ECoLab: A cooperative system to improve training processes

Ángel Fidalgo-Blanco[1], María Luisa Sein-Echaluce[2], Francisco J. García-Peñalvo[3]

[1]Technical University of Madrid, Madrid, Spain
angel.fidalgo@upm.es
[2]GIDTIC Research Group, University of Zaragoza, Zaragoza, Spain
mlsein@unizar.es
[3]GRIAL Research Group. University of Salamanca, Salamanca, Spain
fgarcia@usal.es

Abstract. The goal of the qualitative research is to achieve information regarding the attitudes and opinions of a group of individuals with similar habits, needs and interests. The selection of the participants is a key element in the qualitative research. This paper presents a new model, ECoLab (Experiencial Cooperative Laboratory), of qualitative research that integrates the following methods: Focus Group, Delphi, After Action Review, LivingLab and MediaLab. This new model is designed to improve educational processes and works with the information from the tacit knowledge of the persons, specifically with their experience. For this reason, any person who participates must have participated (or be participating) in the process on which it is desired to investigate and improve. Thus, the group of people participating in ECoLab should be heterogeneous in terms of their role, experience and commitment to the subject matter of the study. ECoLab consists of different groups of people working cooperatively. The criterion of configuration of each group is based on the homogeneity of the role that they play or have played in the action to investigate. Therefore, the heterogeneity of the participants is integrated with the homogeneity in their grouping. This paper presents the ECoLab model (with two variants, iterative ECoLab and ECoLab lego) and a case study where the most urgent improvements of the Spanish University Education System are investigated in a qualitative way.

Keywords: Qualitative research; Cooperative learning; Experiential learning; ECoLab

1   Introduction

The goal of the quality research is to achieve information regarding the attitudes and opinions of a group of individuals with similar habits, needs and interests [1]. The most commonly used methods are Focus Group and Delphi. In both cases, we work with a small group of people. The Focus Group method seeks a set of homogeneous and representative users about the product or aspect to investigate [2], while the Delphi method assembles previously identified experts, since the random selection of participants is not valid in this case [3]. The selection of the participants is a key element in the qualitative research, thus the criteria they should meet must be specified and they will be different according to the topic to be investigated.

Also, there exist other more recent qualitative research methods that maintain a common selection criterion of participants, regardless of the subject of the investigation. The After Action Review (AAR) method, from US Army, is devoted to investigate how to improve military actions. This method imposes a common condition on the components of the group, having participated in the action. In this way information is obtained from the tacit knowledge of the people about the subject to investigate. The AAR method is usually located in the discipline of knowledge management and is widely used in the industrial sector.

The LivingLab is other method that joins the qualitative research with the development of a project [4-5]. It integrates the lab idea, as an innovative and creative space with resources enough to develop a project and it is open for people to participate independently of the knowledge they have about the topic of the project to develop. In this case, even citizens with no knowledge of the project could participate, but who may be affected by it. The most commonly used method is the spaces called MediaLab used by municipal administrations as an element for citizens to participate in municipal projects.

In this paper, we present a new original model of qualitative research that integrates traditional methods such as the FocusGroup or Delphi, methods based on knowledge management (such as AAR method) and the LivingLab model. The result is a new structure of group organization, which allows to refine the degree of abstraction of the research as well as its application, both in general and specific contexts.

The rest of the paper is organized as follows: Section 2 is devoted to present the ECoLab model with a double perspective, the methodological one and the process one. Section 3 describes a case study to understand better the application of the proposed model. Finally, Section 4 concludes the paper.

2   ECoLab Model

The proposed qualitative research model is called ECoLab (Experiential Cooperative Laboratory) and has been designed to improve educational processes. ECoLab works with the information from the tacit knowledge of the persons, specifically with their experience, based on the criteria of the AAR method, where the only condition is to

have participated in the action, and therefore having experience in it. For this reason, any person who participates must have participated (or be participating) in the process in which it is desired to investigate and improve. The selection criterion is common and no matter the degree of experience (beginners can participate along with experts). Thus, the group of people participating in ECoLab should be heterogeneous in terms of their role, experience and commitment to the subject matter of the study.

Also, ECoLab is organized in a physical space where the different groups are located. There exist a series of multimedia devices for each group and for the people who direct the activity. In this sense, it is based on the structure of the Medialab, where a suitable context is created to produce knowledge. All the media are interconnected. In the research process, the work done by each group in a private way is alternated with common debates among all the groups and the people who direct the activity.

