

The e-learning in Higher Education Schools of Agriculture and Forestry: A Delphi Survey Method Approach

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Abstract – E-learning and its forms have been introduced for many years at all levels and types of education, with many theories about the proper approach regarding the method.

The aim of this paper is to reflect properly the necessary criteria and features of an integrated electronic course to be taught in faculties of Forestry and Agriculture.

To achieve this objective, Delphi survey method has been used, that has proved a popular tool to assist decision making, in the research of information systems for the identification and prioritization of issues. It is a team approach which is used to investigate and collect the experts' opinion on a specific topic, by creating communication processes between them, so that they eventually work as a whole, in order to deal with complex problems.

This survey method, within a group of 20 experts throughout the country, led to the recording of the necessary features and the criteria to be taken into account for the state of e-learning in Forestry and Agriculture faculties in the near future. The characteristics recorded by experts, were classified into three categories. (a) features and capabilities that an e-learning platform must have, (b) the characteristics of the structure of an electronic e-learning course, and (c) the type of electronic course content.

This was surveying the necessary features for a complete e-learning system, to be implemented in Agriculture and Forestry higher schools, enabling the maximum transmission capacity of knowledge and skills through it.

Keywords – Agriculture Higher Schools, Delphi Survey, e-Learning Characteristics, e-Learning Platforms, Forestry Higher.

I. INTRODUCTION

The need to expand the knowledge base is vital in today's times since so much new information is being generated in almost all the professions. With each new information a new possibility of improving the performance levels of a job seems feasible [1]. Universities are key actors in sustainable development by generating new knowledge as well as contributing to the development of appropriate competencies and raising sustainability awareness [2]. The quick and massive development of technology in the last twenty years has caused many changes in the education field [3]. The electronic services provided by the new Information and Communication Technologies (ICT's), have demonstrated as an important tool in efforts to disseminate the e-learning in modern education. The new technologies have entered our lives dynamically and online services are the lever for sustainable regional development [4]. E-learning has become one of the most important technologies of the modern era. E-learning is a learning process which aims to create an Interactive learning environment based on the

use of computers and the internet [5]. Web-based learning has many advantages and its usage has extended from time to time [6]. Social software has already led to the widespread adoption of portfolios for learners, bringing together learning from different contexts and sources of learning and providing an ongoing record of lifelong learning, capable of expression in different forms [7]. E-learning also creates learning communities difficult to assemble with traditional method [8].

The creation and maintenance of an electronic course however is not a simple matter [9]. It should be easy to use and scalable, but also must have feedback and specific structure and content depending on the object of the course and the cognitive level of learners.

The challenge of an integrated and impeccable structure of an e-course is an important issue, and every teacher should provide the necessary features of the lesson. It is easier though to reach more solid conclusions if the stage of prognosis is not done by one person but by a team.

The world has been changing in ways that are not always easy to predict, and we must prepare our students for these changes and needs. Thus, a new educational approach is required to educate students for the complex and challenging future. This implies radical changes in the ways of teaching, learning, managing and leading in education [10].

The traditional Forecast methods with questionnaire although adequately reflect this aspect of a population group on one or more questions, disadvantaged in the prediction of future developments due to multiple interdependencies between factors that influence-shaping these developments. To remove this disadvantage, the Delphi method was developed, and attempt to solve this problem by activating the intuition and experience [11].

The Delphi method has proved a popular tool in research of information systems to identify and prioritize issues to assist in decision making. It's a team approach used to investigate and collect the view and the opinion of experts, on a particular topic, creating communication procedures between them to eventually work as a whole in the face of complex problems.

The Delphi survey method invented by Herman Kahn and others, in order to combine experts' opinion on a specific topic. It is performed in a series of iterations, each of which is modified by the results of the previous. It generates a collective view of possible developments, although sometimes criticized because it emphasizes consensus and gives little weight to deviations [12]. Nevertheless, the Delphi method has proved popular tool to research information systems (IS) for the identification and prioritization of issues administrative decisions [13]–

[21]. It based on structural surveys and makes use of information from the experience and knowledge of participants who are mainly experts. Therefore, it delivers both quantitative and qualitative results and raises forecast for probing bizarre regulatory elements.

