

# Towards an Open and Scalable Learning Infrastructure for Food Safety Capacity Building

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## ABSTRACT

There is a wealth of institutions and projects that offer access to good educational resources related to food safety and food standards, ranging from training opportunities and courses to open educational resources, and from targeted/needed skills and competences to certification opportunities and courses. Still, these resources cannot be easily discovered, especially on a global scale. As in other areas of agricultural education, there is a need to pool together the variety of resources on food safety and standards in a baseline infrastructure that will enhance their findability and discoverability. This paper introduces an approach that can help address this challenge: taking advantage of current advances in e-learning technologies and standards in order to set up a learning infrastructure for food safety that will be open and scalable.

**Keywords:** Food safety, competences, metadata, Massively Open Online Courses (MOOC), open educational resources (OER)

## 1. INTRODUCTION

A variety of approaches have been developed to provide access to content addressing different aspects, stakeholders, and fields, such as global search engines for all domains and target groups. Examples include the GLOBE initiative that provides a generic search engine for educational content in a Google style (<http://www.globe-info.org>), courseware-oriented networks like OpenCourseWare (<http://www.ocwconsortium.org>), OER-focused aggregators such as OER Commons (<http://www.oercommons.org>) but also domain-specific networks such as Organic.Edunet for organic agriculture education (<http://www.organic-edunet.eu>).

However, a significant variety of content is still missing as it is inaccessible or unknown to the potential target groups. The main cause points to the lack of clear policies and little or no awareness on how to openly share learning opportunities and content as well as the establishment of thematic networks that will allow people to search and discover the right content for their information need. Although a high number of such learning portals have been deployed, there are not many that are particularly deployed for agricultural education (Tzikopoulos et al., 2005; Tzikopoulos et al., 2007). Technology components are now being put in place to facilitate the development of such portals, based on the principle of metadata aggregation from various, distributed sources (Manouselis et al., 2010).

The overall aim is to put in place a technology infrastructure that will collect and provide a rich content base for various agricultural education contexts and scenarios, through numerous interfaces and modalities. Efforts for the coordination of this work have taken place in the context of the Agricultural Learning Repository Task Force (AgLR-TF, <http://aglr.aua.gr>) and have led to the development of data pools such as the Green Learning Network of agINFRA (<http://aginfra.eu>). However, a significant variety of content is still missing as it is inaccessible or unknown to the potential target groups. The main cause points to the lack of clear policies and little or no awareness on how to openly share learning opportunities and content as well as the establishment of thematic networks that will allow people to search and discover the right content for their information need.

This challenge becomes more obvious in topics of extreme priority and importance on a global scale. The topic of food safety belongs to this category. Food safety focuses on the way food needs to be handled, prepared and stored in ways that will prevent foodborne illness. There is a wealth of institutions and projects that offer access to good educational resources related to food safety and food standards, ranging from training opportunities and courses to open educational resources, and from targeted/needed skills and competences to certification opportunities and courses. Still, these resources cannot be easily discovered, especially on a global scale. And as in other areas of agricultural education, there is a need to pool together the variety of resources on food safety and standards in a baseline infrastructure that will enhance their findability and discoverability.