The description of the model is made on the basis of two visions: the *methodological model* and the *continuous refinement model.*

2.1 Methodological model

One of the most important differences with respect to other qualitative research methods is that ECoLab consists of different groups of people working cooperatively. The configuration criterion for each group is based on the homogeneity of role that they are playing or have played in the action to investigate. Therefore, ECoLab integrates the heterogeneity of the participants with the homogeneity in their grouping.

Figure 1 shows a distribution of participants, which as a whole is heterogeneous, but the clusters per work table correspond to homogeneous profiles, similar of a Focus Group organization.
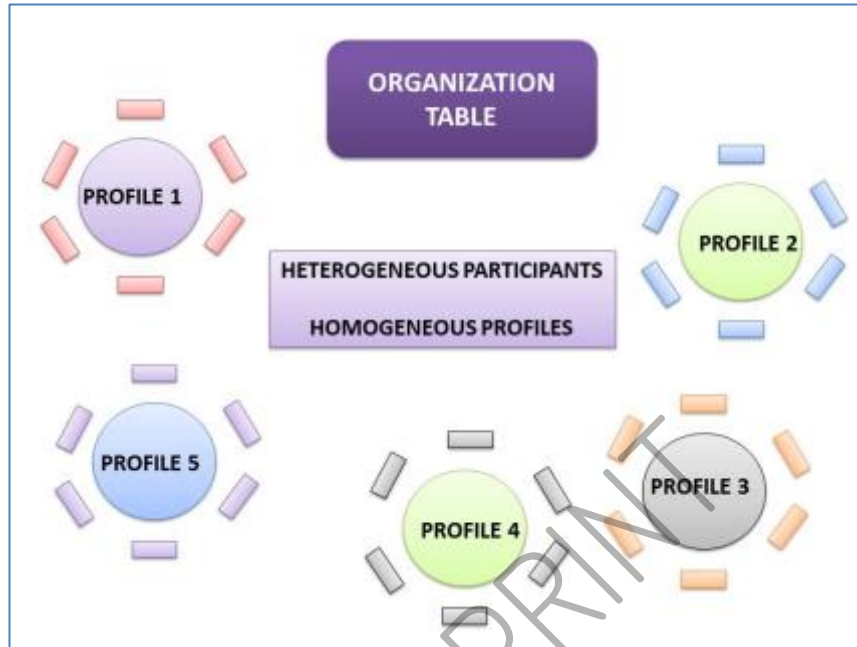
Fig. 1. Distribution of participants in an ECoLab session

The ECoLab process is based on the formulation of a set of common questions to all participants. Each table debates to obtain an agreed response by the components of the table. After a time, each table presents its conclusions, which are commented by all the session participants in an open debate. Parallel to the exhibition and discussion, people assigned to the coordination identify convergences and divergences with respect to each contribution.

Now, we are going to describe the mission and structure of each of the main components: the organizational table and the homogeneous profile tables.

The organizational table has the mission of managing the ECoLab knowledge creation process, those expressed in Figure 2 (points 1 to 4). There must be two people at least, due to the tasks corresponding to item 3 is done parallel to point 4.

1. Formulating the common questions, including the decision about the available time to debate and reach the consensual conclusions in the tables.
2. Moderating the presentation of conclusions of each table and the debate associated with each topic.
3. Identifying convergences and divergences for each answer to the different questions.
4. Producing a map of knowledge that reflects the main points of what happened or using a repository to classify the knowledge generated by participants and provide a personalized search [6].

