Career management for UK food degree students at multiple institutes using an industry-developed professional competencies framework

WESTON, E.J.E. <http://orcid.org/0000-0002-2161-4103>, MILLMAN, Caroline <http://orcid.org/0000-0003-4935-0477>, SETAREHNEJAD, A. <http://orcid.org/0000-0001-6234-2258>, BENNETT, E.J. <http://orcid.org/0000-0003-3368-3349> and ORUNA-CONCHA, M.J. <http://orcid.org/0000-0001-7916-1592>

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1 **Full Title**

2 Career management for UK Food degree students at multiple institutes using an industry developed professional
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4
5 **Name(s) of author(s)**
6 Emma J E Weston, Caroline Millman, Anita Setarehnejad, Emma J Bennett, Maria Jose Oruna-Concha
7
8 **Contact information for corresponding author**
9 Emma JE Weston, Division of Food, Nutrition and Dietetics, School of Biosciences, University of Nottingham, Nottingham, UK.
10 emma.weston@nottingham.ac.uk
11 ORCID https://orcid.org/0000-0002-2161-4103
12 Tel: 00 44 (0) 115 951 6214
13
14 **All other author affiliations** [with complete addresses]
15
16 Caroline Millman
17 Sheffield Hallam University, Service Sector Management, Sheffield Hallam University, Howard Street, Sheffield, Sheffield, S1 1WB,
18 UK.
19 ORCID https://orcid.org/0000-0003-4935-0477
20
21 Anita Setarehnejad
22 Cardiff Metropolitan University, Western Avenue, Cardiff, CF5 2YB, UK
23 ORCID https://orcid.org/0000-0001-6234-2258
24
25 Emma J Bennett
26 Food and Nutritional Sciences, University of Reading, Harry Nursten Building, PO Box 226, Reading, RG6 6DZ, UK
27 ORCID https://orcid.org/0000-0003-3368-3349
28
29 Maria Jose Oruna-Concha
30 Food and Nutritional Sciences, University of Reading, Harry Nursten Building, PO Box 226, Reading, RG6 6DZ, UK
31 ORCID https://orcid.org/0000-0001-7916-1592
32
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52 **ABSTRACT**:

53 Recruitment of food science and technology graduates remains a priority for the United Kingdom (UK) food industry in the wake of

54 skills shortages. As a result of the contemporary pressures faced by the food industry, it is essential that students applying for such

55 roles are aware of and ready for management, leadership and relevant professional competencies. This collaborative study uses

56 the industry informed established framework, namely Competencies for Food Graduate Careers (CFGC) and assesses the

57 integration of this resource into careers education for food-related programs of four Higher Education Institutions (HEIs): Cardiff

58 Metropolitan University (CMU), Sheffield Hallam University (SHU), University of Nottingham (UoN) and University of Reading

59 (UoR). Mixed method analysis was conducted with students prior to and on conclusion of the teaching sessions, including surveys

60 and focus groups. Students confirmed that CFGC was informative and useful for preparing them for a graduate career in food

61 science and technology. No single method of integration of CFGC was proposed, instead intervention can be undertaken by a

62 variety of approaches, suitable for level of study and Institutional operation, as outlined in the study.

63

64 **5 Keywords:** education, employability, food industry careers, professional competencies, food science

65

66 **Practical Application:** *NOTE: Do not include a PA for JFS Concise Reviews, JFSE, and CRFSFS papers*. ***N/A***

67

68 [END PAGE 2]

Introduction

Ensuring students of vocationally based programs have understanding of the requirements of graduate employers is well understood (Bohlscheid & Clark, 2012). This is increasingly the case in food sciences education where the graduate job market is strong, to meet demands for food science and technology 'thought leaders' managing more sophisticated conversion of raw materials, whilst satisfying consumer and global health demands (Lillford & Hermansson, 2019; Institute of Food Science and Technology, n.d.-a). A recent UK government report, outlines the need for training a workforce with strong management and leadership skills to meet future technological consumer and workforce demands for food businesses (Food and Drink Sector Council, 2019). In relation to the recent pandemic, a recent Universities UK report (2020) stated enhanced skills in "digital, entrepreneurship, business/public sector management, and sustainable economy" would benefit business recovery.

Discipline specific competency frameworks can be utilized to improve a student's awareness of the desirable skills and behaviors for specific vocational pathways and whilst not prevalent in food-related careers are widely used in healthcare and professional degrees governed by appropriate accredited bodies (Artess, Hooley, & Mellors-Bourne, 2017). These frameworks can inform choice and plans for personal development and enable success in future graduates' job application and selection processes.

