



**ASKFOOD – Alliance for Skills and Knowledge to Widen
Food Sector-related Open Innovation, Optimization and Development**



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ASKFOOD Interactive Training Gap identifier

METHODOLOGY – supporting review

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2 INTRODUCTION

The ASKFOOD Interactive Training Gap Identifier is a tool intended to support individuals and organization in self-assessing the current status of their skills and to increase their awareness of the skills that are and will be more and more required in the food industry and in the different food-related sectors.

The basic assumption behind the ASKFOOD Interactive Training Gap Identifier is that a continuous upgrading and upscaling of skills for the food sectors and sub-sectors, as well as for food-related industries that are growing of relevance (i.e. food tourism, nutraceutical, hybrid marketing), can only occur when there is a perfect matching between two components:

1. Accessible and Mediated Open Knowledge¹ (and this is what our project provides through several tools especially targeting industry professionals, or students, or policy makers, or start-uppers);
2. On-real time awareness of skills needed at individual and at organizational level.

As a first contribution to this approach, **the ASKFOOD project invested in wide-spreading solutions to make Accessible and Mediated Open Knowledge in the food industry.** Some of the tools related to this first aim are:

- a) The **Forecast Aggregator** (<https://www.askfood.eu/tools/forecast/>), that simply collects, connects, ranks and explains, emerging future trends that will provoke disruptive changes in the food industry and, as consequence, will produce significative challenges for future skills required by the sector;
- b) The interaction with the **ASKFOOD Talent and Mobility marketplace**, where start-uppers that have a question, need an introduction or want to poll for knowledge, can post the request to the Forum of experts;
- c) The dialogue with the **Knowledge Clusters**, where they can regularly report their numbers and staying accountable to a larger group, while having the chance to talk about the challenges they are working through and to learn from peers and experts who have overcome similar obstacles;
- d) The possibility to use the **Smart Atlas**, to browse resources and good practices existing throughout Europe as distributed knowledge agents;
- e) The **adoption of the PLEF solutions**, that will apply organizational and technological solutions to mashup personal learning environments that belong to, are created for, or belong to different types of active learners in the food industry;
- f) The **3.0. wiki platform**, fed by the Permanent Observatory that will collect info and initiatives to support training innovation in the food sector;
- g) The **ASKFOOD Digital Training and Business Ecosystem** that will support training experts and stakeholders involved in the Knowledge Clusters and in the entire structure of the ASKFOOD Training Hub, to share practices and materials that can support the entire cycle of knowledge management in the learning processes, as well as thematic insight on how to deal with disruptive training solutions to face the 8 big change-drivers (according to the TEMPEST Model)

All of them share the assumption that reflective thinking, action learning, open knowledge are expanding the no-cost, self-learning opportunities but they need “a mediation”, that is to say, clear and significative inputs about how some contents can be aggregated, compared, hybridized. It’s not a pure “one-way” model nor a “one-size-fits-all” approach. It’s just a mean to create innovation and to avoid collapsing in the Paradox of Choice, à la Barry Schwartz².

¹ The shift from de-structured self-learning, blended learning, mediated training and the future of Accessible and Mediated Open Knowledge is well described in Lucy Montgomery, Open Knowledge Institutions. Reinventing Universities, MIT University Press, 2019 <https://wip.mitpress.mit.edu/pub/oki>

²Cfr. Barry Schwartz, The Paradox of Choice – Why More Is Less, Harper Perennial 2004

As a second side of this approach, **the ASKFOOFD project wants to invest on increased awareness on the skills required by the food sector in the coming years.** This result is needed both in order to avoid skill mismatch and in order to support personal learning and career paths for present and future food professionals (among those, also present students and early stage researchers). The Interactive Training Gap Identifier is created to accompany this kind of reflection. We live in times of heightened concern among policy-makers and the media regarding the tremendous changes in skill demands that will arise from the proliferation of digitalization (including new forms of virtual work), artificial intelligence and robotics in our economies and societies. Technological challenges are not the only change drivers affecting the future of skills and jobs in the EU F&D and food-related industries. As we presented in deliverable 1.1., also Economic, Market, Political, Environmental, Societal, Transformational and Scientific drivers are reshaping the future of jobs and skills and require a continuous attention and an improved capability to orient skills and jobs in the right direction.

The last European Skills and Job Survey ³(CEFEDOP, 2015) highlights that 43% of adult employees have recently experienced changes in the technologies they use at work and 47% saw changes in their working methods or practices. About one in five considers it very likely that several of their skills will become outdated in the next five years.

According to World Economic Forum, besides the technological shift and the estimated impact of the Fourth industrial revolution, wider disruptive changes to business models will have a profound impact on the employment landscape over the coming years. Many of the major drivers of transformation currently affecting global industries are expected to have a significant impact on jobs, ranging from significant job creation to job displacement, and from heightened labour productivity to widening skills gaps. In many industries and countries, the most in-demand occupations or specialties did not exist 10 or even five years ago, and the pace of change is set to accelerate. By one popular estimate, 65% of children entering primary school today will ultimately end up working in completely new job types that don't yet exist.

In such a rapidly evolving employment landscape, the ability to anticipate and prepare for future skills requirements, job content and the aggregate effect on employment is increasingly critical for businesses, governments and individuals in order to fully seize the opportunities presented by these trends—and to mitigate undesirable outcomes.

Literature suggests that, at least in relation to continuing professional development, learning is more likely to lead to change in practice when needs assessment has been conducted, the education is linked to practice, personal incentive drives the educational effort, and there is some reinforcement of the learning based on a self- assessment of training needs.

³ <https://www.cedefop.europa.eu/en/events-and-projects/projects/european-skills-and-jobs-esj-survey>

3 THE METHODOLOGICAL APPROACHES THAT INSPIRED THE ASKFOOD INTERACTIVE TRAINING GAP IDENTIFIER

The ASKFOOD Interactive Training Gap Identifier is a tool to self-assess skills, so to measure the gap between the existing and the desired skills according to the same job profile or to support personal career path or to measure – at organisational level – skill mismatch and desired skill sets to acquire in order to reach strategic goals for the company and to face properly future challenges.

In order to create the Interactive Training Gap Identifier, three methodological steps were put in place:

Step 1. Definition and classification of the skills

Step 2. Choice of the approach to connect skill needs and training design

Step 3. Map of the jobs and of professional profiles around which structuring the Interactive Training Gap Identifier.

3.1 Definition and classification of skills

To consider the future of skills in F&D and food-related industries, it is first important to have a definition of this concept.

The word “skill” is used both in everyday language in a variety of ways, but also by several separate social scientific disciplines –especially economics, psychology and sociology. Its use has palpably changed in the last half century, broadening out from a narrow focus on technical or physical abilities. There is no full consensus among perspectives.

To ensure consistency, it is best to define skill in a broad sense to refer to any personal characteristic which is productive of value and which can be augmented through some form of investment. What constitutes “value” will differ according to readers’ perspectives.