The homogeneous profile tables should be composed by a limited number of people, between 4 and 6. All people participate in the internal debate and agree together the information to be displayed in the room (Figure 2-a). But in addition to the participant role, there must be three more roles: moderator, secretary and spokesperson. The same person can assume several roles. The moderator's mission is to agree on a common vision in the time available for discussion; the secretary must write the common vision into a minutes document (Figure 2-b); and the spokesperson is the person who exposes the conclusions (Figure 2-c) and participates in the debate in response to any clarification requested by any member of the rest of the profile tables or the organization table itself.
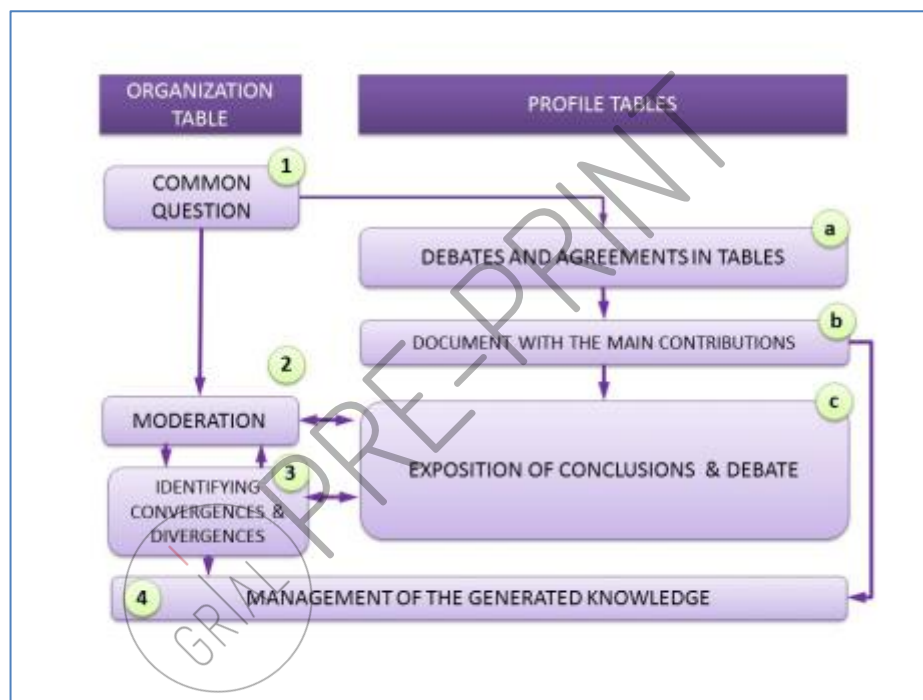

Fig. 2. Cooperative tables model

2.2   Continuous refinement model

ECoLab is designed to work with both generic aspects, for example, how to improve Education; and with very specific concepts, for example, how to increase students' participation in a specific subject.

The affinity degree among the participants who share the same profile is the key element for a successful instance of the model; for example, if the objective is to study how to improve Education, in the faculty profile table, it will be enough the participants belong to this professional body, regardless of their academic level or the

subject matter. However, if the objective is oriented to a specific subject, the involved teaching staff should be related to that subject.

ECoLab is a context of creative force; this means, we can obtain conclusions that may be not-foreseen, divergent and even imply new actions. In this sense, ECoLab is designed to integrate with other ECoLab sessions. There are two types of integration:

- *ECoLab in spiral*. From the results of an ECoLab session, new sessions may be organized to continue working on the same topic. In the new session, questions may be refined. For example, if one of the topics in which there is convergence to improve Education is about student motivation, another ECoLab could be done to work deeper in that issue, taking into account that profiles of the different tables could significantly change. In this case, each ECoLab spiral obtains more precision and concreteness in the results [7-8].
- *ECoLab Lego*. Different ECoLab sessions can be considered to address different issues, but they might be related to each other. In this case, the results of the different ECoLab sessions should be integrated, obtaining a much broader view of the subject to be studied, as well as different relationships. In this case, an ECoLab process starts from the most specific towards the most abstract.

3 Case of study

ECoLab has been defined in the scope of the ideas lab of the International Conference on Learning, Innovation and Competitiveness [9-10]. This laboratory tries to innovate in the improvement and innovation processes in the learning scope and to apply them in the biennial call of the International Conference.

The objective of ECoLab session we are going to use as case study is to obtain an overview of the impact that an educational innovation [11] should have on the university context and the most immediate actions to improve education. In order to achieve this, we wanted to give social value to the action by reconciling interests and committed people to improve Education.

The experience was made at the Technical University of Madrid during the month of June 2016 and for the session, all the tables (profiles and the organization ones) used a computer with wi-fi connection.

3.1 Description

As shown in Figure 3, four tables were created with the following profiles:

- *University student*. The composition had different student profiles (masters, first courses, belonging to associations, etc.).
- *University Teachers*. The common thread is that all the participants had experience in educational innovation.
- *Retired University Faculty*. Belonging to retired associations of the Technical University of Madrid (2 people) and people who were pioneers in educational innovation in Spain.

- *Academic managers*. With political and managerial responsibilities in the government of universities.

Fig. 3. Tables with different profiles

Figure 4 shows the different roles of the coordination table. One member of the organization moderates the interventions of each table ("general moderator") during the sharing and another member realizes, in real time, a common vision of what happens in the room.