In partnership with UK and Republic of Ireland (ROI) industry employers, a project conducted during 2015 to 2017, established a language tool of desirable *elements* or competencies, namely Competencies for Food Graduate Careers (CFGC) (Weston, Crilly, Mossop, & Foster, 2017). Following a survey, role profiles of desirable *elements* were developed for 14 initial bachelors' graduate roles typically undertaken by food scientists in the region (Weston, Foster, Crilly, & Mossop, 2020a). This competency framework has been subsequently utilized for curriculum mapping and program development activities at University of Nottingham (UoN; Weston, Benlloch-Tinoco, Mossop, McCullough, Foster, 2020b) and the University of Reading (UoR; Fagan, Cooper, Chatzifragkou, & Bennett, 2020) and is now recommended for use in applications for Institute of Food Science and Technology (IFST) degree accreditation (Institute of Food Science and Technology, n.d.-b). Food science degrees in the UK demonstrate reference to content of the pertinent Quality Assurance Agency (QAA) benchmark statement (The Quality Assurance Agency for Higher Education, 2019) for specific technical skill requirements. However as the 'generic skills' list outlined for graduates to possess is shared across many other program types and careers, CFGC provides the specific information on broader competencies requirements and is designed to complement the QAA standard.

An additional aim of the competency framework project was to provide credible and current careers education to students and recent graduates. Whilst attempts are made to educate UK high school students about food industry careers via websites (Institute of Food Science and Technology, n.d.-a; National Skills Academy of Food and Drink, n.d.) and adhoc outreach activities, students often start their higher education not realizing the full extent of the roles available to them. An integration of this framework into teaching at UoN has provided students (since 2017) with a coherent source of rich information to use in their career planning, with encouraging feedback from students and industry.

There is a growing interest in co-operation across HEIs domestically and worldwide to best prepare food science graduates for the global workplace (Bohlscheid & Clark, 2012; Stevenson, 2016; Roberts, Robbins, McLandsborough & Wiedmann, 2010), and CFGC can provide a platform for further discourse and action (Emond, Poole, & Weston, 2020). To encourage wider engagement by educators, students and employers, the role profiles as infographic posters, and support information is situated on the IFST website directly accessible by the reference provided (Weston, 2018). A simple interactive open access online tool, has also been

106 created, again directly accessible in the reference (University of Nottingham, n.d.) aiming to provide careers guidance for students

107 and new graduates and support personal development and job application preparation. By accessing open access CFGC

108 resources, other UK HEIs have started to introduce the framework to support careers education and research. As broader use of

109 CFGC for careers education commenced, it was considered worthwhile to discover how and when the framework was integrated

110 into other teaching programs and, by gathering student perceptions, reflect on the relative success of such interventions.

111 In order to investigate these research questions, a study was undertaken during the 2019-2020 academic year with selected

112 undergraduate (UG) and postgraduate (MSc) taught cohorts studying food science-based degrees in four UK institutes, namely

113 Cardiff Metropolitan University (CMU), Sheffield Hallam University (SHU), University of Nottingham (UoN) and University of

114 Reading (UoR). The specific aim was to explore the impact of integration of CFGC into curricula activity to support careers

115 education. Each HEI included this intervention at a level of study and semester initially deemed most appropriate for their programs

116 of study. Whilst recent events in relation to the Covid-19 pandemic impacted on some aspects of the study in the spring semester,

117 sufficiently useful data was obtained to review and reflect on the interventions.

118

119 **Methods**

120 The four UK institutions outlined above who undertake the teaching of food science at undergraduate (UG) and postgraduate (MSc)

121 level took part in this study. The purpose was to explore the impact of integration of CFGC into curricula activity, by a variety of

122 means to support careers education. The study was conducted from September 2019 to May 2020.

123 This study was organized in two parts, firstly students' knowledge of careers in the Food Industry was evaluated by a 'pre-survey'

124 and then, students were introduced to CFGC materials. Their knowledge was tested again by the same means using a 'post-

125 survey'. Both surveys included multiple choice and open-ended questions. The format of delivery of CFGC into sessions varied at

126 each university due to year of study, teaching methods and module (UK term equivalent for 'course') subjects.

127 Questions asked in the pre-survey comprised of questions on demographics and characteristics that might influence career

128 ambitions (age, gender, program studied, year of study, placement, home country). Additionally, questions were asked about

129 intended careers and potential roles that the student was interested in as well as a measure of how confident they were of the skills

130 and qualities required in such roles.

131 The post-survey repeated some of the demographics questions where a purely longitudinal study could not be undertaken - UoR

132 was able to collect and match data for their cohort. The students were again asked of their proposed entry into the food industry

133 and career ambitions before asking about the CFGC, how useful and how easy it had been to navigate through including some

134 institutional specific questions.

135 Research data was collected from pre and post surveys and analyzed in a qualitative and quantitative format. STATA Version 15.1

136 (StataCorp, 2017) was used to analyze the quantitative data - this was achieved through simple tabulations of data and comparison

137 of the survey responses, of the different groups of students (e.g. MSc/UG and CMU/SHU/UoN/UoR) or simple demographics (e.g.