In a market the value of something is often reduced to, and expressed in, monetary terms even when it is not exchanged. The value generated by skills need not be given in monetary units, though it frequently is. This broad sense of skill captures the vision of policymakers who conceive skills as the channel to raise prosperity and improve well-being.

This breadth of meaning should be helpful when considering future scenarios. When defined in this encompassing manner skill is close, in meaning, to the term “competence” as used by occupational psychology. It incorporates the possession of Knowledge, “Skills” (as used in the narrower sense of whether able to do specific sets of tasks) and Attitudes /abilities (KSA, figure 1). But the term “competence” also has disputed nuances, including when translated into other languages. While there is other broad notion of skill the definition excludes personal characteristics that one cannot reasonably expect to change –such as height –even if such characteristics might have value in the labour market.

Figure 1. KSAs and their definition.

KSA	Description
Knowledge	Condition of being aware of something (facts or concepts)
Attitudes	Feelings, emotions, values or beliefs about something
Skills	Ability to perform tasks or activities measured in time and precision
Habits	Aspects of behaviour that is repeatedly and consistently done without effort or conscious thought

3.1.1 *Alternative/complementary classification of skills*

Skills can be classified according to several typologies, which are useful for theorising about education and training, and about who should fund these.

One typology is the psychologists' distinction between knowledge, abilities and attitudes.

This categorization overlaps partly with the economists' distinction between "**cognitive**" and "**non-cognitive**" skills. The latter term is meant to encompass attitudes, norms, behaviours and traits, and should be accepted as skills (as long as they conform to the general definition). Often, there is no clear break between these types of skills. For example, many interactive social skills, such as those associated with professional communication, entail both cognitive and non-cognitive facilities.

Another typology, important for the economic theory of the funding of training, is the distinction between **firm-specific and transferable skills**. While the former can only have value in the firm where a person works, the latter can be applied to other firms.

A more significant and trendy distinction is the one focusing on **soft and hard skills**. Three are the main criteria we usually apply to mark the distinction among the two:

- To be good at hard skills usually takes smarts or IQ, while to be good at soft skills usually takes Emotional Intelligence or EQ. Examples of hard skills include math, physics, finance, biology, chemistry, statistics, etc... Examples of soft skills include self-management skills like self-confidence and people skills like communication or networking skills.
- Hard skills are skills where the rules stay the same regardless of which company, circumstance or people you work with. In contrast, soft skills are skills where the rules change depending on the company culture and people you work with.
- Hard skills can be learned in formal education and from books. There are usually designated levels of competency and a direct path as to how to excel with each hard skill. E.g. accounting is a hard skill. You can take basic accounting and then advanced accounting courses; you can work and get experience, or take an exam and be certified. ON the contrary, there is no simple path to learn soft skills.

3.1.2 *The ESCO Model*

ESCO (European Skills, Competences, Qualifications and Occupations) is the European multilingual classification of Skills, Competences, Qualifications and Occupations (<https://ec.europa.eu/esco/portal/home>).

ESCO works as a dictionary, describing, identifying and classifying professional occupations, skills, and qualifications relevant for the EU labour market and education and training. Those concepts and the relationships between them can be understood by electronic systems, which allows different online platforms to use ESCO for services like matching jobseekers to jobs on the basis of their skills, suggesting trainings to people who want to reskill or upskill etc.

ESCO provides descriptions of 2942 occupations and 13.485 skills linked to these occupations, translated into 27 languages (all official EU languages plus Icelandic, Norwegian and Arabic). Over time, it will also display the qualifications awarded in the education and training systems from Member States, as well as qualifications issued by private awarding bodies. The aim of ESCO is to support job mobility across Europe and therefore a more integrated and efficient labour market, by offering a "common language" on occupations and skills that can be used by different stakeholders on employment and education and training topics.

ESCO is a European Commission project, run by Directorate General Employment, Social Affairs and Inclusion (DG EMPL), in the framework of Europe 2020. It is available in an online portal and can be consulted free of charge. Its first full version (ESCO v1) was published on the 28th of July 2017 and was revised in 2018.

In its role as a unique dictionary of skills and jobs, ESCO is useful in a context where people change jobs and employers more frequently than in the past, new skills are regularly needed and geographical and occupational mobility is increasing. Online talent platforms, such as job boards and social media, are

transforming the way recruitment takes place. Employers and job seekers increasingly use digital tools to publish and apply for job offers or to look for and offer training opportunities. Companies and education and training providers need clear and updated information on skills and qualifications to better manage talent and to address skills gaps on education and training programmes.

ESCO concepts and descriptions can help people to understand:

- what knowledge and skills are usually required when working in a specific occupation;
- what knowledge, skills and competences are obtained as a result of a specific qualification;
- what qualifications are demanded or often requested by employers from those searching for work in a specific occupation.

The use of ESCO concepts can also facilitate the transition to this ever-growing digital labour market, by offering a common “language” on occupations and skills that makes these digital tools communicate and work better together.

ESCO is used in online applications and platforms. ESCO’s concepts and the relationships between them can be understood by electronic systems. This allows different systems and platforms to use ESCO to suggest the most relevant jobs to jobseekers on the basis of their skills or the most relevant trainings to people who want to reskill or upskill. ESCO contains accurate descriptions of occupations and skills that can be used in both drafting job offers and CVs, facilitating comparability and matching. This will support both employers to find the right people for their vacancies and jobseekers to find the right jobs for their skills.

The use of ESCO in job offers, research, big data analyses, etc., helps education and training providers to understand what skills the labour markets need. They can then adapt their curricula accordingly to prepare their students better for tomorrow’s labour markets. ESCO also helps potential employers to better understand what students have learned.

ESCO is available in 26 languages, allowing jobseekers and employers to better communicate about skills, training and jobs in any chosen European language. Through its use in the EURES portal and in many other online platforms, it helps European public and private employment services to offer their services across borders, languages and electronic systems, so that they can better support people who want to work in another European country.

The ESCO classification is composed of **modules** that contain elements such as occupations, knowledge, skills and competences, qualifications, and the International Standard Classification of Occupations (ISCO) hierarchy. When combined and interrelated, these modules make up the whole classification. There are three main types of module:

1. **Core modules** hold the actual ESCO concepts (occupations, skills, etc.) along with their Unique Resource Identifiers (URIs).
2. **Linking modules** provide links between two or more modules, at least one of which is a core module. An example is the relationship between occupations and skills.
3. **Supporting modules** enrich the core modules with supporting classification schemes such as ISCO-08.

ESCO is structured in three pillars:

- (1) **Occupations**: An occupation is a grouping of jobs involving similar tasks and which require a similar skills set. Occupations should not be confused with jobs or job titles. “Job” is bound to a specific work context and executed by one person, while “occupations” group jobs by common characteristics. ESCO contains occupations, not jobs. Occupations in ESCO cover all types of labor market activities including unpaid activities, voluntary work, self-employment and political mandates (if the mandate is an occupation itself).

