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SUPPLEMENTARY INFORMATION

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Translating academic careers into industry healthcare professions

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Exploring Biomedical Career Readiness

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Introduction

Many innovative medicines have their origins in our academic institutions, where fundamental research by dedicated graduate students and post-doctoral fellows is providing deep insights into complex diseases and rare genetic disorders. Translating such inventiveness into solutions or products that change clinical practice or become commercially viable is a complex process that requires dedicated teams of professionals to move and test each solution along a Research & Development (R&D) pipeline. During the last decade, we have seen tremendous growth in the Biotech/Medtech/Pharma industries, as they begin to commercialize a broad range of biomedical products and advanced cellular therapies. A key to the success of these new opportunities is a steady supply of talent, not only working in research settings, but in each of the many steps along the translational cycle (1). These include, among others, patenting, preclinical toxicology and safety studies, clinical trial design and execution, synthesis and testing of new chemical entities/biologics, quality control testing, regulatory assessment, market authorization and the many steps associated with commercialization: marketing, sales, distribution, etc.

An open question is where will this talent come from. For many of these activities, advanced science training and problem-solving skill sets acquired during graduate and post-graduate studies are considered valuable talents in individuals who are seeking to enter a biomedical career. Given the incredible opportunities in biomedicine, it seems prudent to ask whether our academic institutions are adequately preparing biomedical graduates for such careers. For example, do our graduates have a translational mindset, are they thinking like entrepreneurs, do they understand their talents, are they seeking new skill sets that will make them more attractive to future employers, are there proactive career development programs dedicated to advanced biomedical graduates, and do they actively help graduates explore new career opportunities? Based on previous studies, the answer to these questions are less than clear and rather point to students having to find their own way. One known contributor to this potential lack of readiness relates to the culture of biomedical institutions which are rather focused on the acquisition of knowledge for knowledge sake and the training of students towards careers in academia as research scientist or faculty position (2)(3). Unfortunately, studies show that only 15-18% of student graduating with a Ph.D. in the life sciences make it into tenure track positions (4)(5). There is also a strong path dependence (6) in academia, which tends to lead talented academics towards academic careers, despite the dearth of jobs (7). Such a situation might suggest that many of our talented biomedically trained scientists are not well prepared of careers outside of academia. Stated differently, what do academic institutions offer the other ~85% of graduates who will not stay in academia? Moreover, as a community, are we not missing out on an opportunity to foster the translation of new biomedical solutions by helping this well-trained talent pool identify equally gratifying careers in government, science policy making, product design, medtech & biotech industries or even founding a startup? To explore these important issues, we developed a survey to take the pulse of biomedical students in top academic institutions in Europe and the United States. Our data suggest that students are much more realistic about their limited academic career opportunities, yet yearn for a broader set of advisors and mentors to explore their career options and ultimately identify rewarding jobs that would further the translation of innovative medicines.

Investigative Goal

The central question addressed in this study is how prepared are biomedical students for career paths outside of academia and whether graduate programs (8) need to do more to foster broader career perspectives (9) and entrepreneurial mindsets (10) (11). We thus designed an international questionnaire to better understand the mindset and experiences of biomedical students in career related matters, while guiding the creation of proactive career development programs that meet the needs of the next generation of biomedical scientists.

Methods

A literature review on www.pubmed.gov helped to capture the status quo of how efficiently biomedical research is being translated as well as to understand how effective career development programs within university settings are meeting the needs of young biomedical students and future scientists. On this basis, the questionnaire "Career development in Life Sciences" was developed. The impulse survey was refined with the assistance of students in the Berlin "Career Development Initiative" (13), a grassroots initiative established and run by biomedical and medical students as well as postdoctoral fellows at the Einstein Center for Neurosciences in Berlin, Germany. Afterwards, the questionnaire was revised and pretested in several interviews with professionals.