138 Age and Gender), using Chi-square testing was conducted to measure any significant difference between groups. This was

139 conducted in order to assess the impact of characteristics on the research questions. Basic thematic analysis (Braun & Clark 2006)

140 was applied to analyze open end questions with supporting triangulation (Golafshani, 2003) and external auditing (Creswell, 2014)

141   of draft results conducted for validation purposes. A semi-structured group interview, conducted before the impact of Coronavirus

142   pandemic[1] was conducted at UoN to explore outcomes of their post-survey data which informed overall findings.

143   This study was approved by the four collaborating institutes' ethics committees; Cardiff Metropolitan University (Sta-1628), Sheffield

144   Hallam University (ER21512350), University of Nottingham (BIO-1920-003 & SBREC190106A) and University of Reading

145   (08/2020). Informed consent obtained from students prior to the data collection, either on paper (in-class) or via an online survey.

146   Delivery of CFGC at each institute

147   UoN:
148   The online pre-survey at UoN was performed with third year UG food sciences cohorts and also MSc Food Production

149   Management students. Specific teaching intervention of CFGC as outlined below, and subsequent capture of student feedback was

150   centered on the UG cohort studying Food Science, or Food Science and Nutrition programs. This cohort was a mixture of students

151   returning from an additional year-long industry placement or directly from second year. They attended a core Personal and

152   Professional Development for Food Scientists module conducted in semester one, where CGFC has been increasingly integrated

153   into learning outcomes, content, delivery and assessment for two years prior to this study. The module includes several activities,

154   some adapted to include CFGC (such as developing a tailored CV and mock interview against a CFGC role). In other cases new

155   activities have been developed such as mapping CFGC roles against real job specifications for students to explore their personal

156   interests and possible ideal roles. Reference to the online resources and tool (Weston, 2018; University of Nottingham, n.d.) were

157   made during activities alongside inclusion of CFGC documentation in the module virtual learning environment (VLE) and presence

158   of the 14 role posters on the walls of the teaching room each week.

159   Toward the end of the semester a paper-based version of the post-survey was completed by the UG cohort (December 2019).

160   Initial inspection of survey results, informed the areas to explore in a 1.5-hour semi-structured group interview, held in February

161   2020. The session was facilitated by a researcher from another institute (SHU) and comprised six student volunteers aiming to

162   represent the gender, nationality, program of study and placement options of the cohort.

163   MSc students were given a specific timetabled classroom session in semester one to introduce CFGC to the cohort, explore the

164   career options available and associated development of elements of the CFGC framework to their core areas of study.

165   SHU:
166   The cohort at SHU was formed from final year UG students studying Food and Nutrition or Food Marketing Management programs

167   and postgraduate students studying various MSc food-related curricula. Students at both levels attended a session at the beginning

168   of semester two where they all took part in an online pre-survey. Cohorts then studied Food Innovation Consultancy (UG) and

169   Work-Related Learning (MSc) modules respectively, where they had the opportunity to explore existing professional skills and

170   receive support to develop new ones. In these modules, specific reference was made to the CFGC and also The Chartered Institute

171   of Marketing (CIM; 2019) competencies framework. Students were directed to the resources for self-directed study and possible

172   use in the development of their personal portfolio. The post-survey was carried out online towards the end of semester two and

173   students were reminded to complete the survey before the end of the term.

174   CMU:
175   The cohort took part in the study at CMU were first year UGs enrolled on the Food Science and Technology program. Students

176   attended two sessions in semester one to obtain general information on how to prepare themselves for university and careers after

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[1] The Coronavirus pandemic meant that studies in semester 2 had to be completed online in all institutions. This did not affect the study for UoN and UoR as work was completed prior to "lockdown". SHU had completed the lectures containing the signposting of the resources but were not able to complete the survey in seminars as hoped, so response rates were affected. Students at CMU and MSc students at UoN were not able to be invited for participation in the second survey for the same reason.

177 graduation. One of those sessions took place during induction week in September 2019 where students received talks about

178 different food sectors from food technologists based at Cardiff Met Food Industry Centre. Students received information on how

179 food industry operates and what employers are looking for. The session continued by introducing a real job advertisement,

180 discussing what skills an individual need to secure that role. At the end of the session, students were introduced to different study

181 subjects and given direction on how to develop their skills and competencies whilst at university.

182 Students attended the second session in a form of a plenary towards the end of semester one where they were asked if they had

183 general understanding of the type of graduate job they may apply for. Students were then encouraged to discuss and search

184 relevant skills for that particular role. They were advised to think of suggestions on how they could acquire those skills. At the end

185 of the session, students shared their thoughts and findings with the class and they were informed about the future use of CFGC in

186 semester two, the aims of the study and how it will work

187 At the beginning of semester two students were reminded by email about the CFGC project and asked to complete the online pre-

188 survey. CFGC resources were presented on the VLE and staff encouraged the cohort to explore materials in routine

189 communications during the newly enforced online teaching activities[2].