- (2) **Skills and competences:** The ESCO skills pillar, which is sometimes referred to as skills and competences pillar, applies a wide definition of skills. It contains not only skills, but knowledge, skills and competences. In the skills pillar, ESCO distinguishes between
- i) skill/competence concepts and
 - ii) knowledge concepts by indicating the skill type.

There is however no distinction between skills and competences recorded in the ESCO skills pillar. ESCO v1 contains about 13,500 knowledge, skills and competence concepts. It also includes an explanation of the concept in the form of description, scope note and definition.

The skills pillar of ESCO does not contain a full hierarchical structure but they are structured in four different manners:

- a. Through their relationship with occupations, i.e. by using occupational profiles as entry point;
- b. In the part of the transversal knowledge, skills and competences through a skills hierarchy;
- c. Through relationships indicating how knowledge, skills and competences are relevant to other knowledge, skills and competences (in particular in cases of skill contextualisation);
- d. Through functional collections that allow to select subsets of the skills pillar.

ESCO's current structure supports user needs by including searching for specific skills, doing semantic search, filtering search results, clustering skills in groups (e.g. language skills, digital skills or management skills) to work at a more aggregated level, identifying related concepts, identifying concepts of a specific interest for the user, using only part-subset of the classification, getting statistics etc.

- iii) **Qualifications:** Qualifications in ESCO come from national qualifications databases of Member States. These qualifications are included in National Qualifications Frameworks that have been referenced to the EQF. Since 2014, the Commission has been financially supporting Member States and other partner countries (EFTA, EEA and candidate countries) to develop national qualifications databases and to interconnect these with the Learning Opportunities and Qualifications in Europe portal (LOQ) and with ESCO. Other qualifications might be directly provided to ESCO by awarding bodies in the future. These are not part of national qualification frameworks but are also relevant for the European labour market including private, sectoral and international qualifications. The qualifications pillar supports the understanding of the individual qualifications needed by employers, public and private employment services, learners, workers, jobseekers, education and training providers and other actors. This information should be as complete and transparent as possible to meet the information needs of these stakeholders. Qualifications data includes the following core information:

- Title: Exact title of the qualification (without translation).
- Field: Based on ISCED Fields of Education and Training 2013.
- Country/Region
- European Qualifications Framework (EQF): only relevant for qualifications that already have an EQF level assigned through the referencing process of National Qualifications Frameworks to the EQF.
- Awarding body or competent authority
- Description of the qualification expressed in learning outcomes
- Information on other fields can also be provided, such as credit points, internal quality assurance process, link to qualification supplement, entry requirements, etc.

Member States and other stakeholders wishing to publish information on their qualifications in ESCO need to structure their data according to the qualifications metadata schema developed for this purpose and upload it in the qualifications dataset register (QDR). After the publication of ESCO v1, organisations providing data on qualifications can annotate with ESCO terminology. To this end, they identify knowledge, skill and competence concepts in the skills pillar of ESCO that are relevant in the context of the learning outcome description of a qualification.

All three ESCO pillars are structured hierarchically and interrelated with each other to make visible (Figure 3):

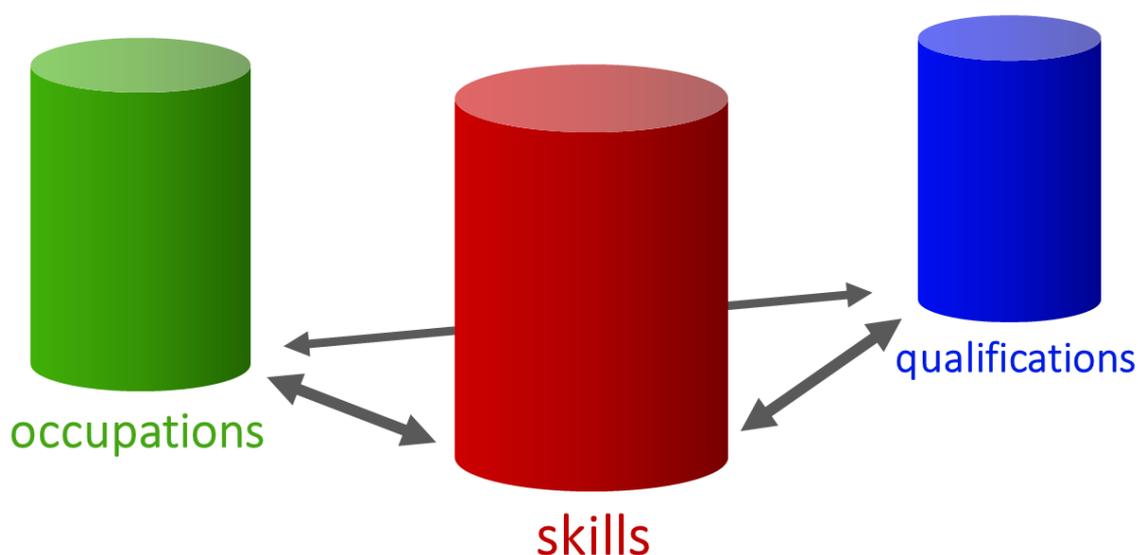
- Which knowledge, skills and competences terms are useful to describe jobs in a specific occupation,
- Which knowledge, skills and competences terms are useful to describe learning outcomes of a qualification,
- Which qualifications Member States consider relevant in the context of a specific occupation.

The relationship between knowledge, skills and competences and occupations is defined as "essential" or "optional".

"Essential" are those knowledge, skills and competences that are usually required when working in an occupation, independent of the work context or the employer.

"Optional" refers to knowledge, skills and competences that may be required or occur when working in an occupation depending on the employer, on the working context or on the country.

Figure 3. The three pillars of ESCO



3.1.3 The use of ESCO to classify skills and occupations for the Interactive Training Gap Identifier

In ASKFOOD project partners decided to link our analysis to the ESCO description of occupation and skills (see Figure 4) for two main reasons:

a) **We need to focus on missing, consolidated and emerging skills and occupations in food industries and in food related sectors.** ESCO gives a perfect representation of consolidated (existing) skills and occupations for which mobility of workers is already registered in Europe. Missing skills and occupations in the ESCO catalogue are a signal (to be further examined) of emerging skills and of future occupations. ESCO was used, in this perspective, as an official picture of the State of the Art of skills and occupations related to food industries.

b) **ASKFOOD partners were involved in the forum for domain experts involved in the revision of ESCO.** The exercise that we carried out and the future results deriving from the application of the Interactive Training Gap Identifier will support a broader design of improvement for ESCO.

In Table 1 and 2, the list of jobs and of skills referred to Food that are present in ESCO are listed: it is a group of 142 occupations and 272 core skills referred to present food jobs.