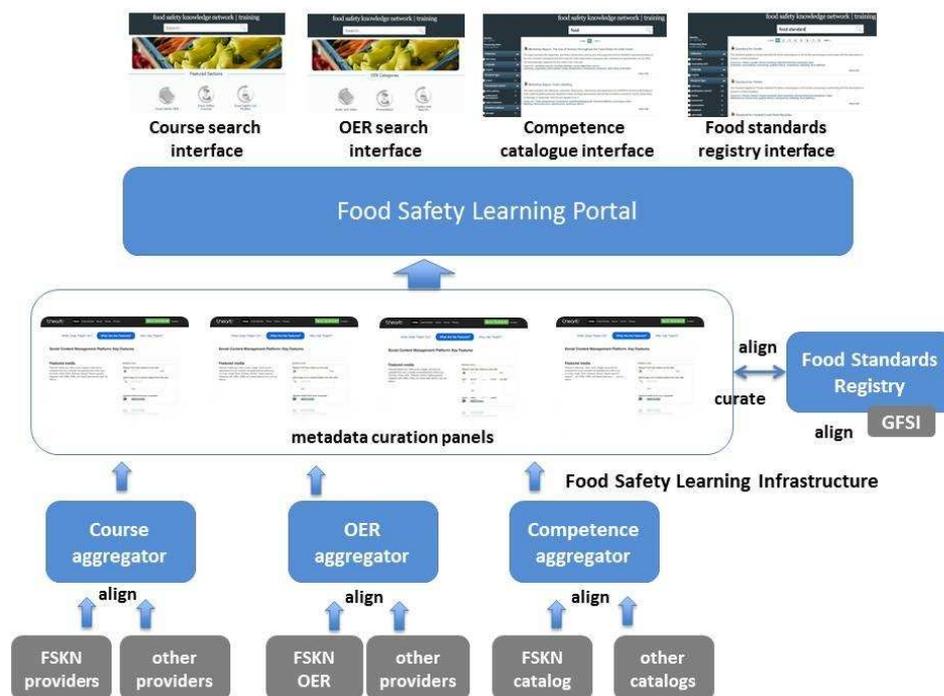


Figure 1 Overall architecture of a GFSP learning infrastructure

The Food Safety Knowledge Network (FSKN, <http://foodsafetyknowledgenetwork.org>) is an initiative that aims to help strengthen the food industry’s response to the complex food safety knowledge and training challenges that affect emerging markets by providing access to free

learning resources. The FSKN began as a collaboration between Michigan State University (MSU) and the Global Food Safety Initiative (GFSI) of the Paris-based Consumer Goods Forum and now includes several knowledge development and funding partners. Its challenging set of aims cannot be achieved through a single learning platform or system, because this will be an approach that will centralize and generalize a capacity building initiative that is designed to scale up by following a focused and regional approach. In this context, FSKN decided to extend its technology backbone in order to take advantage of existing OER on food safety topics that are available for free from institutions and projects around the world (such as FAO and WHO), by building online OER discovery services over the data infrastructure of the Green Learning Network (<http://greenlearningnetwork.com>). In collaboration with Agro-Know Technologies and the agINFRA initiative, FSKN is aiming to put in place an open and scalable learning infrastructure for food safety capacity building.

## **2. DESIGNING AN OPEN AND SCALABLE LEARNING INFRASTRUCTURE FOR FOOD SAFETY**

Our aim is to put in place an open and scalable learning infrastructure for food safety. This means, designing, developing and deploying a technology platform that will be periodically ingesting data about food safety educational resources, both from FSKN repositories and collections as well as from external content providers and sources. This technology platform will be based on the principle of metadata aggregation rather than local storage of the digital resources themselves: that is, it will provide the necessary mechanisms (in terms of automated software tools) and user interfaces (in terms of functionalities and features) that will support the identification, indexing, curation, enhancement and publication of metadata descriptions for the various information types of relevance to the food safety educational stakeholders. This platform will include, among others:

- Mechanisms in which educational offerings (such as online, blended or physical courses on food safety topics) will be published and advertised.
- Mechanisms in which open educational resources (OER) on food safety topics (such as lecture recordings, slides, notes, lesson plans, good practice guides) will be shared and discovered.
- Tools and interfaces to catalogue, view and navigate in food safety related skills and competences.
- Tools to register and map food standards in interoperable and machine-readable representations, facilitating their alignment and cross-walking.
- Multiple access points and interfaces to the information aggregated in the infrastructure, from various channels and devices.

The overall architecture of the proposed infrastructure is presented in Figure 1. The points that follow discuss in more detail how each layer will function:

- A main web portal that will serve as the main front-end to present the project and allow users to find information in the aggregated sources
  - will support various interaction modalities (visual, device, thematic, geographical, industry, ...) for search & discovery of courses and OER

- will offer multilingual interfaces and metadata facilitated by automatic translation engines
- A set of learning applications (apps) and widgets that will serve as search/discovery interfaces and mechanisms
  - to be embedded in other web sites and portals (widget-like or search pages in sites)
  - to include mobile apps for various operational systems (iOS, Android, Windows 8)
  - will provide a back-end engine to allow straightforward generation of adaptable versions of both (thematic, industry, geographical, linguistic, ...)
- A back end technology infrastructure to support the Educational Offering Aggregation
  - will ingest, harvest, aggregate course and OER metadata from existing or new (e.g. legacy) learning platforms and OER collections
  - will include tools to allow course and OER providers to align/map their metadata & classifications to the network's reference ones
- A Curriculum Registry & Alignment layer
  - will represent the network's curriculum in an interoperable format (using learning outcomes, competences)
  - will include tools to allow other course providers to register and express/map their curricula to the network's reference curriculum
  - will provide tools to facilitate the generation of multilingual versions of the curricula descriptions

### 3. USAGE SCENARIOS

In this section, we will describe a number of typical usage scenarios in order to illustrate how the food safety learning infrastructure can be put in place. A set of prototype demonstrators have been developed in order to support this illustration, explaining how the back-end infrastructure can support various usage environments. To make this demonstration as realistic as possible, we have used the existing agricultural learning infrastructure of the Green Learning Network (GLN, <http://www.greenlearningnetwork.org>) that is federating, aggregating and indexing educational collections on all areas of agriculture and biodiversity.