190 UoR:
191 The CFGC was not currently integrated into UoR teaching but planned intervention with CFGC resources focused on first year UGs

192 and MSc students both studying food-related programs. Students had experienced prior careers education intervention. First year

193 UG students had access to online information on CV writing, covering letter, applications and interviews. They also had the

194 opportunity to attend a teaching session where students were introduced to careers service, placements and methods of applying.

195 At MSc level, students had an introduction to career services and also a meeting with an industry mentor and attended a food

196 symposium where individuals from the industry came and talked about their roles and careers.

197 A specific session was timetabled in semester two to give students an overview of the CFGC resources to obtain their immediate

198 feedback on this. The students were not required to formally use the resources beyond the one-off session. It was delivered in a

199 computer lab to allow students to explore the online resources mid-session. The session started by introducing the project to

200 students where they were asked to discuss the roles within the food industry that they were already aware and competencies that

201 they thought employers were looking for. Then students were asked to complete the paper-based version of the pre-survey. Next,

202 students were introduced to the CFGC and given a tour of different elements that it contained. Students were given time to explore

203 the CFGC materials and consider a role that they are interested in applying in the future and discovering relevant skills. At the end

204 of this exercise students were asked to complete the paper based version of the post-survey in-class.

205

206 **Results**

207 Survey participants

208 For three institutions (SHU, UoN, UoR) the pre-survey was issued and completed in class, whilst CMU issued the online survey

209 remotely - a total of 139 students took part in the first part of the study (CMU: 10, SHU: 55, UoN: 37, UoR: 37). Participants of the

210 post-survey reduced to a total of 66 students (CMU: 0, SHU: 12, UoN: 18, UoR: 36), due to the remote nature of the survey

211 completion by SHU students, and also the inability to satisfactorily access students at CMU and for MSc students at UoN due to the

212 Coronavirus pandemic[2].

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[2] The Coronavirus pandemic meant that some activities related to CMU studies (semester 2) moved online and students were not able to be reliably invited to participate the second survey.

The characteristics of the sample for the pre-survey are set out in Table 1 indicating that 110 (79%) of the participants were female, whilst 39% of the total were from outside the UK. In total, 45% of participants were 18-21 years old and 43% were 22-25 years old. Of the total number of students, 47 (34%) were studying a MSc program with the remainder 92 (66%) studying an UG qualification. Of the UG students, 66 (72%) were in their final year of study with 50% having taken the opportunity to undertake a placement. Participants characteristics of the post-survey are presented in Table 1 indicating that 51 (77%) of the participants were female with 48% from outside the UK. In total, 53% of participants were 18-21 years old and 39% were 22-25 years old. Of the total number of students, 23 (35%) were studying a MSc program with the remainder 43 (65%) studying an UG qualification. Of the UG cohorts, 27 (63%) were in their final year of study.

Analysis of quantitative data

Pre-Survey

Figure 1 illustrates the types of career paths the students are considering on graduation (a) and any specific role types under consideration (b). Results indicate a prevalence for seeking employment alongside or instead of further study or a research degree in their responses (it is worthy of note for non-UK contexts, that 'a graduate scheme' is a form of employment, not academic study in any form). Aside from appreciably lower interest in academic research from the MSc students, there appears similarity of response or interest in fields by UG and MSc students. Types of roles of interest are briefly considered in the discussion section.

Table 2 shows that the first question holds no significant association between understanding of desirable workplace skills and the level of their study, however it appears UG students are relatively more confident in understanding the personal skills they possess for working life.

Post-Survey

Responses to key single response questions in the post-survey are illustrated in Table 3 indicating that the majority of students positively received the introduction and integration of CFGC into teaching activities with all questions responded affirmatively at 78% or greater. Responses also indicate that students understood the resources and found them relevant and useful for career planning and job applications.

Analysis of qualitative responses (post-survey only)

Qualitative responses were analyzed and the generated themes gathered for the two open-ended responses in the post-survey (Q10 and Q11) are presented in Figures 2 and 3.

When asked "What did you like about the CFGC?" (Q10) and "What would you improve about the CFGC?" (Q11) similar profiles were observed for both UG and MSc cohorts. Proportions of response provided are based on the total items collected namely; Q10, 69 (UG), 25 (MSc) and Q11, 31 (UG), 16 (MSc). For the first question, *Provision of role types and profiles as well as Information on types of graduate skills or competencies required* (Figure 2) were the top two responses accounting for very similar percentages overall (32% and 20%, respectively in UG and 40% and 16%, respectively in MSc). Furthermore, UG students found it *very easy to use* (14.5% UG vs 8% MSc) whereas both cohorts similarly favored the tool *for personal use for job suitability and personal development* (17.4% and 16% for UG and MSc, respectively).