Table 1. The list of the 142 occupations related to Food in the ESCO database

1. Food analyst
2. Food safety specialist
3. Food biotechnologist
4. Street food vendor
5. Food production operator
6. Food production planner
7. Food technician
8. Food technologist
9. Airline food service worker
10. Food science lecturer
11. Food service vocational teacher
12. Food regulatory advisor
13. Food and beverage packaging technologist
14. Food grader
15. Food safety inspector
16. Pet and pet food specialised seller
17. Restaurant manager
18. Quick service restaurant crew member
19. Pet and pet food shop manager
20. Food production engineer
21. Street food salespersons
22. Food service counter attendants
23. Food and beverage tasters and graders
24. Food preparation assistants
25. Delivery driver
26. Chefs
27. Stall and market salespersons
28. Quick service restaurant team leader
29. Food processing and related trades workers
30. Fast food preparers
31. Street and market salespersons
32. Food production manager
33. Industrial cook
34. Dryer attendant
35. Street vendors
36. Cook
37. Kitchen helpers
38. Dieticians and nutritionists
39. Waiter/waitress
40. Bulk filler
41. Blogger
42. Butchers, fishmongers and related food preparers
43. Waiters and bartenders
44. Street vendors (excluding food)
45. Steward/stewardess
46. Fish cook
47. Production supervisor
48. Dairy processing technician
49. Centrifuge operator
50. Kitchen assistant
51. Columnist
52. Head waiter/head waitress
53. Food and related products machine operators
54. Waiters
55. Food processing, wood working, garment and other craft and related trades workers
56. Wine sommelier
57. Packaging and filling machine operator
58. Consumer rights advisor
59. Cooks
60. Head chef
61. Street and related sales and service workers
62. Domestic cleaners and helpers
63. Critic
64. Supermarket manager
65. Private chef
66. Dietitian
67. Animal feed nutritionist
68. Environmental and occupational health inspectors and associates
69. Fruit and vegetable canner
70. General veterinarian
71. Hunter
72. Official veterinarian
73. Immigration officer
74. Botanical technician
75. Shop sales assistants
76. Elementary occupations
77. Artistic, cultural and culinary associate professionals
78. Fish preparation operator
79. Pricing specialist
80. Bioengineer
81. Travel attendants, conductors and guides
82. Hotel and restaurant managers
83. Weight loss consultant
84. Soil scientist
85. Envelope maker
86. Sensory scientist
87. Food and related products machine operators
88. Product graders and testers (excluding foods and beverages)
89. Sport therapist
90. Emergency response worker
91. Subsistence crop farmers
92. Biology technician
93. Subsistence fishers, hunters, trappers and gatherers
94. Packing, bottling and labelling machine operators
95. Microbiologist
96. Chemical engineers
97. Sales workers
98. Other sales workers
99. Agronomist

- | | |
|---|--|
| 100. Water treatment systems operator | 122. Market-oriented skilled forestry, fishery and hunting workers |
| 101. Food Photographer | 123. Market-oriented skilled agricultural workers |
| 102. Aquaculture workers | 124. Other health professionals |
| 103. Personal service workers | 125. Skilled agricultural, forestry and fishery workers |
| 104. Legal, social, cultural and related associate professionals | 126. Subsistence livestock farmers |
| 105. Religious associate professionals | 127. Environmental and occupational health and hygiene professionals |
| 106. Restaurant managers | 128. Craft and related trades workers |
| 107. Subsistence mixed crop and livestock farmers | 129. Mixed crop and animal producers |
| 108. Subsistence livestock farmers | 130. Delicatessen specialised seller |
| 109. Mixed crop and animal producers | 131. Fruit, vegetable and related preservers |
| 110. Service and sales workers | 132. Beer sommelier |
| 111. Subsistence crop farmers | 133. Fruit and vegetable preserver |
| 112. Pet groomers and animal care workers | 134. Other craft and related workers |
| 113. Domestic housekeepers | 135. Prepared meals nutritionist |
| 114. Bartenders | 136. Chilling operator |
| 115. Travel attendants and travel stewards | 137. Fish and seafood shop manager |
| 116. Service station attendants | 138. Fish and seafood specialised seller |
| 117. Cleaners and helpers in offices, hotels and other establishments | 139. Plant and machine operators and assemblers |
| 118. Subsistence farmers, fishers, hunters and gatherers | 140. fish trimmer |
| 119. delicatessen shop manager | 141. Fishery and aquaculture labourers |
| 120. Stationary plant and machine operators | 142. Aquaculture and fisheries production man |
| 121. Subsistence mixed crop and livestock farmers | |

Table 2. The list of the 272 core skills (learning outcomes) related to Food in the ESCO database

- | | |
|---|---|
| 1. food policy | 25. food safety principles |
| 2. food colorants | 26. ensure food quality |
| 3. infections in food | 27. advise on food preservation |
| 4. food science | 28. cultural customs on food preparation |
| 5. food toxicity | 29. use food cutting tools |
| 6. food allergies | 30. food products composition |
| 7. food engineering | 31. general principles of food law |
| 8. supervise food quality | 32. work in a food processing team |
| 9. food preservation | 33. traceability in food industry |
| 10. food service operations | 34. pathogenic microorganisms in food |
| 11. maintain food specifications | 35. care for food aesthetic |
| 12. food plant design | 36. direct the preparation of food |
| 13. food materials | 37. provide food and beverages |
| 14. food product ingredients | 38. operate kneading of food products |
| 15. perform food risk analysis | 39. monitor food production documentation |
| 16. food legislation | 40. create food production plan |
| 17. food storage | 41. manage food manufacturing laboratory |
| 18. teach food science | 42. food and beverages on the menu |
| 19. create decorative food displays | 43. identify nutritional properties of food |
| 20. rear food fish | 44. manage the use of additives in food manufacturing |
| 21. pair beer with food | 45. food hygiene rules |
| 22. dispose non-food waste within the food industry | 46. control food safety regulations |
| 23. serve food in table service | 47. analyse characteristics of food products at reception |
| 24. assess food samples | |