The online questionnaire was then built on www. questionpro.com. and sent out by E-Mail to Master`s and Ph.D. students, Postdocs or Alumni from the life sciences at institutions across Europe, such Charité Universitätsmedizin Berlin, Germany, the Karolinska Institute, Sweden, the University of Oslo, Norway, Tel Aviv University, Israel and the United States of America such as Stanford University. The questionnaire was also published on https://www.science.hr. Responses were received over a period of nine months from January 25th, 2018 to October 25th, 2018 from 314 participants (n=314). It took on average 9 minutes to complete the survey. The mixed methods questionnaire contained of 26 questions (See supplemental material), including quantitative and qualitative answers (the latter with additional textboxes). All questions were in English and for most multiple answers were possible. The participants were asked to add more details if requested ("*other*"). All answers were listed in alphabetical order and, if suitable, completed by alternative answer options like "*uncertain*". The participation in the study was completely voluntary.

Results

Profile

The questionnaire was completed by 314 respondents (n=314), of which 66% were *female* (n=207) and 33% *male* (n=103), 1 respondent chose the option "*diverse*" and for 3 respondents the data was missing (see Supplemental data S1- Q 19). 39% held a *Master`s degree* (n=121), 26% a *Ph.D.* (n=82) and 11% a *bachelor`s degree* (n=35). 2% (n=7) chose the option "other" e.g. a diploma degree and were included in the Master's group. Information on the question of highest degree granted was lacking for 22% of respondence (n=69) (see Supplemental data S1- Q18).

Respondents had diverse life science backgrounds, with training in: Biology (n=160), Neurosciences (n=136), Biochemistry (n=124), Biotechnology (n=97) and Medical Neurosciences (n=79). A minority also had training in Physiology, Bioinformatics, Biophysics, Cognitive Sciences, Pharmacology, Medicine, Physics, Epidemiology,

Humanities, Pharmacy and Veterinary Medicine (multiple answers possible) (see Supplemental data S1- Q17).

Current Job Decisions

Seventy five percent of the respondents were currently at work in *Academia* (n=236). The remainder (~25%) had jobs in *industry* (n=16), *start-up* (n=13), *nonprofit organization* (n=11), *medical sector* (n=8) or *government* (n=7) (Figure 1a; see also Supplemental data S1-Q01). 54% of the respondents indicated, that their current job position was *research* (n=54%) (Figure 1b; see also Supplemental data S1-Q02). 24% found their current job via the *newspaper / internet* (n=74), or via their personal network (22%, n=68)(Figure 1c; see also Supplemental data S1-Q03). Most replied that *knowledge and/ or experience* (n=232) was crucial to getting a job, as well as *soft skills* (n=76) and an active *network* (n=70). Only 12% assessed *certificates* as important (n=39) for getting a job. Most responded that their university *career development offices* had little or no impact on getting a job (Figure 1d; see also Supplemental data S1-Q04).

Envisioned Career Paths

Forty seven percent of those surveyed (n=149) plan to *explore career options* after graduation, followed by 20% who seek to *get a high paid job* (n=63). 16% plan to care for *family* (n=51) or *do a Ph.D* (n=51) and respectively 14% plan to invest in *more education* (n=43). 12% are *uncertain* about their plans after graduation (n=37) (Figure 2a; see also Supplemental data S1- Q05).

It can be seen, that overall 37% wanted to end up working in *academia* (n=117). 31% planned to work in *industry* (n=98); here we found a significant difference between respondents *with job experience* who want to follow an industrial career path (n=34) and those, who *without job experience* (n= 64). The fraction who were *uncertain* about their future work area were double for those without job experience (n=61), compared to those who have job experience (n=31) (Figure 2b; see also Supplemental data S1-Q06). 71% stated that that their current job was considered a *direct* (38%) (n=119) or *indirect* (33%) (n=105) strategic step towards their dream job (Figure 2c; see also Supplemental data S1-Q07).