Overall, constructive and positive comments were obtained when the students were asked what to improve. It is noteworthy some students indicated that the tool was good and there was nothing that needed improvement (13% and 25% of UG and MSc students, respectively). However, 13% of both UG and MSc responses indicated that they would like to see more than three themes to choose from when using the online tool (University of Nottingham, n.d.) and the same proportion would like to view roles outside of the CFGC remit. Furthermore, 29% of UG and 31% of MSc would like to see examples of real job advertisement. Within the UG

251 cohort responses, some suggested improved visual impact and others requested features that were actually already available

252 (13%).

253

254 Conducted at the start of semester two the group comprised one male, five female UG students, where half that had undertaken a

255 placement year and within the overall group of six had representation of home (UK) and overseas students. Taking the findings of

256 the UoN post-survey as a basis for discussion the findings clearly confirmed the value of the tool to the students. However, areas

257 for further improvement centered on provision of "real-life" examples of graduates in each role and also improved visual impact of

258 the material beyond the current 'blue' tones. With respect to the teaching interventions, they found regular application of CFGC in

259 activities such as interrogating job specifications, CV writing and mock interviews very useful. The provision of posters on the wall

260 in the teaching room supported in-class activities whilst self-directed work drew on the online resources, including use of the

261 additional maps of CFGC *elements* against their core program of study at UoN (Weston et al., 2020b).

262 ## Discussion

263 Some of the interventions planned and the conclusion of the post-survey with some cohorts have clearly been hampered by the

264 global pandemic[1]. Despite this, the study continued and all collected data synthesized to establish some findings that could be of

265 worth for degree educators. Reflections of these initial findings could then enable development of future careers support using

266 CFGC, whilst considering additional strands of research. Although the study has been conducted in the UK, it is envisaged that

267 the findings will have some application for educators and students in other countries as the food sector is truly international and

268 similarities can be drawn by others.

269 In reviewing data, researchers were mindful that whilst the CFGC tool is aimed at food science students, some programs have

270 other disciplines embedded in curricula e.g. business, marketing and consumer sciences. Thus, students may wish to explore roles

271 outside of those highlighted in CFGC. The researchers appreciate they would not have the expertise to build extra vocations into

272 CFGC, however suggestions for inclusions of other frameworks or careers resources to support students moving into other fields

273 will be facilitated in those institutes with some of these broader programs. It was also suggested a generic 'role' be developed for

274 those planning to undertake postgraduate taught (MSc) programs to support their career planning and immediate application

275 processes.

276 Responses from students in the pre-survey indicate a readiness to explore career options and varying levels of prior understanding

277 of typical pathways and requirements, with MSc students perhaps having more confidence overall. Conversely the UG students

278 seem to have more clarity on the roles that they are interested in undertaking upon graduation. Roles such as *new product*

279 *development (NPD), doctoral study (PhD), company graduate schemes* and *sensory technologists* are commonly undertaken by

280 new graduates in the UK and to a certain extent in an international context (Hartel & Klawitter, 2008; Oreopoulou et al, 2015).

281 Relative numbers of responses in the pre-survey reflect this reality quite clearly. Whilst no known research has been undertaken to

282 confirm prevalence of roles in the UK, there is prior knowledge of industry employment patterns, in particular relating to destinations

283 of graduates from the 4 UK institutions in the study. In addition, review of graduate role advertisements over the past 5 years has

284 been undertaken, where for example the NPD role types are one of the most common initial graduate positions to undertake.

285 Participants selecting *nutritional roles* and *other non-technical food roles e.g. marketing and commercial*, perhaps reflect the nature

286 of their program of study and thus interest in this field.

287 The interrogation of the survey responses of the different groups of students or when comparing simple demographics, through

288 Chi-square testing, did not yield any significance e.g. Institution, age or placement. This was possibly in part due to the sample size

289   of the post-survey. Additionally, the longitudinal movement of individual role choices between pre survey and post survey questions

290   could not be sufficiently tested due to the pandemic. This needs further research, to establish if there are any changes to career

291   interest following the introduction of the tool.

292   Responses gathered from the post-survey and group interview indicate students value CFGC and its use in teaching in four UK

293   institutes, which is most encouraging.

294   Now confident in the success of the use of CFGC resources beyond UoN, there were some areas identified from the study that

295   could be considered to develop CFGC in the future. Transition from higher education into employment is challenging and students

296   should be supported, so they are ready to perform in a real work environment and able to respond positively to the demands of

297   employment (Pollard et al., 2015). Understanding the roles available more fully should enable students to identify the right positions

298   to apply for, and if successful in securing a role, start work better prepared for what may be expected of them. Supporting this aim,

299   a significant learning was that students from both UG and MSc cohorts would welcome examples of "real-life" job advertisement

300   and case study examples of graduates associated to each of the CFGC roles. These additional features would inform them of (i)

301   the type of role and how it fits within the company; (ii) what type of person may suit the role, and (iii) more insights into how an

302   individual may tailor job applications. This can aid reflection on whether they have the right competencies and thus personal

303   decision-making. Work to gather such material to add to CFGC resources will be undertaken by the researchers, including updating

304   the visual aspect of the components to maximize their impact as appropriate.