48. provide food labelling expertise
49. keep food laboratory inventory
50. assess nutritional characteristics of food
51. improvise to occurring food processing situations
52. keep up with innovations in food manufacturing
53. pursue excellence in the creation of food products
54. coat food products
55. blend food ingredients
56. food and beverage industry
57. post-process of food
58. develop food safety programmes
59. fermentation processes of food
60. develop food production processes
61. develop food policy
62. comply with food safety and hygiene
63. apply food technology principles
64. research new food ingredients
65. use instruments for food measurement
66. monitor developments used for food industry
67. animal anatomy for food production
68. monitor milled food products
69. work in conveyor belts in food manufacturing
70. recommend pet food selection
71. advice food processing professionals
72. analyse samples of food and beverages
73. strive for nutritional improvement of food manufacturing
74. perform food safety checks
75. weigh animals for food manufacturing
76. handle communications in the food processing industry
77. natural food resources
78. advise food industry
79. food safety standards
80. ensure cost efficiency in food manufacturing
81. nutritional adequacy of food intake
82. use food preparation techniques
83. measure precise food processing operations
84. operate mixing of food products
85. administer ingredients in food production
86. manage resources in food manufacturing
87. food labels
88. coordinate launches of new food products
89. set up equipment for food production
90. develop new food products
91. make artistic food creations
92. configure plants for food industry
93. perform strategic planning in the food industry
94. assess shelf life of food products
95. clean food and beverage machinery
96. food canning production line
97. perform detailed food processing operations
98. interpret data in food manufacturing
99. wild game meat food safety
100. perform microbiological analysis in the food chain
101. food dehydration processes
102. exert quality control to processing food
103. adapt efficient food processing practices
104. effects of pesticides in food raw materials
105. ensure full functioning of food plant machinery
106. evaluate retail food inspection findings
107. work independently in service of a food production process
108. participate in the development of new food products
109. ensure compliance with environmental legislation in food production
110. analyse trends in the food and beverage industries
111. ensure refrigeration of food in the supply chain
112. watch food product trends
113. manage time in food processing operations
114. attend to detail regarding food and beverages
115. operate equipment for food homogenisation
116. execute chilling processes to food products
117. find new types of food & beverages
118. communicate regarding food labelling interdisciplinary issues
119. make critical decisions regarding the processing of food
120. take action on food safety violations
121. use new technologies in food manufacturing
122. store raw food materials
123. give advice on the matching of food with wine
124. apply requirements concerning manufacturing of food and beverages
125. identify the factors causing changes in food during storage
126. assess quality characteristics of food products
127. perform physio-chemical analysis to food materials
128. participate as observer in different types of audits in the food sector
129. assess environmental parameters at the workplace for food products
130. plan food plant production activities
131. think creatively about food and beverages
132. perform nutrition analysis
133. supervise food in healthcare
134. grade foods
135. prepare simple meals on board
136. manage communications with food industry governmental bodies

137. advise customers on alcoholic beverages' harmony with food
138. feed pets
139. inspect raw materials for muscle food processing
140. supervise employees in food production plants
141. monitor temperature in manufacturing process of food and beverages
142. operate vibratory feeder in food production
143. starchy plant foods
144. European food safety policy
145. select adequate packaging for food products
146. manage challenging work conditions during food processing operations
147. animal nutrition
148. risks associated to physical, chemical, biological hazards in food and beverages
149. animal food products
150. functional properties of foods
151. clinical examinations in dietetics
152. follow hygienic procedures during food processing
153. processes of foods and beverages manufacturing
154. take food and beverage orders from customers
155. assist in the development of standard operating procedures in the food chain
156. prepare orders
157. recommend wines
158. perform inspections of food-processing plants
159. advise on preparation of diet food
160. manufacturing of light metal packaging
161. prepare service trolleys
162. chemical preservation
163. handover the food preparation area
164. follow an environmental friendly policy while processing food
165. apply GMP
166. ensure cleanliness of food preparation area
167. harvest live aquatic species
168. use reheating techniques
169. calculation of food energy
170. apply HACCP
171. prepare meals for flights
172. provide nutrition to animals
173. use culinary finishing techniques
174. sell snacks
175. prepare ready-made dishes
176. nutrition
177. sparkling wines
178. drug administration regulations
179. foodborne diseases
180. label foodstuffs
181. cook pastry products
182. conduct ante-mortem veterinary health inspection
183. sommelier activities
184. seafood processing
185. dietary regimes
186. preserve samples
187. alcoholic beverage products
188. boil water
189. suspend animals
190. enzymatic processing
191. prepare stage effects
192. apply extruding techniques
193. archaeobotany
194. check travel documentation
195. supervise camp operations
196. develop policies for nutritional programs
197. prepare garnish for drinks
198. prepare canapés
199. prepare saucier products for use in a dish
200. prepare the restaurant for service
201. distribute meals to patients
202. compile wine lists
203. create innovative desserts
204. establish gaming policies
205. adjust temperature gauges
206. feed additives
207. take drive-through orders
208. apply preservation treatments
209. audit HACCP
210. perform sensory evaluation
211. handle chemicals for clean in place
212. investigate customer complaints
213. teach hospitality principles
214. operate pasteurisation processes
215. obtain event permits
216. estimate costs of required supplies
217. formulate dietetic intervention
218. tend canning machine
219. operate a heat treatment process
220. livestock feeding
221. trap animals
222. monitor larval development
223. halal slaughtering practices
224. sell weight loss products
225. forecast catering services
226. comply with standard portion sizes
227. types of condiments
228. check bottles for packaging
229. process fruits and vegetables
230. perform on-farm product processing
231. production scale fermentation
232. slaughter animals
233. make recommendation on nutrition to public policy makers
234. deliver group sessions on nutrition
235. work according to recipe

236. monitor the nutrition status of the individual
237. ensure product preparation
238. teach survival skills
239. kosher slaughtering practices
240. manage corrective actions
241. provide humanitarian aid
242. monitor the use of resources in production
243. ultra-high temperature processing
244. research new cooking methods
245. apply foreign language for international trade
246. beverages filtration processes
247. monitor the welfare of animals
248. see to the detainees' well-being
249. perform water treatment procedures
250. care for living pets in the store
251. handle kitchen equipment according to the requirements
252. Code of Conduct for Responsible Fisheries
253. provide charity services
254. educate healthcare users on nutrition
255. process dairy farm products
256. counsel on nutrition and its impact on oral health
257. coordinate humanitarian aid missions
258. advise customers on appropriate pet care
259. perform gross post mortem examination on animals
260. animal hunting
261. oversee warehouse value-added activities
262. administer lactic ferment cultures to manufacturing products
263. prepare flight reports
264. impart training on general quality management supervision
265. manage the transportation of animals
266. follow up nutrition care plan
267. advise customers on delicatessen selection
268. sell fish and seafood
269. cook seafood
270. develop zoonotic disease control policies
271. transport fish
272. remove parts of fish



The exercise done with experts, starting from the ESCO database, was double:

- a) **creating an “heat map” for food industry sub-sectors, so to emphasize increasingly relevant occupations and skills.** In this first direction, the basis for the discussion was the Report of FDE addressing skills and jobs in the Food and Drink Manufacturing and Processing (FDE/CERES, *Meeting the Challenges of the Labour Market*, November 2013). Skills and excellence parameters were compared with those listed in the ESCO Catalogue and industry members and experts valued the most relevant training gaps in order to upskill and/or to create proper skills in five core subsectors. The results of the analysis are included in D1.4. In respect to the Interactive Training Gap Identifier, this first stage of work led to the identification of professional families with related learning outcomes to set up the interactive questionnaires for the self-assessment. The 5 steps for the creation of the Interactive Training Gap Identifier are described in Chapter 3.
- b) **creating a check grid to compare the presence/absence in the ESCO catalogue of professional profiles and skills related to the main future challenges for skills and consequent training gaps by collecting signals and trends related to the main change drivers that are disrupting the food industry** (Forecast Aggregator). Wise investments need always to take into consideration the fact that the typical dynamic of investments is “you spend money today and see the returns in the future”. Applying such a rule to investments on skills is even more critical, because it refers to sensitive and wide-range investment options that may concretely affect the competitiveness of an industry, of a country and the well-being of future societies and next generations. The exercise we did was not about to predict the future, but it was based on the belief that we need to anticipate future demand if we want properly inspire investment strategies on skills. The starting point of this second path was that the secret to predicting the future is to get better at understanding the present, and to aggregate a lot of data and information that experts and think tanks provide about emerging trends and evolutionary paths that are affecting (and will affect more and more) competitiveness drivers and success factors in industries. The only difficulty is, the present is complex, and it is always evolving. In this perspective, the link with ESCO (and the dialogue that the ASKFOOD Consortium activated with them) will simplify the update and the maintenance of our tools.

3.2 Choice of the approach to connect skills need and training design

The design of the training program is the process of creating a **blueprint** for the development of individual of organizational learning starting from an assessment of needs, objectives and constraints that are always specific ones. In this respect, the ASKFOOD Interactive Training Gap Identifier supports the first critical stages of training and learning design.

The functionalities and the tools that compose the Interactive Training Gap Identifier are, consequently, inspired by the main methods to support training design:

- (1) The Training Needs Analysis Methodology (TNA)
- (2) The DACUM (Develop a Curriculum) Workshops
- (3) The SCID (Systematic Curriculum and Instructional Development) Method

3.2.1 The TNA Methodology ⁴

Training Need Analysis (TNA) is the process of designing training solutions according to four main phases:

- a) **Identification of the point of view** (organizational or individual; present-based or forward looking) and of its goals and objectives, including a future/forward-looking perspective. Training needs analysis can therefore not only address present deficiencies, it can also act as a developmental tool to allow managers to project future needs. A training needs analysis (TNA) occurs before a detailed training plan can be developed and implemented. It is aimed to outline exactly how the objectives of the organisation will be realised through the delivery of training that will focus on improved and/or changed skills, knowledge and/or attitudes of those directly involved.
- b) **Listing of Jobs and related tasks that need to be learned.** For the organisation or industry, the goal of the TNA would be for the workforce to be adequately trained so that performance is at its optimal, and so that money, time and other resources are not constantly side-lined to fix the performance problems of a poorly-skilled workforce. At individual level, this exercise is useful to recombine career-development paths with learning and training activities.
- c) **Analysis of competences and skills** that are required to perform a job so to assess the state-of- the-art of existing skills.
- d) **Identification of training needs and definition of training priorities**, on the basis of a ranking of the competences/skills/professional families/jobs/individuals that are worth to be trained and of the available resources (and consequent time or financial or organizational constraints)

The TNA methodology will support critical answers to these questions:

- What are the skills, knowledge and understanding that workers need to do the job efficiently?
- What are the workers' current skills, knowledge and understanding?
- Do the workers hold the skills, knowledge and understanding required, or is there a gap?

The diagnosis of training needs helps to identify the discrepancies between the knowledge held by potential training/education participants and the knowledge which is desirable for some specific reasons. When describing the status quo, we usually refer to the realities of potential training participants (e.g. food professionals, marketing managers), presenting their way of working, identifying issues they grapple with, or identifying the imperfections in how their tasks are carried out. In a nutshell, we present a description of the situation, an analysis of professional practices of a specific group of people.

This kind of analysis may produce two types of Training needs based on:

- beliefs relating to the training needs among the potential target audience, which sometimes are accompanied by the desire to meet those needs, or
- the desirable level of knowledge or skills among specific groups of stakeholders, i.e. indicate the extent to which educational efforts may contribute to achieving a desirable state of things.

Training has to be based on skills gaps. At the stage of conducting the TNA, the organisation may already know that there is a performance gap, in which case you will have verified with management that this is the case and that training is the answer (or, at least, one of the answers) that will close the gap and assist them to meet their objectives and expectations.

The implementation of training needs research should begin with formulation of the key research problems which will delineate the range of questions asked in interviews with stakeholders or in questionnaires. Success of research depends on the research question, which must be clear and distinct. The research question determines what is important (which data should be collected, which aspects of data should be

⁴ <https://rm.coe.int/tna-and-nts-training-needs-analysis-and-national-training-strategies-h/1680746e54>

analysed etc.) and, moreover, what is unimportant and should be skipped (in the research project concerned).

In any case, TNA can produce significant benefits, both at organizational and individual level:

- The organisation's needs and objectives are identified. A training program that specifically targets organisational needs and objectives is developed.
- Training programs that do not address the skills-performance gap are eliminated.
- Resources (e.g. money, time and technology) are allocated for training.
- Training is prioritised.
- Trainers' time and effort can be spent on more productive activities.
- Organisations will be in a position to work in partnership with training provider/s.
- The work unit's training needs are identified. Staff rosters that take training sessions into account can be developed.

In the design of the ASKFOOD Interactive Training Gap Identifier we took in account some methodological solution developed by using TNA for the qualitative analysis of training needs: the initial individual in-depth interview (IDI) and the guidelines for the Focus Group Interview (FGI).

An individual in-depth interview is carried out by a specially trained interviewer according to a pre-prepared detailed guide which defines the objectives and the general flow of the conversation. It enables careful exploration of how the interviewees think and act, how they look at a situation, the motives behind specific activity and the extent of the interviewee's knowledge. These interviews (ca. 1 h) are usually held with individuals who share similar characteristics that are important for the research.

A focus group enables a carefully planned discussion with selected participants in a comfortable environment in order to explore their perceptions of a specific area of interest. The aim of this research technique is to reconstruct, as closely as possible, the real processes of social communication and to confront participants' varying opinions through the discussion. Participants are invited to a focus group because they have distinctive personal characteristics that directly correspond with the objectives of the research. This research technique is especially suitable for investigating the opinion-forming processes and the problems of decision-making that are subject to peer influence and collective behaviour. Usually, a focus group interview has 6 to 10 participants.

3.2.2 The DACUM workshops and related toolkits⁵.

DACUM (Develop a Curriculum) is a US-based methodology that supports open and participatory processes for occupational analysis and curriculum design. It is a one- or two-day storyboarding process that provides a picture of what the worker does in terms of duties, tasks, knowledge, skills, traits and in some cases the tools the worker uses. The information is presented in graphic chart form and can include information on critical and frequently performed tasks and the training needs of workers. The strength of DACUM is that this method is a job-oriented task analysis process which seeks to answer what skills and knowledge are required to perform a specific job at a certain proficiency level.