Development of Job Skills

Fifty two percent responded that there was a *career development office* at their last attended university (n=163), whereas 30% were *uncertain* about the existence of such a department (n=95) and 18% stated that such support does *not exist* at all (n=56) (Figure 3a; see also Supplemental data S1-08). Only 24% replied that their career development office supported *building an alumni network* (n=75). 17% answered their career development office assisted them with *soft skills* (n=53) while 16% answered, it also offered *coaching* (n=51) (Figure 3b; see also Supplemental data S1-09). 59% of the respondents' stated that their training prepared them for an *ability to work under pressure* (n=184). 56% felt that their academic training increased their *presentation skills* (n=177) and 54% their *problem-solving skills* (n=169) (Figure 3c; see also Supplemental data S1-Q10).

Respondents estimated that the following additional training would have been useful in their current position: 37% *network skills* (n=116), 26% *research experience* (n=82), 24% *soft skills* (n=76) and 24% *working experience* (n=67) (Figure 3d; see also Supplemental data S1-Q11). 46% replied that *work experience* (n=146), 43% *networking skills* (n=134) and 33% *getting a Ph.D.* (n=335) were critical to help them get their dream job (Figure 3e; see also Supplemental data S1-Q12).

Understanding the Mindset

We also asked the survey participants: "What is the goal of going to university in general? 93% replied, it was *education* (n=293), followed by 82% preparation for career (n=259), 23% *transition to adulthood* (n=73) and 13% *entrepreneurial skills* (n=41)(Figure 4a; see also Supplemental data S1-Q13). 74% of the respondents answered that they received more *advice on academia careers* (n=232), 18% in *industry* (n=57) and 14% in the *medical sector* (n=44) (Figure 4b; see also Supplemental data S1-Q14). We also asked: "Do you take the idea of translation into your personal job considerations? 46% replied *yes* (n=146), while 24% estimate it as *marginal* (n=75) and 14% clearly stated *no* (n=45). 7% were *not familiar* with the concept of translation (n=21) (Figure 4c; see also Supplemental data S1-Q15).

Thirty nine percent were of the opinion that *unawareness of options / lack or support* prevented them from following their ideal career path (n=122). 32% stated that they focused their studies on *one particular career direction* (n=99). 19% had *conflicting interests with their employer* (n=59), whereas 18% were of the opinion that *personal or family issues* prevented them from reaching the ideal career (n=56) (Figure4d; see also Supplemental data S1-Q16).

Discussion

It has been recognized for some time that most (86%) students graduating with doctoral degrees (PhD) in the biological sciences do not find a career within but outside academia (2,3). In earlier studies, it was nonetheless reported that 52% were focused on pursuing academic careers in 2017 (14). This number even increased in the meanwhile up to 56% in 2019 (15). In our impulse survey, only 37% still wanted to end up working in academia, indicating that this group from top biomedical universities/institutions were more realistic about their job opportunities. This number was observed to decrease with growing work experience. A similar effect has already been described by Roach and Sauermann in 2017 who claim, that PhD students lose interest in an academic career over the course of graduate training (7).

Still, 74% of the surveyed life scientists received the most advice about pursuing a career in academia. These data indicate that the mindset within academia is still oriented towards training most students for academic careers, rather than preparing them for the more likely scenario (86%), e.g. careers outside academia as has already been described in Nature's 2017 PhD Survey (14).

This disconnect is a potential contributor to the high level of frustration and insecurity among students, as well as psychological issues (9). It also appears to ignore a core need of graduate and postgraduate students for additional training in skill sets that are essential to survive outside academia, including management (16) and digital proficiencies (17). From an economic perspective, it is important to recognize that this very large pool of highly trained life scientists represent a critical underutilized resource. This vital resource could be used to support the growth and expansion of a booming medtech and biotech industries, that are poised to take advantage of academic inventiveness and bring new creative solutions to market. In this regard, it is crucial for academic institutions to also see that they are a very important part in the translational ecosystem, which requires closer partnership between pharmaceutical industries, government and life science startups (18) (19). Clearly, if academia is to truly foster translation, it will need to embrace the fact that most graduate students will have careers outside of academia and that they should be better trained to meet these opportunities (16) .

