clos-
ely by the third option (enough).

Following what has been said in the previous section, we can identify two groups of training needs within the field of research. The first
group is related to bibliographical issues and the second one to computer application programs for research. Both groups present a similar
level of training needs.

4. Conclusions

In addition to the results already commented on in the previous sections, combined with the experience gained during the analytical
process followed to determine the faculty’s training needs, we have obtained a series of criteria that other higher education institutions can
utilize to design their own faculty training programs more efficiently.

4.1. To establish systems for the detection of training needs

We obtained a high level of participation in the study (47% of the population, the participation being voluntary), which indicates that
faculty have a great interest in providing information about their training needs. It is recommended that higher education institutions also
foster the creation of stable structures designed to learn the training needs that their faculty might have at different moments in relation to
ICTS.

4.2. To create a modular training offer

The results obtained in the factorial analysis suggest organizing the ICT training of university faculty in a modular way. Actually, according
to the grouping of the variables in the factorial analysis and its graphical representation in rotated space by the Varimax method, the
structure of those modules could be as follows:

Modules directed towards teaching tasks:

- Basic computer modules.
  - Hardware resources: computers, projectors, USB memory sticks.
  - Basic programs and the internet: word processing software, browsers, e-mail.
- Advanced computer and Internet modules.
  - Web 2.0 applications: blogs, mailing lists, wikis.
  - Management content systems: virtual platforms.
  - Advanced computer programs: software for the treatment of images, video, data, etc.
- Modules directed towards research tasks:
  - Modules on the management of bibliographical resources.
    - Web page management of documentation centers: catalogue and database searches.
    - Management of bibliography programs.
  - Modules on computer applications for research.
    - Searches for research scholarships.
    - Project management programs.
    - Analytical programs for quantitative and qualitative data.

The idea of organizing the teachers’ training in modules is already being carried out in some learning programs taking place in different countries. One of the main programs is the “Academy of ICT Essentials for Government Leaders – A Modular Training Program.” This program was created by the Asian and Pacific Training Centre for Information and Communication Technology (APCICT) of UNESCO Bangkok, and it summarizes the pedagogical and didactical advantages of modular training (Singh, 2008).

At the same time, the International Labour Organization in its 91st meeting pointed out the advantages of modular training. Competency-based modular training has recently received more international support. Compared with time-based training programs, competency-based approaches are seen as more efficient, relevant, and outcome-focused. (I.L.O., 2003).

In the case of universities assuming this kind of curriculum organization, future studies would have to verify if the creation of ICT certification programs at two levels (course and module) is better received by faculty members than the creation of independent courses that are not interconnected. Moreover, at the university level, there is a possibility of creating a third group of modules related to the managerial tasks that faculty members carry out through the use of ICTs. Even this possibility is not being introduced in the present work.

4.3. To adapt the training needs to the demand

The ICT training that universities offer to their faculty has to be adjusted to the needs that this group requires at each moment. According to the present study on the UPV/EHU’s faculty training needs and, specifically, after analyzing Tables 1 and 2, we can say:

- In response to a low need, we propose to limit the range of training directed towards mastering the applications in the basic computer module that are related to hardware resources and basic programs.
- In response to a high need, we propose to extend the training modules related to the content management systems for virtual teaching, Web 2.0 applications, and advanced programs.
- In response to an average need, we propose to maintain the intermediate training offered in the bibliography management programs and computer applications for research.

4.4. To intervene in the work environment

In studies carried out at the University of the Basque Country (Lareki, 2007) and other Spanish universities (Bautista, 2001; Cabero & et al., 2002), we observed that a great majority of the consulted faculty are self-taught in the use of new technologies. On many occasions, this autodidactic training has been completed with the collaboration of colleagues when there is a need to use a specific technology. In addition to the modular training that universities could offer, we understand that there is room for the implementation of other measures that should focus on the working environment of those faculty members. Those measures should encourage and acknowledge the faculty dedication to the field of ICTs. The creation of referential professors in the application of ICTs, who are recognized as dedicated leaders in this area or field, or the creation of scholarships that promote educational innovation with ICTs could help regulate self-teaching and self-training between equals (equal people).

References

Cabero, J. et al. (2002). Las TICs en la Universidad. Sevilla: MAD.

Table 2
Training needs in relation to technological research resources: representation of percentages.

<table>
<thead>
<tr>
<th>Resource</th>
<th>Nothing (%)</th>
<th>Something (%)</th>
<th>Enough (%)</th>
<th>Much (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online forms</td>
<td>25.6</td>
<td>40.3</td>
<td>17.8</td>
<td>16.4</td>
</tr>
<tr>
<td>Statistical packages</td>
<td>18.6</td>
<td>27.4</td>
<td>24.9</td>
<td>29.1</td>
</tr>
<tr>
<td>Libraries’ computer resources</td>
<td>18.5</td>
<td>42.6</td>
<td>27.4</td>
<td>11.5</td>
</tr>
<tr>
<td>Communication platforms</td>
<td>29.3</td>
<td>37.9</td>
<td>17.3</td>
<td>15.4</td>
</tr>
<tr>
<td>Video-conference systems</td>
<td>19.6</td>
<td>32.4</td>
<td>23.3</td>
<td>24.7</td>
</tr>
<tr>
<td>PDF file creation</td>
<td>27.7</td>
<td>30.7</td>
<td>20.4</td>
<td>21.2</td>
</tr>
<tr>
<td>Impact magazines’ databases</td>
<td>18.4</td>
<td>33.1</td>
<td>25.1</td>
<td>23.4</td>
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<tr>
<td>Libraries’ access website</td>
<td>22.9</td>
<td>39.4</td>
<td>24.5</td>
<td>13.1</td>
</tr>
<tr>
<td>Bibliography management programs</td>
<td>14.8</td>
<td>36.5</td>
<td>25.8</td>
<td>22.8</td>
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<tr>
<td>UPV/EHU’s digital left-luggage</td>
<td>32.3</td>
<td>30.1</td>
<td>16.5</td>
<td>21.2</td>
</tr>
<tr>
<td>Project management software</td>
<td>24.8</td>
<td>23.4</td>
<td>17.6</td>
<td>34.2</td>
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</tbody>
</table>