The DACUM process provides information about theoretical knowledge, practical skills, and personal attitudes or dispositions needed to equip a person to perform at a certain level. It involves local individuals with reputations for being the "top performers" at their jobs, working on a short-term committee assignment with a qualified DACUM facilitator. Workers are recruited directly from business and industry and they become the Panel of Experts who collectively and cooperatively describe the occupation in the language of the occupation. Its use with many companies, community colleges, and government agencies has shown the process to be very effective, quickly accomplished, and low cost.

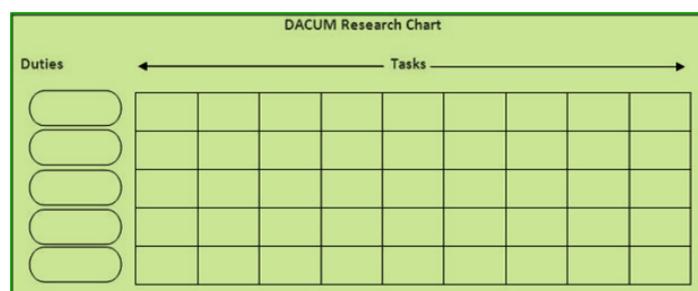
⁵ www.dacum.org

The Panel works under the guidance of a trained facilitator for two days to develop the DACUM Research Chart. The chart contains a list of general areas of competence called DUTIES and the TASKS that define that duty.

DACUM is based on three logical premises:

- (1) expert worker can describe and define their job/occupation more accurately than anyone else,
- (2) an effective way to define job/occupation is to precisely describe the tasks that expert workers perform;
- (3) all tasks, in order to be performed correctly, demand the use of certain knowledge/skills, tools, and positive worker behaviours.

Figure 4. The DACUM Research Chart



The DACUM Research Chart (Fig. 4) can be used for conceptualizing future jobs, and to describe portions (selected duties) of one's occupation.

Figure 5. Example of the DACUM Research Chart for US Food Investigators

Duties, Tasks, and Steps		Knowledge	Skills, Abilities, and Attributes	Tools, Equipment, and Resources
A	Preparing for Inspections			
1	Read the Assignment			
	a Receive assignment	<ul style="list-style-type: none"> • FACTS system management • TURBO EIR 	<ul style="list-style-type: none"> • Computer skills • Critical thinking skills 	<ul style="list-style-type: none"> • Compliance branch • Computer • FACTS database • FDA intranet connection • TURBO EIR
	b Generate assignment sheet			
	c Review assignment comments			
2	Review Inspection Resources			
	a Review compliance programs	<ul style="list-style-type: none"> • FDA procedures and protocols • IOM • Resource availability • Resource location 	<ul style="list-style-type: none"> • Computer skills • Critical thinking skills 	<ul style="list-style-type: none"> • Compliance policy guide • Compliance program • Computer • Firm file jacket • Food experts • Guide to inspection • Industry guidance • IOM • Peers • Regulation
	b Review guidance documents			
	c Review regulations			
	d Review firm's history			
	e Perform web-based literature search			
	f Seek technical advice			
	g Review products previously covered during inspection			
3	Develop Personal Safety Plans			
	a Review file jacket	<ul style="list-style-type: none"> • FDA procedures and protocols • IOM • Required elements of personal safety plan • Required elements of personal safety plan • Safety 	<ul style="list-style-type: none"> • Communication skills • Critical thinking skills • Multi-tasking skills • Organizational skills 	<ul style="list-style-type: none"> • Computer • Emergency contacts • FACTS database • File jacket • IOM
	b Review FACTS for personal safety indicators			
	c Assess personal safety risk			
	d Write personal safety plan			
	e Submit safety plan for approval			
	f Contact law enforcement agencies for backup			
4	Conduct Inspection Team Meetings			
	a Schedule meeting	<ul style="list-style-type: none"> • FDA policies and 	<ul style="list-style-type: none"> • Communication skills 	<ul style="list-style-type: none"> • Computer

Brainstorming techniques are used to obtain the collective expertise and consensus of the Panel. As the Panel determines each task, it is written on a card. The cards are attached to the wall in front of the Panel.

The completed chart is a graphic profile of the duties and tasks performed by successful workers in the occupation. The Panel also identifies the general knowledge and skills required of successful workers, the tools, equipment, supplies, and materials used, the important worker behaviours essential for success, and the future trends and concerns likely to cause job changes. Figure 5 presents the DACUM Research Chart completed for an US profile related to Food investigators.

DACUM has multiple and subordinate uses such as:

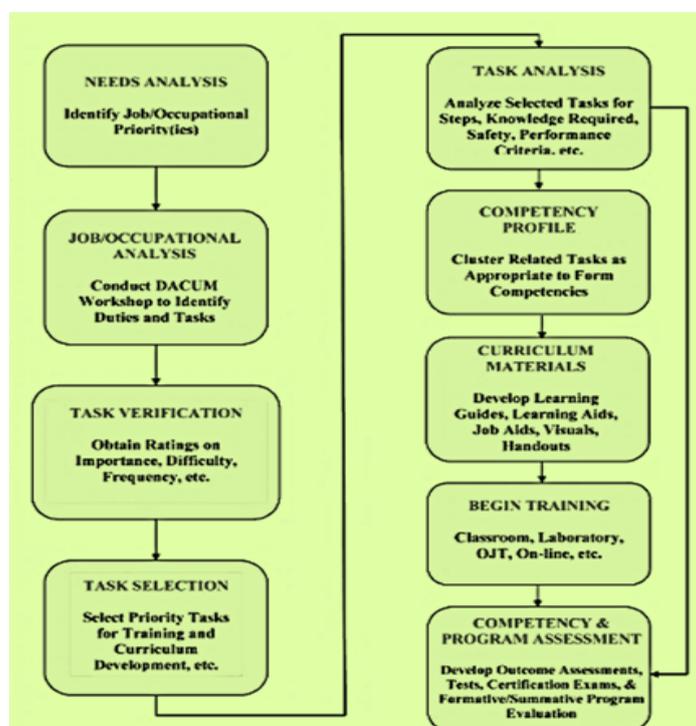
- (1) Management Decision-Making,
- (2) Human Resources/Organizational Development,
- (3) Career Planning/Advising,
- (4) Learner Assessment, certification and licensure.

The same process can be used also for job analysis, occupational analysis, process analysis, functional analysis, and conceptual analysis. DACUM analysis coupled with task analysis and task verification can provide a legally defensible basis for higher stakes competency assessments used in certification or employment situations.

In the design of the ASKFOOD Interactive Training Gap Identifier we took in account some methodological solution developed by using DACUM especially in order to fix the flowchart and the sequence in which to organize the interactive tools and which tools select as the easiest and more effective to be used to support self-assessment and awareness of skill needs.

The Logical Flow is represented in Figure 6.

