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Teaching Open Science. What do FNS-Cloud Food Researchers Want to Know?

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Abstract

Training can better meet user needs by involving the potential users early in the process. Here, development of open science training for food science students and professionals began with 11 guided interviews of 15 beneficiaries in a European project aiming to build a 'food cloud' of datasets and services (FNS-Cloud, H2020 No. 863059). Discussions covered what partners want to learn, how they prefer to learn, and who are their ideal trainers. Inductive coding of interview transcripts with NVivo 12 qualitative analysis software revealed an inclination for technical training with a focus on data. Face-to-face learning and on-demand elearning offered by younger scientists were preferred methods and trainers. Most interviewees also talked about 'food cloud'-specific fears and desires. These interviews are now the foundation of three well received elearning courses and two workshop series supporting the value of user input in early course development decisions.

Keywords: *Open science; course development; lifelong learning.*

1. Introduction

Open Science is a system change allowing for better science. It is based on transparent and collaborative ways of producing and sharing knowledge and data as early as possible in the research process, and for communicating and sharing results (European Commission, 2019).

The Food Nutrition Security Cloud project (*FNS-Cloud, H2020 No. 863059*) aims to develop an infrastructure, tools, and services to exploit food, nutrition, security data as a way to make food science less fragmented and more open. To give support to the users of FNS Cloud (the infrastructure not the project), a train-the-initiator program is ongoing and focuses on introducing open science principles and practices and the use of cloud catalogs, tools, and services available within the FNS-Cloud project.

The goal of FNS-Cloud training is to provide and improve the skills needed to successfully use and contribute to the FNS Cloud user communities. Training in specific skills and capabilities is widely recognized to help organizations achieve their goals and create competitive advantage by adding value to their key resources – i.e., employees (Nikandrou *et al*., 2009). The planning of a training program requires defining the goal and the extent of training, selecting the training methods and means, as well as the training place and equipment. A review of factors that influence the success of training highlights the importance of both individual and training design factors (Awais Bhatti & Kaur, 2010) and, notes that when learners perceive that the content of the training is similar to actual job tasks, they tend to react in a positive way. Thus, perceived content validity affects the learner's performance self-efficacy, develops a positive reaction in the learner, and affects transfer or learning motivation (Liebermann & Hoffmann, 2008). Furthermore, the use of a co-design process in which learners and trainers co-create training programs has been shown to enhance identification of learner needs and to create student-instructor bonds (Haraldseid *et al*., 2016). Taken together, these studies suggest that there is value in having trainee input to make an overall training program more effective and, by asking for input in the beginning, there are higher chances of tailoring the training to meet the needs of the trainees.

Training needs analysis is a well-recognized process employing methods including, among others, observations, workshops, questionnaire surveys, desk research, focus groups, and interviews (Gubta, 2007). When the training options are quite open, as in the beginning of a training program, and there are no previous experiences to draw on, interviews are likely to give a dataset with the width and breadth to conceive a program from scratch.

Here, to ensure the content validity of trainings for FNS Cloud user communities, and to reflect the training needs and preferences of FNS-Cloud project beneficiaries, a series of semi-guided interviews with expert representatives of the key food institutions in the FNS-Cloud project focused on what individuals wanted to learn, learning methods, and ideal trainers.

2. Methods

2.1. Interviews

Eleven semi-structured interviews were carried out during the period April-October 2020. Both interviewers (2 persons) and interviewed (15 persons) were food science professionals participating in the FNS-Cloud project. In most interviews, the two interviewers collaborated to pose questions, engage in discussion, take notes, and follow the semi-guided structure. All interviewees were invited to bring colleagues and four of them did. Interviews, which lasted 30 minutes, aimed to identify training needs and preferences related to open science and the use of datasets, tools and services: what beneficiaries want to learn, how they prefer to learn, and who are their ideal trainers.

2.2. Data processing and analysis

Notes, independently taken by the two interviewers during the interviews, were combined to produce almost word-to-word transcripts of the interviews and were stored in a word document. Inductive coding (Chandra & Sang, 2019) of the transcripts was done with the NVivo 12 Pro© software for qualitative analysis, following an iterative approach involving three researchers reviewing interview transcripts, codes, sub-codes, and coded phrases.

3. Results and Discussion

3.1. Respondents

Table 1 shows demographic characteristics of the interviewees.

Table 1. Interviewee Characteristics.

Demographic categories	Number of persons
Sex	
Female/Male	10/5
Age	
under 40/41+	3/12
Education	
PhD yes/no	12/3
Workplace	
Academic/Other	11/4

Respondents were mostly women. Age profile indicates that most of them are in advanced stages of their careers, and they have a high education level. The majority work in academic positions (universities, research institutes) whereas a few work in companies or as advisors. This is a relatively small sample size, but it contains detailed data and does represent FNS-Cloud beneficiaries and is therefore useful in designing a targeted training program.

3.2. Respondent Training Desires

Overall, 330 minutes of interviews were conducted, 5 256 words were transcribed, and 180 phrases were initially coded into the three broad categories of the semi-structured interviews: What to Learn, How to Learn, and Who Should Teach. A fourth category of comments was identified during coding and named FNS Cloud Fears/Desires, and these comprised 18.3% of coded phrases. Here were comments such as, "The home page should be very simple" which did not refer to Training at all but rather to the nascent Community of Practice "myFNSCloud" and the catalogs of data, tools, and services found there. The relatively small number of comments in the FNS Cloud Fears/Desires category likely reflect, in part, the guidance of the interviewers towards discussions on training, but given the overall open quality of the interviews it may also indicate that training, e.g., to know how to use an online site, is more valued than the intrinsic properties of the site itself.