Fig. 4. Coordination table

A total of four questions were given to the profile tables' members, which were delivered a few days in advance:

- Q1- In what aspects of teaching should the educational innovation impact?
- Q2- What changes should be most urgently made to improve learning?
- Q3- What barriers and drivers have the application of educational innovation?
- Q4- Do you know any examples of educational innovation that improve the learning process? Identify some indicators that define this good practice.

The mission of the organizing table, in terms of the sharing, was to elaborate:

- Common aspects.
- Differences.
- Contradictions.
- Reconciliation of interests.

The duration of the session was 4 hours, one hour per question (40 minutes for the internal debate and 20 minutes for the presentation of the conclusions).

3.2 Case of study results

Each table provided a report with the name and profile of its members, and the main conclusions associated with each of the questions. This information was made public to all the participants of the different tables.

Also, a concept map was generated where the contributions of the different tables were organized. There was a coincidence in the type of contribution in each table. Thus, all the tables gave information about *general aspects of education* and about *specific aspects of the students*. For this reason, all interventions were classified under these two categories

Figure 5 shows the concept map for question Q1, obtained from the contributions of the faculty table.
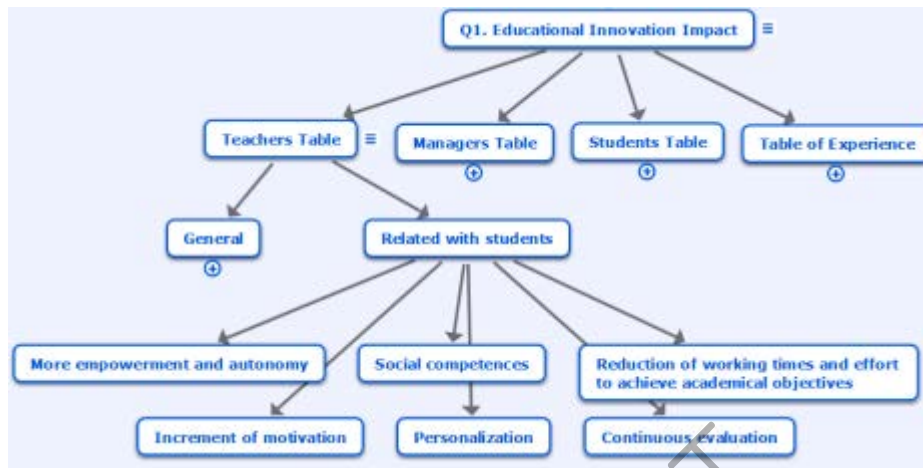
Fig. 5. Faculty table Q1 answers. Conceptual map after an ECoLab

The **common aspects** are obtained from the analysis of the nodes. For example, one of the aspects, with greater convergence among the tables, was the *motivation of the students*. Despite this convergence, each table made contributions that are complementary, for this same indicator "motivation" each table approached the following way:

- *Table of the experience*: Types of motivation and reasons why students are not motivated.
- *Students table*: Direct relationship between the lack of motivation and the active participation of the students.
- *Faculty table*: The need to increase motivation is related to students' willingness to learn.
- *Table of academic managers*: Motivation should be focused on how students can acquire various competences such as self-learning and decision making.

As it can be observed, although there is a coincidence in one of the aspects where educational innovation should impact, each table brings a joint vision. In this case, the students relate it to specific aspects of their learning; the table of experience based its opinion on the causes and methodological aspects; the faculty table thinks emotional issues are the main cause; and the table of academic managers relates the conclusions with the achievement of certain competencies. All the contributed aspects are complementary and with the them is possible elaborating concrete actions taking into account the different approaches.

Also, there are **different aspects** for each table and, as a result of the same question Q1, each table had different perspectives:

- *Table of the experience*: Identifying in what the students have improved and in which the teachers have been wrong with respect to their pedagogy.
- *Students table*: Encouraging the figure of the mentor.

- *Faculty table*: Orienting educational innovation to become an educational research.
- *Table of academic managers*: Working on teaching coordination between the different subjects.

4   Conclusions

EcoLab is specially designed to generate information where you can contrast different visions of different types of involved users in an improvement process. Over this information, points of convergence and divergence are determined, a knowledge map is obtained and, mainly, decisions are made to improve the process (to be concretized in a set of actions).