Figure 6. The Logical Flow of the DACUM workshops that served as a basis to select and to organize the web tools for the Interactive Training Gap Identifier (modified from ⁶)



⁶ R.E. Norton, and J.R. Moser, *DACUM Handbook*, 3rd ed., CETE College of Education and Human Ecology OSU: Ohio, 2008, pp.1-15

3.2.3 The Systematic Curriculum and Instructional Development (SCID) Method⁷

The SCID Method, organized according the DACUM Workflow, is a curriculum development process, with several steps:

1. **Needs Analysis**, also called “needs assessment”, which can be conducted in different ways.

In an academic setting, with the aim to identifying which occupational areas have employment opportunities and will attract enough students to justify an instructional program as well as salary levels and required skill levels in the occupation and whether the instructional program should be offered at the secondary or postsecondary level.

In an industry or business setting, with the aim to identifying training that can be done and which benefits to employees and to the company. It involves consulting with supervisors and managers as well as looking for training implications in data on the quantity and quality of products or services, worker safety records, new equipment, new work processes, or other factors.
2. **Job/Occupational Analysis**. The difference between job and occupational analysis is that in a company setting, the focus of analysis is a single job, whereas in most community /academic situations the focus is on an occupational area consisting of several closely related jobs. Job/occupational analysis involves finding out what should be taught to students or worker trainees.
3. **Task Verification**, to verify selected aspects of each task identified in the DACUM process. Is the task actually performed in the job or occupation? How important is the task? How difficult is it to learn to perform the task? How frequently is the task performed? Task verification data are collected through paper or web-based surveys of other expert workers and, sometimes, the immediate supervisors of those workers. Data are statistically analyzed and become a basis for decisions about which tasks should be taught and which should not. The data are also valuable for creating test blueprints. Task verification can involve as few as 25 expert workers or supervisors responding to a survey—or as many as thousands. Seeking input and involvement from expert workers and supervisors builds further support and buy-in from the local occupational community. Through task verification, many more workers and companies become aware that the institution is updating an existing instructional program or creating a new one. All in all, task verification not only provides critical decision-making data; it’s also good public relations.
4. **Task Selection**, data gathered during task verification are used to select tasks for instruction. Instruction would typically not be provided for a task that is of low importance or of low difficulty or that is performed by very few workers unless there is a compelling reason to provide instruction—for example, the task is a new one that workers have not yet been trained to perform. The most common experience has been that if a task is performed by fewer than 25 percent of workers, it should be set aside, as the return on investment for training on such a task will be quite low. Usually, task selection decisions should be made by a team of qualified persons; in academy, for example, a team could include the department chair, an instructor, a curriculum specialist, and a member of the DACUM panel.
5. **Task Analysis**. Whether in a university or a company, instructors need more information (unless they have had recent personal experience) on the tasks selected for instruction: the steps of the task, the tools and equipment needed, the knowledge and skills required, safety concerns, relevant worker behaviours, decisions the worker must make, and the criteria used by industry to judge the adequacy of performance. Ideally, all tasks should be analyzed. However, there may be limitations to task analysis in practice. Companies usually want every important task analyzed. Company managers often say that they want to capture the intellectual capital of current workers before they leave or retire. Colleges, on the other hand, often feel that instructors are responsible for personally conducting task analysis or for bringing in guest speakers on tasks they are not familiar with. A thorough analysis of a single task with many steps can take an hour or more, so limited availability of expert workers from industry and limited time available to instructors can make task analysis difficult.
6. **Instructional Competency Profile** is established using good professional judgment. The best option is examining the results of task analysis carefully to see which tasks require similar knowledge and worker

⁷ Norton R. SCID: MODEL FOR EFFECTIVE INSTRUCTIONAL DEVELOPMENT, 1993

behaviours. Often, there are multiple tasks in the occupation that require basically the same knowledge, although the knowledge may be applied differently. For instruction, it often makes a lot of sense to cluster such tasks together and write a new competency statement that encompasses all of the clustered tasks.

7. **Competency-based Curriculum Materials** can be developed. Many types of competency-based materials can be developed, including learner-centred learning guides, learning aids, handbooks, handouts, and job aids or instructor lesson plans—to mention just a few. Time, resources, instructor preferences, and institutional preferences are some of the factors that determine which materials are developed. Although learning guides take skill and time to develop, they have many advantages. Learning guides consist of a performance objective and two or more enabling objectives. For each enabling objective, a learning experience with multiple, carefully selected activities is developed. Each learning experience contains a Self-Check and Model Answers and/or a Practice Exercise. Upon completion of all learning experiences, the learner must demonstrate his or her skill; the instructor uses the performance criteria in the learning guide’s Performance Test to evaluate the learner’s performance. If the learner does not demonstrate competency in the Performance Test, the instructor guides him or her to more practice or other activities until competency is achieved. A knowledge test may also be administered, if desired.
8. **Begin Training** —assuming you’ve recruited students, provided the necessary facilities, hired a qualified instructor, and so on. The instructor has three important roles: advise students, assist students, and assess student progress. Instruction may be delivered in a classroom, in a laboratory, online, or through on-the job training. Instruction could be delivered in a blended approach using two or three different methods.

Administrators, other stakeholders, and learners may need to be oriented to learning guides or modules if they are being used for the first time. It may be a challenge for instructors to develop high-quality, learner-centred, competency-based materials, but there are many advantages of learning guides:

- They allow learners to work at their own pace.
- They free the instructor from lesson planning and lecturing.
- The instructor or trainer becomes a facilitator of learning.
- Instructional content is standardized for all students.
- The instructor has more time to work with individuals and small groups of students.
- The learner always has an opportunity to practice the skill before demonstrating that he or she has achieved the competency.

9. **Competency and Program Assessment** is often given only minimal attention but is essential to the assessment of program outcomes and to program improvement. A Performance Test at the end of each learning guide assesses the learner’s skill in the tasks covered by that learning guide. In overall competency assessment, however, the learner’s skill is assessed across many competencies for many purposes such as course grading, worker promotion, worker performance, certification, and credentialing. During the course of instruction, program formative evaluation data should also be collected on how well the instructional program is working. If some elements of the program are not working well, in-course corrections should be made as soon as possible. At the end of each cycle of the instructional program, summative evaluation should also determine learner completion rates, learner satisfaction, instructor reactions, cost per student, and other data that can indicate needed program improvements and provide for program accountability.

In the design of the ASKFOOD Interactive Training Gap Identifier we took in account some methodological solution developed by using SCID to connect the self-assessment results with continuous development of training schemes and innovative training packages that are developed in WP3 and to give punctual inspirations and inputs to the “double 5 Ps” model that will be implemented in order to innovate training Plans, Patterns, Perspectives, Positioning and Ploys by acting in differentiated ways on training Products, People, Places, Promotion and Price/Prize-schemes.

Important Notes about this Document

This document is aimed to provide general information to enable individuals, employers and training providers to be acquainted on the skills for career, training and education purposes.

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