The objective of most Delphi applications is the reliable and creative exploration of ideas or the production of information relevant to decision making. The Delphi Method is based on a structured process for collecting and distilling knowledge from a team of experts, using a series of questionnaires interspersed with controlled opinion feedback [22]. Represents a useful tool for communication between members of a group of experts and, thereby, facilitate the formation of a group judgment [23].

The method has three characteristics that set it apart from conventional interaction of a group. These are: 1) Anonymity, 2) Repeat with controlled feedback and structuring information flow and 3) Statistical group response [24]. Because of the anonymity of each one and the same weight of all views in the Delphi method, it avoids the disadvantage of the panel method. On the other hand, the process is relatively time consuming [25].

In the case of this study, the Delphi survey method was used for issues of new technologies in education and e-learning, in order to exploit the possibility of convergence of the views of experts to evaluate platforms e-learning that will meet the needs for standard electronic design courses for Agricultural and Forestry lessons, identifying and describing the structure and content factors that should be taken into account [11], [26]–[28].

II. METHODOLOGY

The aim of this study is to record the views of experts selected from across the country on the subject of e-learning in Higher Schools of Agricultural and Forestry content. For this purpose, selected Delphi survey method, which approximates the matter by seeking an agreement between the experts group, maintaining their anonymity. The idea behind this is that while the experts will not agree on all issues, however, in every subject they agree that it probably will happen.

The sample size of experts evidently affects the error and vice versa the reliability of estimates has been shown experimentally. Upwardly size is limited itself by the fact that generally experts in specific specialized topics are few. Downwardly the minimum sample size may not be less than seven, because before and after this size has been a significant change in the size of the error [29], whereas the extreme views of a few will not affect the results of the group disproportionately [30].

The essential element of the Delphi process is the anonymity of the participants, when they express their opinion, therefore would not be affected by the others.

The time required to collect the data for the first and second phase of the survey, was from September to December 2015.

The scope of questions included in the method, defined in the context of the use of new technologies in education and media and tools should be used for an e-learning

course, but also (a) the features and capabilities that an e-learning platform must have, (b) the characteristics of the structure of an electronic course, and (c) the e-learning content, based on the views of the experts surveyed.

The questionnaires were drawn up and sent to the chosen experts, accompanied by a cover letter, providing clear explanations for completing the questionnaire and information on the purpose and significance of research, but also as a means of creating a positive attitude towards research and further urges of the completion of the questionnaire and ultimately contribute to greater return rate of completed questionnaires [31].

III. RESULTS

The questionnaires were compiled electronically using the electronic online Google Forms application, and together with a cover letter, the link sent via email to each expert. Special care was taken in order to prevent the experts from knowing who the other participants in the survey are, so anonymity was met.

Of the questionnaires sent, received answered 21, from four cities (Thessaloniki, Athens, Orestiada, Heraklion), five Universities (Aristotle University, Agricultural University, Democritus University of Thrace, University of Crete, University of Macedonia), eight different Higher Schools (Agriculture, Forestry, Natural Sciences Informatics, University-Surveying and Civil Engineering, Biotechnology, Philosophy, Fine Arts), researchers of State agencies and two special experts in telecommunications and networks. Eleven of the 21 experts agreed to participate in the second round of the Delphi study (percentage 52.38%).

By gathering and initial mapping of the views of experts, the first phase of the Delphi survey was completed. The responses were classified and analyzed in a manner that allowed the creation of the second phase Delphi survey questionnaire. The new questionnaire included questions from the first, but for each question displayed the percentage of the answers given by all experts and the ability to each one of them to change the selection or not, taking into account the view of the rest who took part in the survey. The new questionnaire was tested and reformed in the group with experts in the same way as the first time. Sending, answering and receiving of the second questionnaire, were made in the same way as the first phase, to the same experts, while continuing to maintain their anonymity.

As expected from the phase of the literature review, the three most proposed eLearning platforms are Moodle, Blackboard and the OPEN e-Class (40.91%, 27.27% and 22.73%, respectively percentages), with 85.71% of experts, as one of the three choices they were able to have, choose Moodle, the Blackboard 57.14% and OPEN e-Class 47.62%, followed by A-Tutor with 4.55% and Dorkeos and Docebo with 2.27% each.