305   With respect to how CFGC can support teaching activities, this study has gathered viewpoints of different teaching interventions

306   across four UK institutes. The system of integration at UoN is now well established into a core, third year UG semester and it was

307   agreed the students gain from this focused, 'rich' approach, but there is argument it may be at a relatively late stage of the program

308   to provide the best use for some students. Respective cohorts have, also valued targeting students before they embark on

309   placement applications (UoR), before more detailed reflective modules (SHU), or use in plenary sessions to excite new

310   undergraduates (CMU). The researchers are also mindful that the level of support from internal careers services at each institute

311   varies and should be efficiently integrated into any plans for the future. For instance, mock interviews are already provided in some

312   institutes by generic careers advisors but perhaps could be better supported by the use of CFGC resources in future. As result of

313   this study, CGFC is now integrated into the educational processes at all four institutes; for example at CMU it is embedded in their

314   professional skills module where in the 2020-2021 year, students have engaged in an in-depth session about competency in the

315   Food Industry.

316   The learnings from this study have provided ideas and confidence in processes for a number of forms of interventions that all the

317   researchers intend to use flexibly and appropriately in the future with their UG and MSc student cohorts. For example although

318   whilst there are no plans to change the main timing of intervention in programs at each institute, responding to findings in this study,

319   at UoN there are additional earlier points of intervention in the second year of undergraduate study since spring 2020 exploring

320   specific modules and their impact on student's personal development in relation to desirable career competencies. Equally it has

321   been agreed that in future, all activities should be explicitly aligned, so the students can see how their career journey has been

322   facilitated during their whole program of study. Specific curriculum mapping against CFGC (as outlined earlier) may be employed

323   in other institutes to facilitate this and prior work aligned to this study at UoN (Weston et al, 2020b) informed by studies including

324   the limited work by other food science educators (Joyner, 2016), in addition to further publications (Joyner & Stevenson, 2017) may

325   help to support this endeavor for others. It is also appreciated that some of the terminology may be different for other countries,

326 however, the content and applicability of the approach to aid employability is perceived to be universal for the wider food industry

327 and Higher Education outside of the UK.

328 The perceived relevance of CFGC to students to help them choose the right career pathway in the food industry has been

329 established from this study. The researchers are mindful that whilst core food sciences graduate roles are likely to remain as

330 opportunities for students, businesses respond to future needs and thus types of roles and the nature of requirements to succeed in

331 them may evolve through time. For example, the CFGC element *digital capability* may increase in desirability for some roles, and

332 new roles may also emerge for our graduates and postgraduates. As such it is aimed for the CFGC survey originally conducted in

333 2017 (Weston et al., 2020a) to be reprised in the future, to enable any revisions to be made to reflect contemporary needs of

334 employers.

335 **Conclusion**

336 CFGC has been disseminated as open access resources (Weston, 2018; University of Nottingham, n.d) and used at UoN for a

337 number of years in teaching activities. This study has sought to understand the receptiveness of students at a range of UK

338 institutes to these resources and also explored the value of a variety of careers support interventions within food science-based

339 programs. In a climate of rapid change in teaching 'classrooms', striving to improve teaching quality for our students, including in

340 careers education, is never more important. The results of this study is aimed to support educators reflecting on this facet of their

341 degree provision and how they can best prepare their graduates for success in the food industry.

342

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345 feasible when routine teaching activities were significantly disrupted in 2020.

346

347 **Author Contributions (required for *JFS* original research manuscripts)**

348 All authors were responsible for the design, implementation (at respective institutes), and data analysis for the project. Draft and

349 revision activity for the report writing were also shared.

350

351 **Nomenclature or Appendix**

352 N/A.

353

354 **Supplemental Information – 1 of 1**

355 Title

356 Supporting Information 1 - Pre-Survey Questionnaire

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454   **LIST of CAPTIONS FOR TABLES AND FIGURES**

455   **Tables**

456   Table 1. Responses to questions identifying participant's characteristics

457   Table 2. Responses to initial multiple choice careers related questions included in pre-survey

458   Table 3. Analysis of responses collected from the post-survey questionnaire (multiple choice single answer)

459   **Figures**

460   Figure 1. Presentation of responses to pre-survey questions relating to future career possibilities (both allowing multiple responses)

461   *(Please refer to Supporting Information "Pre survey questionnaire, Section A, Q1 & Q2)*