The translation of academic research into therapies improving health and quality of life for patients on a daily basis is a concept that resonates with 46% in our survey. Academic institutions generating the foundation for such new therapies and promoting their translation (20) should focus on career development (9), to support students in discovering fruitful and successful career paths and thereby enhance translational activities for the benefit of patients.

Many of the top universities across the globe are embracing programs that support translational research and clinical activities as well as the patenting of innovative ideas (Gehr and Garner 2016; others). Many also recognize that most of their students will not stay in academia, yet appear slow to recognize that these highly trained life scientists are well positioned to play active roles in industry and by doing so, support the translation of innovative solutions to the market, hence to patients. As a result of universities lack of support for students to migrate into industrial jobs, graduate students themselves often have the impression that their training will lead necessarily to a job as a professor or researcher running a lab. Our survey reveals that this mindset is changing and that many students recognize the fact that there are few positions in academia. This is reflected in

their top reasons for going to university, namely, 93% are there to get an outstanding education, and 82% to get prepared for their future career. Thus, career development programs and activities should be a center piece of all academic institutions.

Unfortunately, our survey also revealed that existing career development programs are by far not fulfilling student's needs, as 39% of the survey group claimed an *unawareness of options /lack or support* prevented them from following their ideal career path. Clearly, these students could benefit from forward thinking career development offices. Of note, 52% of the group was aware of the existence of a career development office at their university, however, the services provided were very limited services, e.g. preparing a CV. Consistent with this observation, most students felt that their career development office did not have a positive impact on them getting a job. This contrasts with proactive programs, such as the CDI in Berlin, that not only actively provides new training but organizes events to place graduates in exciting new jobs. Exemplifying that student groups can and should be part of their own career development solutions, by creating local student led organizations to complement more traditional support from university run career development offices. In doing so they increase their networking skills, explore career options, speak with individuals with non-academic careers and obtain additional training to increase their readiness for that dream job. These concepts are further emphasized by van Dijk et al: "To allow talented scientists to develop an identity and career as a translational scientist the current academic system needs to be reformed (21)".