Two specific demonstrators are used to explain the envisaged usage scenarios:

- **FSKN training site** (<http://fskntraining.org>): a prototype demonstrating how new educational resource search pages may be deployed within the existing site of FSKN (<http://greenlearningnetwork.org/fskn/fskn-main/>)
- **Codex Alimentarius site** (<http://www.codexalimentarius.org>): a prototype demonstrating how material related to the Codex Alimentarius food standards can be deployed within the existing site of Codex (<http://greenlearningnetwork.org/fao-codex/FAO-codex/>)

To demonstrate the use of the re-vamped FSKN pages and the FSKN-powered pages in other sites, one can use the example of a small meat producer in Paraguay who is exploring how their company can start selling their packaged cooked ham to an international food distribution company. Their product is a high quality one, made from pure pork ham. Still they would like to find out more about the food safety standards of cooked ham.



Figure 2: Prototype demo of the enhanced search page of the Codex Alimentarius web site (<http://greenlearningnetwork.org/fao-codex/FAO-codex/>)

The manager of the meat producer company visits the Codex Alimentarius site (Figure 2) to find out more about the cooked ham standards. She starts searching the content of the portal by entering the term “Ham” in the search box of the portal, and gets a result on “Standard for Cooked Cured Ham” which she views to get more information about the standard. As Figure 3 shows, the resource is a Codex Standard on Cooked Cured Ham that is addressed to managers. Our user clicks on the resource to download the document and read it.

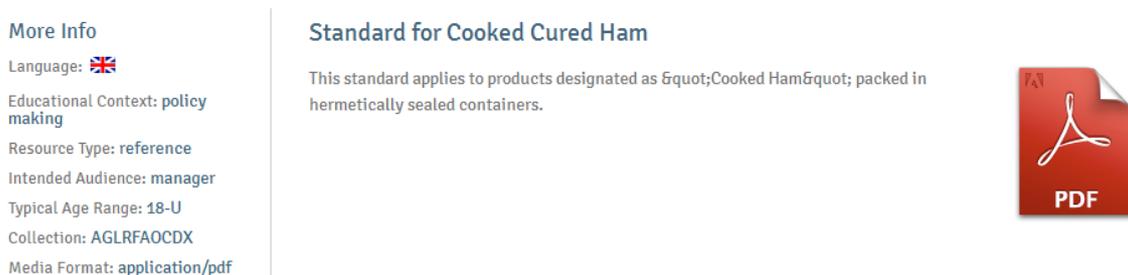


Figure 3: Viewing the metadata description of the cooked cured ham standard

Reading through this document, the manager finds all the necessary information so that their cooked ham products may comply with the Codex standard. In addition, she finds a section that refers to the specific labeling that packaged cooked ham should have to adhere with the standard. Interested to find out more about this, the user goes to the new FSKN search page (Figure 4).

At the FSKN site, the manager decides to look for some guide explaining the food labeling procedures. She scrolls down the page and clicks on the “Educational Resources” section icon. 3. A landing page with the educational resources indexed by FSKN opens. She clicks on the “Guides and Reports” category icon and a list of results with relevant guides appears. Since more than 100 resources are listed in the results, she decides to search into these results by using “Food labelling” in the search box. A shorter list of relevant results is generated through which she identifies a “Guide on Food Labelling - Complete Texts” (Figures 5 & 6).



Figure 4: Prototype demo of FSKN search page offering access to a variety of food safety resources (<http://greenlearningnetwork.org/fskn/fskn-main/>)