462   A) Which of the following career paths would you like to take after graduation?

463   B) Have you considered any of the roles listed below?

464   Figure 2. Presentation of Q10 responses grouped into themes

465   E: Easy to Use; U: Useful or like – general; R: Provision of role types and profiles; S: Information on types of graduate skills or

466   competencies required; P: Personal use for job suitability and personal development; A: Supports job application; N: Did not like

467   anything

468   Figure 3. Presentation of Q11 responses grouped into themes

469   T: Want to choose more than 3 themes in the online tool; O: Would like other roles (some ask non food science roles); V: Improved

470   visual impact or interest of posters/profiles; D: More information on roles/job descriptions/real advertisement examples; J: More

471   support in how to in reality search for a role/job; M: Misunderstanding - wanting features that are already available (can't find?); L:

472   Too many elements; H: Not happy with the tools results when entered info; G: All good nothing to improve.

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474   END
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477   Table 1. Responses to questions identifying participant's characteristics

Variable	n	Mean	Std Dev.	Min	Max	Definition
Pre-Survey						
Country	139	1.74	0.95	1	3	1 UK, 2 EU, 3 Non EU
Gender	139	0.21	0.41	0	1	0 Female, 1 Male
Age	139	1.65	0.79	0	4	0 prefer not to say, 1:18-21, 2:22-25, 3:26-30, 4:31+
UG/PG	139	0.34	0.47	0	1	0 UG, 1 PG
UG Year of study	92	0.34	0.45	0	1	0 1st year UG, 1 Final year UG
Placement	92	0.72	0.50	0	1	1 placement (BSc final year only)
Post-Survey						
Country	66	1.89	0.96	1	3	1 UK, 2 EU, 3 Non EU
Gender	66	0.23	0.42	0	1	0 Female, 1 Male
Age	66	1.56	0.68	1	4	0 prefer not to say, 1:18-21, 2:22-25, 3:26-30, 4:31+
UG/PG	66	0.35	0.48	0	1	0 UG, 1 PG
UG Year of study	43	0.63	0.48	0	1	0 1st year UG, 1 Final year UG
Placement	27	0.63	0.49	0	1	1 placement (UG final year only)

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481   Table 2. Responses to initial multiple choice careers related questions included in pre-survey – compared between UG and MSc

Variable	n	UG	MSc	Chi-square (P value)
Do you know what types of skills/qualities are desirable for the career path that you want to take?				
I do not know	7	6 (6.52%)	1 (2.13%)	3.01
I have some idea	98	67 (72.83%)	31 (65.96%)	(0.222)
I am well aware	34	19 (20.65%)	15 (31.91%)	
How confident are you that you understand what skills you can offer the workplace?				
Not at all confident	2	2 (2.17%)	0 (0.0%)	11.39
Not confident	37	22 (23.91%)	15 (31.91%)	(0.010)*
Confident	85	63 (68.48%)	22 (46.81%)	
Very confident	15	5 (5.43%)	10 (21.28%)	

482   *Significant at p value <0.05

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484   Table 3. Analysis of responses collected from the post-survey questionnaire (multiple choice single answer)