- ECoLab is a methodology that integrates consolidated methods in qualitative research along with more innovative methods such as knowledge management and open laboratories to citizens.
- It allows grading the accuracy of the information according to the characteristics of the analysed problem. It permits iterations and associations with other EcoLab sessions, to give this way a greater scope to the solution.
- It is able to integrate different visions. This increases the scope of the solution, also it allows establishing relational networks among the different concepts.

One of the main conclusions is that this method generates a great amount of information for each question; that information is both convergent and divergent. Therefore, a process of management and organization of the same is required due to it is difficult to deal with large volumes of organizational data.

The people who make up the tables are highly motivated to present their points of view, even though these are done internally at each table, they have to bring their personal vision during the debate too. This causes the debates lengthen considerably and the information provided in a personal way does not coincide with the consensus opinion of the bureau. To manage this circumstance, moderators with experience are needed in order to respect the stablished timing.

It has been observed that an hour for each question is a short time to leave, since the expositions and debate require more than 20 minutes.

The obtained information is very valuable, it allows the decision-making to propose concrete actions and also this information includes different visions, often complementary.

As future work, ECoLab will be exported to other fields different than Education, because of the model can be adapted to any area of knowledge. Also, it will be important to improve issues related to the organizational table, such as new tasks (for example, agreeing on a pooling of the three most convergent and divergent aspects).

The experience will be applied in the International Congress CINAIC, establishing this way a new form of interaction between the participants of the conference and generating information with different visions for all attendees. We will work with a virtual model of ECoLab, using social networks where the conditions of participation and organization can be changed.

References

1. Barrios, E; Costell, E.: Review: Use of methods of research into consumers opinions and attitudes in food research. food Science and Technology International 10(6):359-371 (2004)
2. Langford, J.; McDonagh, D.: Focus Group: Supporting Effective product Development. CRC press. Estados Unidos (2003)
3. Ludwig, B.: Predicting the future: Have you considered using the Delphi methodology? Journal of Extension, 35(5), 1- 4 (1997)
4. Yañez-Figueroa, J.A., Ramírez-Montoya, M.S., García-Peñalvo, F.J.: Systematic mapping of the literature: social innovation laboratories for the collaborative construction of knowledge from the perspective of open innovation. In: García-Peñalvo, F.J. (ed.) Proceedings of the Fourth International Conference on Technological Ecosystems for Enhancing Multiculturality (TEEM'16) (Salamanca, Spain, November 2-4, 2016), pp. 795-803. ACM, New York, NY, USA (2016)
5. Yañez-Figueroa, J.A., Ramírez-Montoya, M.S., García-Peñalvo, F.J.: Open innovation laboratories for social modeling sustainable society sensitive to social needs. In: García-Peñalvo, F.J. (ed.) Proceedings of the Fourth International Conference on Technological Ecosystems for Enhancing Multiculturality (TEEM'16) (Salamanca, Spain, November 2-4, 2016), pp. 1133-1138. ACM, New York, NY, USA (2016)
6. Sein-Echaluce, M.L., Fidalgo-Blanco, A., García-Peñalvo, F.J. Students' Knowledge Sharing to Improve Learning in Academic Engineering Courses. International Journal of Engineering Education 32(2B):1024-1035 (2016)
7. Fidalgo-Blanco, Á., Sein-Echaluce, M.L., García-Peñalvo, F.J.: Knowledge Spirals in Higher Education Teaching Innovation. International Journal of Knowledge Management 10, 16-37 (2014)
8. Fidalgo-Blanco, Á., Sein-Echaluce, M.L., García-Peñalvo, F.J.: Epistemological and ontological spirals: From individual experience in educational innovation to the organisational knowledge in the university sector. Program: Electronic library and information systems 49, 266-288 (2015)
9. Fidalgo Blanco, Á., Sein-Echaluce Lacleta, M.L., García-Peñalvo, F.J.: La Sociedad del Aprendizaje. Actas del III Congreso Internacional sobre Aprendizaje, Innovación y Competitividad. CINAIC 2015 (14-16 de Octubre de 2015, Madrid, España). Fundación General de la Universidad Politécnica de Madrid, Madrid (2015)
10. CINAIC: Congreso Internacional de Aprendizaje, Innovación y Competitividad (2017) Retrieves on 02/20/2017 http://138.4.83.162/congreso/cinaic/sic/EnlaceExterno.asp?E=26~~1813
11. García-Peñalvo, F.J.: Mapa de tendencias en Innovación Educativa. Education in the Knowledge Society (EKS) 16, 6-23 (2015)