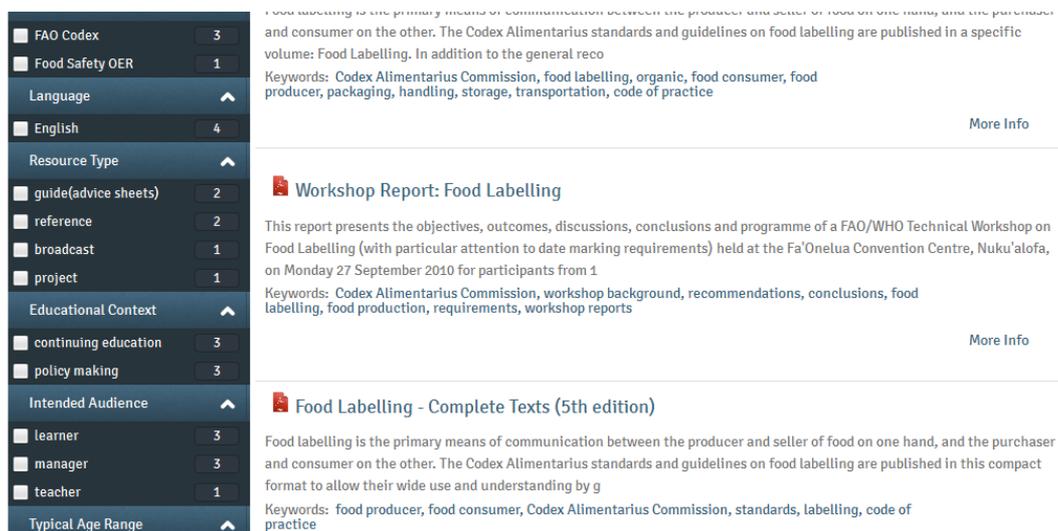


Figure 5: Searching for a resource on food labelling

She clicks on View More and reads the description and sees that this is a guide published by the World Health Organisation (WHO) and FAO, presenting food labeling requirements in a compact format. After downloading and reading the document, the manager of this small company can suggest a revision in the way that the labels of their pork ham products are generated, so that they comply with the general requirements.

Later on, the manager of the small meat producer company finds out that the large food distributor that they would like to work with is requiring from its providers to apply the HACCP standard procedures. She is visiting again the FSKN site and uses the term “HACCP” in the search box. A list of results appear, among which an online course on “HACCP Basics for Processors and Manufacturers”.

C0280 C. Geith, K. Vignare, Ch. Thanopoulos, N. Manouselis. “Towards an Open and Scalable Learning Infrastructure for Food Safety Capacity Building”. EFITA-WCCA-CIGR Conference “Sustainable Agriculture through ICT Innovation”, Turin, Italy, 24-27 June 2013

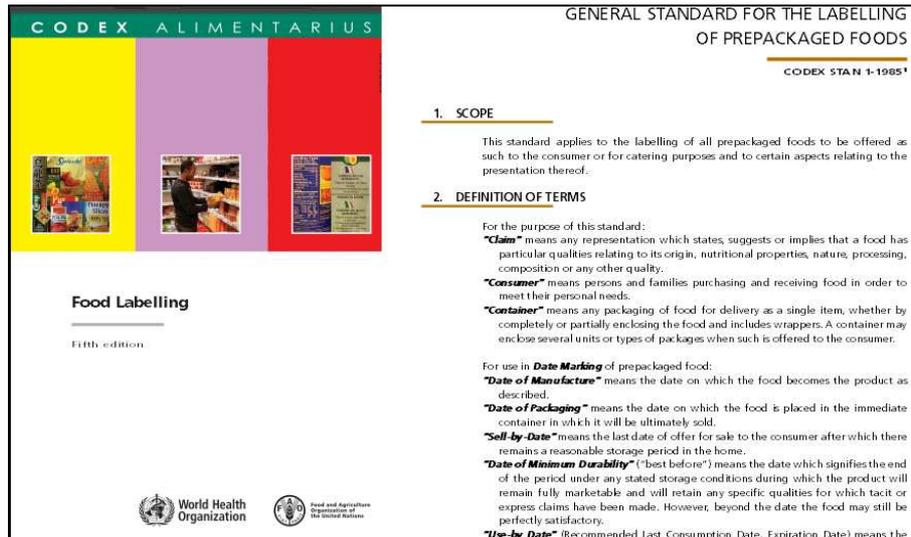


Figure 6: Finding a WHO/FAO comprehensive guide on Food Labelling

The manager goes to the web site of this course where she finds out that with a small cost she can get a better understanding of key HACCP concepts and the steps required to properly implement it in her company. Searching further for open educational material, she also finds a number of good YouTube videos that explain the principles of HACCP for food safety (e.g. Figure 7).



Figure 7: An introduction to HACCP principles for food production discovered through the new FSKN portal

#### 4. CONCLUSIONS

In this paper we discuss how an open and scalable learning infrastructure for FSKN can be set up and deployed. We present the main objectives and the challenges of such a global food safety network, as well as describe the rationale and the components of such a food safety learning infrastructure. A number of usage scenarios are presented, based on a number of demonstrators that have been built on top of the existing learning infrastructure Green Learning Network. The next stage will be fully integrating the demonstrators within the new FSKN site and then evolve the back end into a full scale federation of food safety resources.

## 5. ACKNOWLEDGEMENT

The Green Learning Network (GLN) infrastructure has been developed with funding support from the European Union's Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 283770. The presented food safety pilot demonstrators have been developed with funding support from the Michigan State University (MSU).

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