Within the 81.7 % of comments about Training, What to Learn was the most common category, 60.6 % of all respondent comments, followed by How to Learn at 34 %, and Trainers at 5.4 % (Fig. 1).

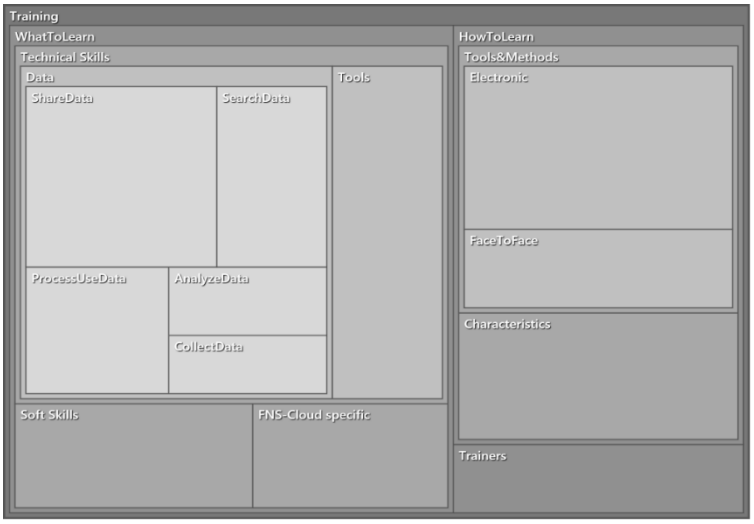

Figure 1. Hierarchical chart of coding references from guided interviews with 15 project beneficiaries.

Within What to Learn, interviewees discussed three categories of material: Technical skills, Soft Skills, and FNS Cloud-specific skills. Comments coded into FNS Cloud-specific skills differed from those in FNS Cloud Fears/Desires in that the former related to trainable skills or knowledge about using the FNS Cloud while the latter were about the technical aspects or design of the FNS Cloud, as shown in the examples below:

Table 2. Differentiating Skills and Fears/Desires.

FNS Cloud-specific skills	FNS Cloud fears/desires
"I need to learn what the content of the FNS Cloud is"	"Is FNS Cloud sustainable? How will FNS be continued in the long term?"
"This is how the FNS Cloud works, this is where things are"	"The home page should be very simple"

Technical skills were the most commonly mentioned in What To Learn, 6 and 7 times more than Soft Skills and FNS Cloud-specific skills, respectively. Within Technical Skills, interviewees talked most about Data, 74 % of comments, while 26 % were about learning Tools. Comments about Tools were most often general, such as "How could I take advantage of each of the tools that are available", or "Will the FNS Cloud be connected to other tools such as GitHub" and this likely reflects the early stage of development of the FNS Cloud infrastructure and the limited number of tools currently available.

Data comments were further sub-coded into desires for skills on how to Collect Data, Process Data, Analyze Data, Search (for other's) Data, and Share (your own) Data. Here, the most common comments were about training in how to Share Data, twice as common as the next most popular topic, Search Data. This supports studies showing that researchers acknowledge the benefits of open data, but data sharing practices are still limited (Wouters & Haak, 2017), and further suggests that a lack of training may be a contributing factor. Comments from FNS-Cloud researchers such as, "I need to know what data to share, how do I do it?" and "Sharing my data: my rights and responsibilities is a course I would take" further support that there is a desire for specific training in how to share data as well as the choices available to the researcher when data is shared.

The 34 % of comments coded into How To Learn were sub-coded into comments about Tools & Methods of learning (68 %) and comments about Characteristics of courses (32 %). In Tools & Methods, two primary themes emerged: comments about Electronic and about Face-To-Face approaches. Most comments, 68 %, were in favor of Electronic training as represented by the following, "An optimal solution would be webinars, recorded so people

could go back to them", but some were clearly the opposite, "Best way to learn is face-to-face workshops."

It is well accepted that people prefer different learning styles, and more recently shown that the preference for online activities is not the same in the older generation as in adolescents (Borun *et al.*, 2010). Nonetheless, our sample of interviewees, who were mostly aged 41 or over and therefore not considered digital natives, suggest that at least among highly educated academic scientists, online learning is appreciated.

Comments on Characteristics of courses often referred to a desire for ease, as exemplified by the following, "Needs to be short and snappy. Must be relevant." but also included several comments on the variability in knowledge of those coming to the trainings, "Group users into two main groups: skilled, that is ICT and data scientists, and unskilled users."

When discussing Trainers, respondents referred to age and qualifications and several expressed a desire for young trainers or trainers with lower qualifications such as "Early career post docs and maybe PhD students." Respondents also referred to skills, mentioning not only experts in the topic but also in related soft skills, "Someone who wants to, needs availability and energy, and needs to be an expert user of the cloud."

4. Conclusions

When designing a training program, a useful way to increase content validity can be to consult with potential users before the program design begins. Even a relatively simple and inexpensive consultation, as the 15 people interviewed here, can provide valuable and specific information relating to course content, design, and instruction. Based on the analysis of these interviews, training for use of the FNS-Cloud began with elearning on data basics ("Introduction to Open Science" and "General Data Protection Regulation (GDPR) in the Data Cycle") and is continuing with practical and hands-on face-to-face workshops ("How to Upload Your Scientific Work"). In an ongoing training program, perceived content validity should be regularly validated by, for example, collecting course evaluations. Only in this way can educators meet the real life demands of training specific skills.

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