Figure 1. Current Job Decisions

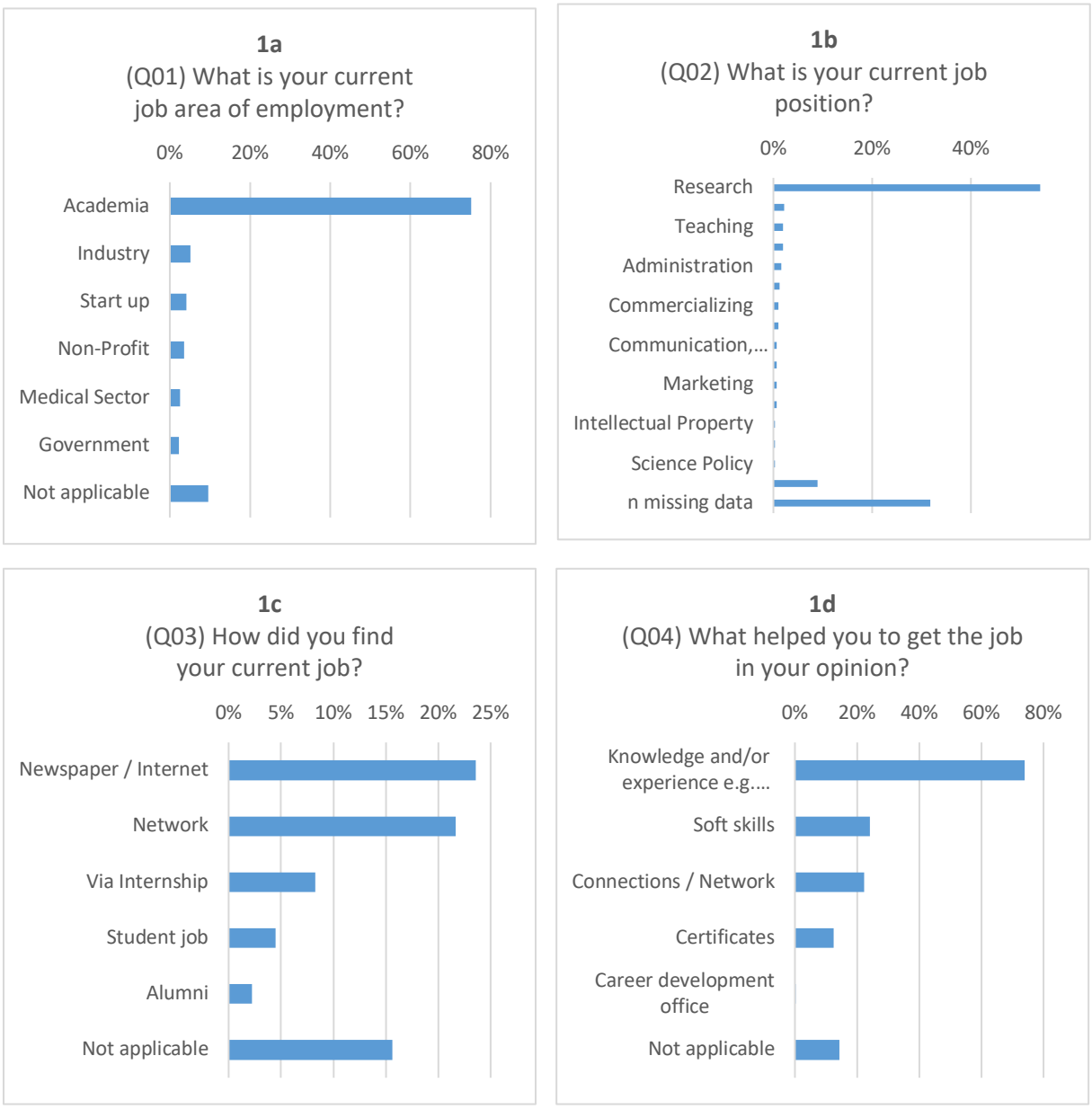


Figure 1. Responses to questions related to making current job decisions in the life sciences. Bar graph of data collected in question Q01 illustrating the percentages of total respondents working in different job areas (multiple answers possible). b) Bar graphs of data collected in question Q02 representing the current job distribution of respondents. c) Bar graph of data collected in question Q03 representing job search strategies (multiple answers possible). d) Bar graph of data collected in question Q04, representing a self-estimation in individual strength related to getting current jobs (multiple answers possible).