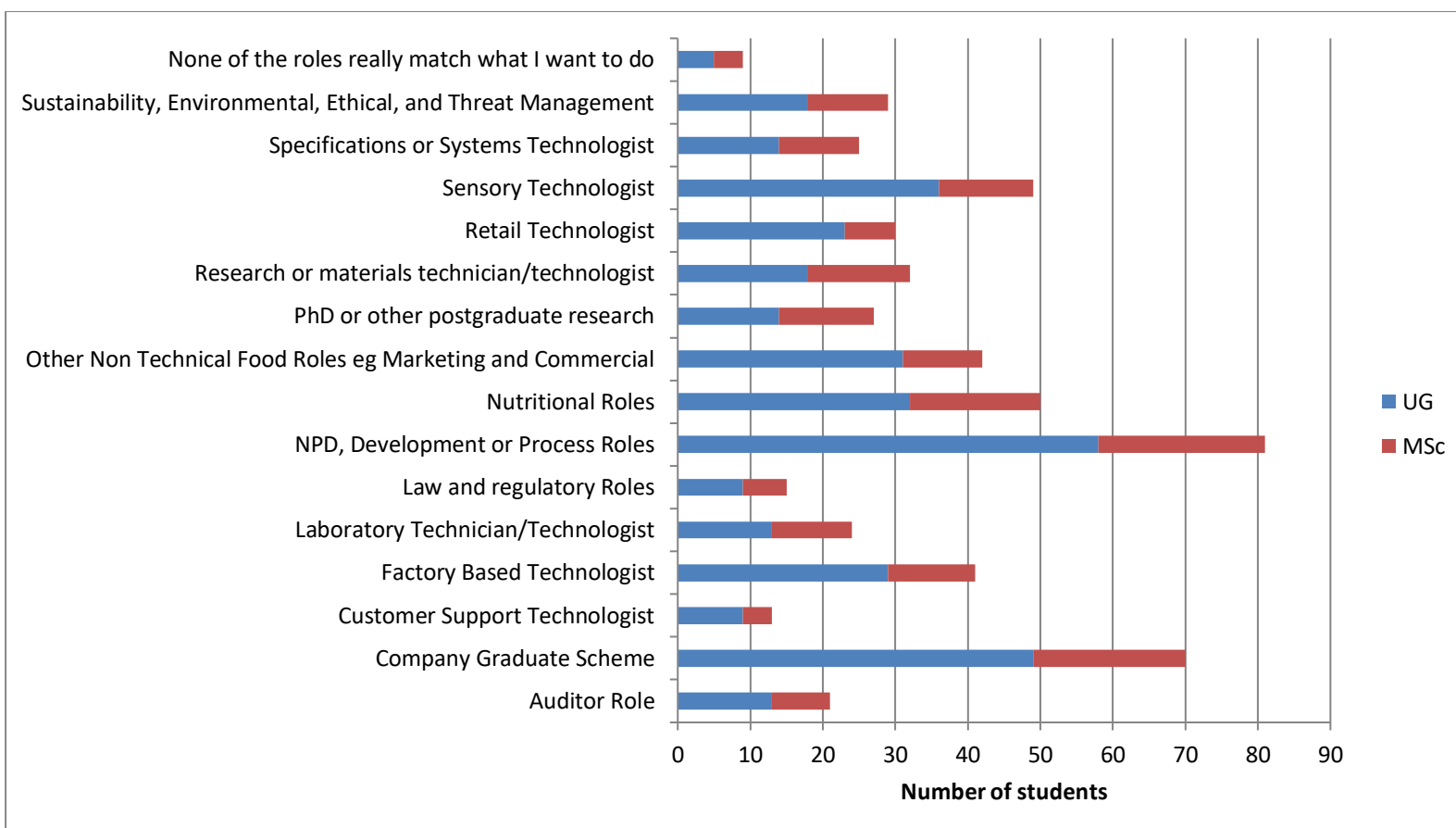| Variable	n	Strongly Agree %	Agree %	Neutral %	Disagree %	Strongly Disagree %
I am confident from the explanation given of the research undertaken, that the CFGC reflects food industry requirements for graduate competencies.	65	35.38	46.15	16.92	1.54	0
The terms and the language used in the CFGC is understandable to me.	64	42.19	46.88	7.81	3.13	0
Having 14 different roles outlined for graduates entering the food industry has been useful for me.	63	41.27	46.03	11.11	1.59	0
I have found the information on what is desirable for each of the roles useful in considering what the most appropriate first graduate roles are for me.	64	29.69	48.44	17.19	4.69	0
Overall the CFGC has been a useful reference with regard to supporting my future career planning and job applications. (SHU and UoN only)	28	46.43	46.43	7.14	0	0

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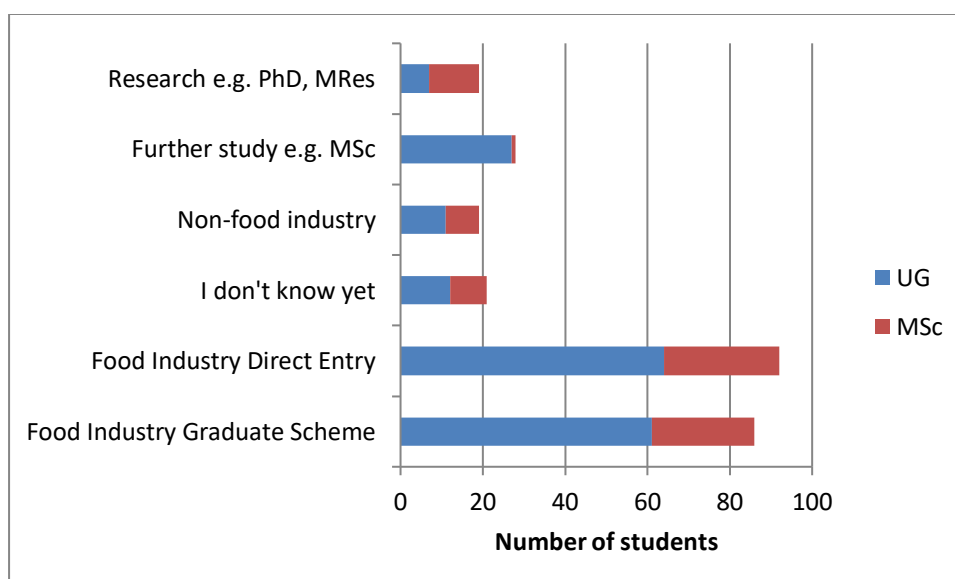
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