Questions that were relevant to the features of the e-learning platform, separated into those that experts were asked about the gravity that has each characteristic of an e-learning platform, and Table 1 was created (the weight of

each of them is the average of gravity prices set by experts), and those relating to whether these features are practical and functional in each one of the three e-learning platforms that have the highest rates (Moodle, Black Board and Open e-class), and asked experts to grade every parameter for each e-learning platform. The results are shown in Table 2.

The data in Tables 1 and 2 were fed to multicriteria analysis application, ELECTRE III. The result of the final classification of the e-learning platforms was: first Moodle, second Open e-class and third Blackboard.

Table 1. The main characteristics and their importance in an e-learning platform

Characteristic	grade
Open source platform	4,17
Notes	4,42
Learning material	4,75
Attending lectures	4,37
Bibliography - sources	4,45
Papers	4,47
Comments - Suggestions	4,10
Table of Contents	4,40
Announcements	4,60
Forum	4,25
Chat	3,50
e-mail / messages	4,47
Conference	3,68
Polls	2,89
Blog	2,84
Calendar	3,89
Easy to install	4,37
Personnalization	3,94
User management	4,72
Multimedia	4,63
Exercises	4,58
Tests with immediate evaluation	4,50
Feedback	4,42
Help – Support	4,65
User collaboration in teams	4,21
File Exchange	4,47
Virtual classroom	3,75
Virtual field trip	3,05
Blended learning	4,21
Statistics	4,11
Online user ID - profile	4,56
Scalability	4,44
Compliance. with standards (scorm)	3,67
Metadata	4,06
Import Export Data	4,56
User friendly	4,80
Security	4,65
Courses management	4,74
Course objects organization	4,47
Hierarchical structuring courses	4,18

Regarding the characteristics and their grading from the experts, 100% of them believe that very important in an e-learning course are, the exercises, the data import and

export, the user friendliness and its scalability, Followed by 94.7% the security, the bibliography and sources provided, and the learning material. With 94.44% the notes, with 94.1% the user management and the examination by direct assessment, 89 5% of the online help and 88.9% with the feedback of the course. On the other side, experts felt there were not at all important characteristics such as chat with 52.6%, personal blogs with 77.8% and polls with 88.2%.

Table 2. Rate per criteria parameter for each e-learning platform

Characteristic	Moodle	Black board	Open e-class
Notes	4,63	4,17	4,60
Learning material	4,25	4,00	3,80
Attending lectures	3,50	3,67	4,00
Help – Support	3,50	3,83	3,60
Bibliography - sources	4,13	3,83	4,20
Papers	4,63	4,17	4,60
Comments - Suggestions	3,63	3,50	4,00
File Exchange	3,88	3,67	4,00
Table of Contents	4,50	4,00	4,40
Announcements	4,25	3,83	3,40
Forum	3,88	4,17	3,60
Chat	2,75	3,33	3,00
e-mail / messages	4,25	4,33	4,40
Conference	3,13	3,33	3,40
Polls	3,75	3,33	4,00
Blog	3,50	3,33	3,40
Calendar	3,63	3,67	4,00
Easy to install	3,75	3,50	3,40
User management	3,88	3,67	3,40
Courses management	3,75	3,50	3,40
Virtual classroom	3,88	3,50	4,00
Virtual field trip	3,43	3,00	2,80
Multimedia	3,75	3,33	3,40
User friendly	3,75	3,17	3,40
Personnalization	3,88	3,33	4,00
Exercises	4,13	3,83	4,20
Tests (immediate evaluation)	3,88	3,50	3,40
Feedback	4,00	3,50	3,40
Open source platform	4,00	3,17	4,00
Security	4,25	4,17	4,20
User collaboration in teams	4,00	3,33	3,40
Blended learning	4,00	3,83	4,00
Hierarchical structuring	3,88	3,33	3,40
Metadata	4,00	3,80	2,75
Course objects organization	4,13	3,67	4,00
Statistics	3,88	3,83	4,20
Online user ID - profile	4,00	3,83	3,00
Scalability	4,25	3,17	3,50
Compliance. with standards	4,00	3,60	4,25
Import Export Data	4,13	3,50	4,00

Similar results had the choices of students as indicated by similar references [32], where regarding the most significant information, between 15 options, that should be included in an e-learning platform, 86% chose course notes, papers (75%), followed by e-mail contact (72.8%), frequently asked questions (63.6%) and online help (60.50%).

The survey results concerning the structure and content of the e-learning course are presented below.

The most essential features for the transmission of knowledge and skills which should be included in an online course with Agricultural and Forestry content are Communication between teacher-student with 21.74%, the course Lectures with 20.65%, the Bibliography, sources and useful links also with 20.65%, the Frequently Answered questions (FAQ) with 14.13%, while the Illustrative Video, and videotaped virtual tours with 11.96%.

When asked about the frequency of online contact, the 72.73% (55% in the first phase) they stated that once a week is necessary for resolving questions, while the need to meet in physical presence the 90.31% of experts, suggest that once a month is the ideal frequency (of 66.67% of the first phase).

In the event of the year in which you need to enter the teaching of e-learning course in studies of Agricultural and Forestry Schools, the 63.64% think that should be the first year (50% in the first phase) and the second and third year following by smaller percentages

The knowledge that teacher should have for the structuring and creation of an e-learning course, is MS Office with 43.90%, with 85.71% of the specialists to choose as one of the options, the use of multimedia applications with 29.27%, from 7.32% that needs to know programming languages and handling databases followed by other options in smaller percentages (Online tools, Mobile Device Interfaces, Basics Video Editing) and there was a response that no knowledge is needed. The main problem for e-teaching of Agricultural and Forestry courses, is the lack of contact with the field at a rate of 30.77% (with 57.14% of specialists will consider it as the most important)) and always in the expert opinion, followed by lack of infrastructure with 25.64%, weak transmission skills with 23.08%, and the lack of expertise with 20%.

The speed with which it has invaded the new technology and the use of mobile phones and smartphones and palm PCs (tablets) in the daily life of modern society comes to support it the view of experts with the 77.78% (60% in first phase) to believe that it is necessary to convert the e-learning application for use on mobile and tablets (mobile app) that will have all the features of e-course, with 9.52% to only propose it, if asked by students.

The major problems for remote e-learning evaluation considered the identification of the examined students with 45.83%, and the absolute inability of copying control during the exam with 41.67%. The virtual tour as a means of e-learning is considered by specialists (55%) essential characteristic of a remote e-course, while 35% thought it should be included only if requested by students. The issue

of e-learning evaluation, problems that have not been overcome to fully electronic evaluation form, reflected in the selection of experts to question the assessment in an online course. Based on the selections made on this issue in the first phase, additional added possible combination of options that existed in the first place.

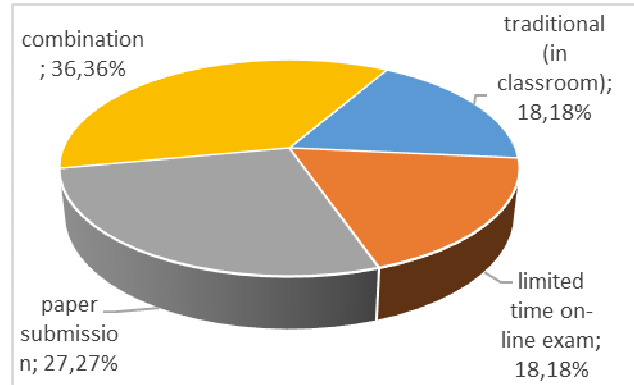


Fig. 1. Evaluation procedure learners in e-learning

The evaluation process of learners within an e-learning course, according to the first stage of the survey should be done by submitting papers (32.26%), as in the traditional way in a room with invigilators (32.26%) while with online time-limited tests prescribed in 29.03% as opposed to the second phase of the survey by a combination of options chosen by 36.36%, and there were experts who individually chose other options (18.18% with a physical presence in a classroom, 18.18% with on-line time-limited tests, 27.27% with paper submission). Note that the selection exam online with unlimited time not selected by any expert (fig.2).

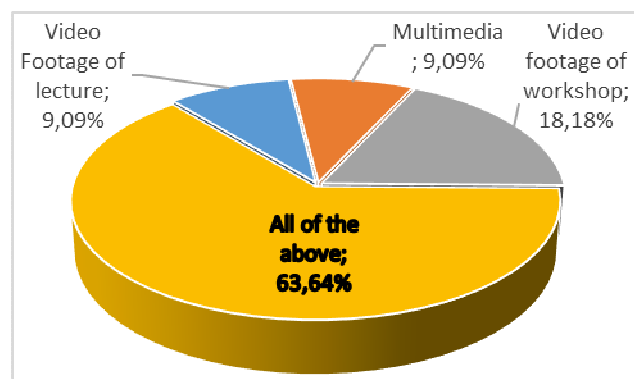


Fig. 2. Techniques to overcome the problem of transfer skills

The peculiarity of Agriculture and Forestry courses has to do with the contact that these disciplines have with the field, and the need of skills transfer. Data that is obvious when you consider the substance of these sciences, but are also the options of experts, who said from the first phase that the biggest problems and difficulties in the integration of e-learning in Agriculture and Forestry Schools is the lack of contact with the field (52.38%) and the inability to transfer skills (42.86%). Techniques that could help to overcome the problem of transfer skills, the 63.64% proposed, beyond the personal contact in the context of

blended learning, the existence of footage of the workshops that have taken place or other similar activities for the consolidation of skills (fig.2). Regarding the lack of contact with the field, 80% thought that this experience cannot be replaced, but it is not wrong to have a virtual field trip. (The percentage reaches 90% if counted the additional 10% which believe that there should be taped material from the course itself).

Regarding Massive Online Open Courses (MOOCs) the 42.86% believe that there will not be at the center of the development of higher education in our country, as opposed to 37.50% who held the opposite view, while 19.05% it considers that there are elements which should be considered together. Naturally the 56.25% of experts felt that the SCORM standard is necessary in an e-learning platform.

For the assessment of whether the use of e-learning should be part of the curricula of Agricultural and Forestry Schools, 95% have a positive view (Strongly Agree-Agree), while 5% have a negative position (Disagree), while strong negative position (Strongly disagree) received no response.

Regarding the necessity of the use of online e-classroom in Agriculture and Forestry Schools, positive aspect has the 85.71% and 14.29% expressed negative position.

Finally, when experts asked about the live broadcast applications of the lecture, but also the recording and the video presentation of it, the 37.50% choose BigBlueButton the 31,25% choose vidyo, and 25% e-delos.

In the last question of the questionnaire, the experts were given the opportunity to make comments and suggestions with open-ended question. The comments and proposals made by experts, concerning the assumption of the complexity of this investigation.

IV. CONCLUSION

E-learning is not simply text and publishing material on the Internet, or posting scores and announcements. It is a series of interactions between instructor-learner-learning material, in order to transfer knowledge and skills via the Internet.

The Delphi survey method comprises two main parts. The first concerns the calibration and grading of the characteristics of an e-learning platform. On the basis of these characteristics, by using a multicriteria analysis application, ELECTRE III, was selected the best and most comprehensive e-learning platform. The completion of the classification process of e-learning platforms, showed that the most suitable is the Moodle, which was used for the implementation and development of e-course.

The knowledge of the teacher for the structuring and implementation of an electronic course, does not need to be specialized. A basic knowledge of computer handling and MSOffice is sufficient.

The proportion of experts who believe that the use of e-learning should be an essential part of the curriculum and even from the first year was Overwhelming, with a frequency of meeting between students with the teacher

once a month with a physical presence and once a week for online contact.

Regarding the importance of the electronic course features, all of the experts (100%) have chosen the ability of import-export data from the online course, expandability, friendliness use and existence of exercises, followed by a large percentage for the data security, the learning material, the supply of notes, the user management and the possibility of self-evaluation with feedback and online help (direct or indirect) and that additional features necessary for the transmission of knowledge and skills are communication between teacher-student, the lectures and the bibliography-sources of the course.

Blended learning offers potential for genuine transformation within the academic community and the majority of faculty are satisfied [33].

This that need be taken for granted in Blended learning as a combination of traditional and e-learning, is the increase of teacher commitment and of their time to be invested for the creation, the maintenance and renewal of the whole enterprise, at least in the first two or three semesters until it reach the level he desires. Additionally required knowledge of new information technologies and the corresponding electronic tools by the teacher [34].

The evaluation of the trainees for their grading is a composite way, taking into account the participation in the learning process, the participation in the activities, the preparation and timely filing work and the final exam.

Finally, because the online education systems are "soft targets" because education systems tend to lack in both technology and trained personnel [35], that's why it should be integrated effort of the electronic course protection as well as the personal data of those who take part.

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