Figure 2. Envisioned Career Paths

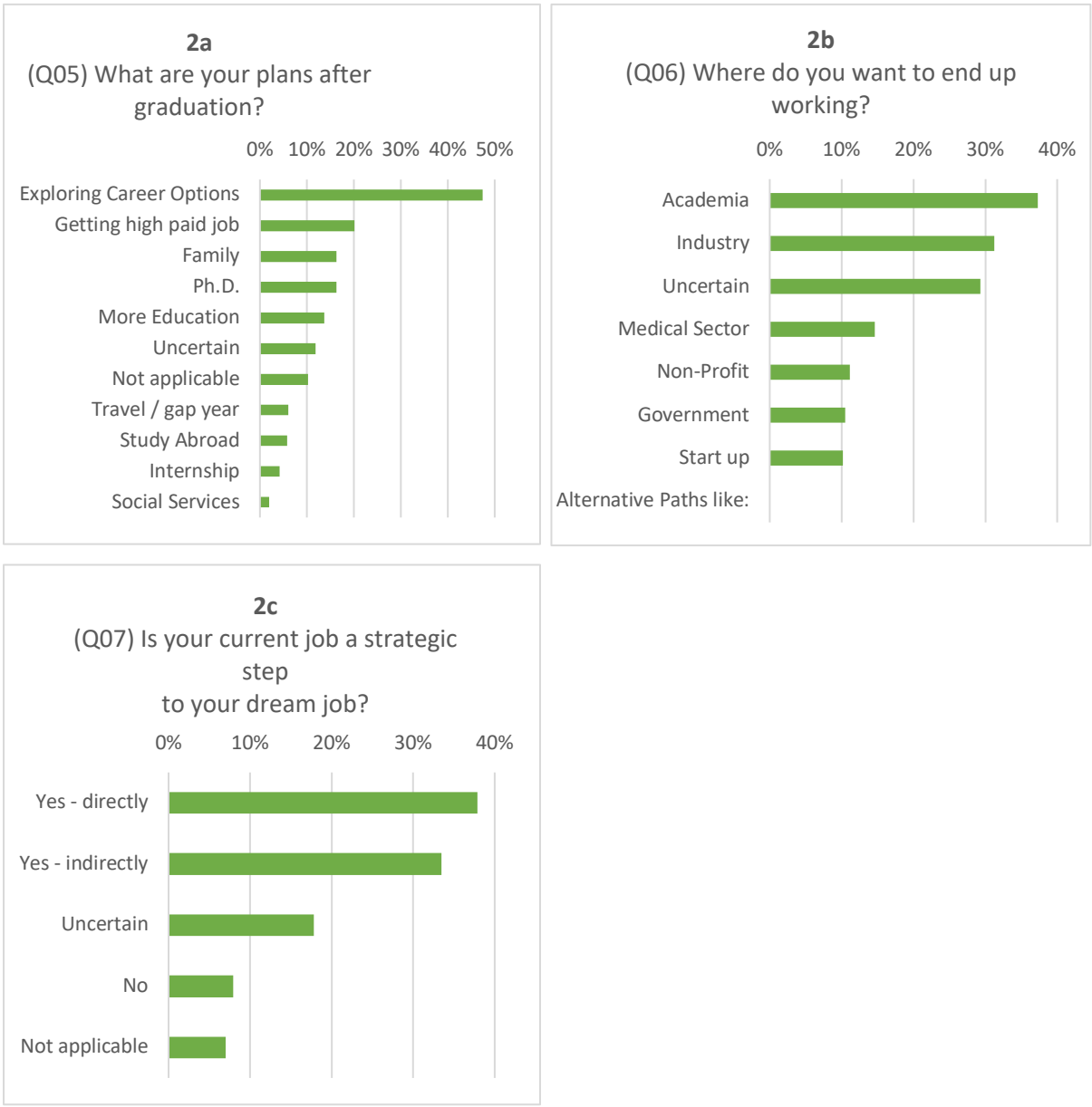
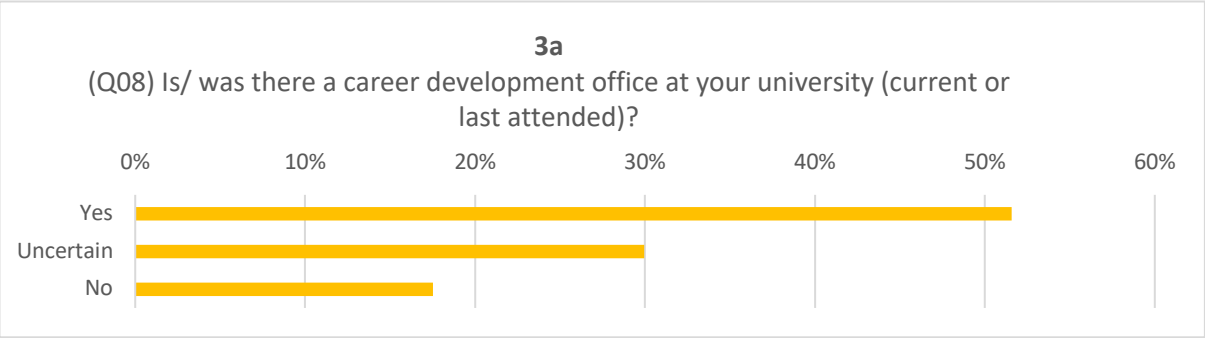
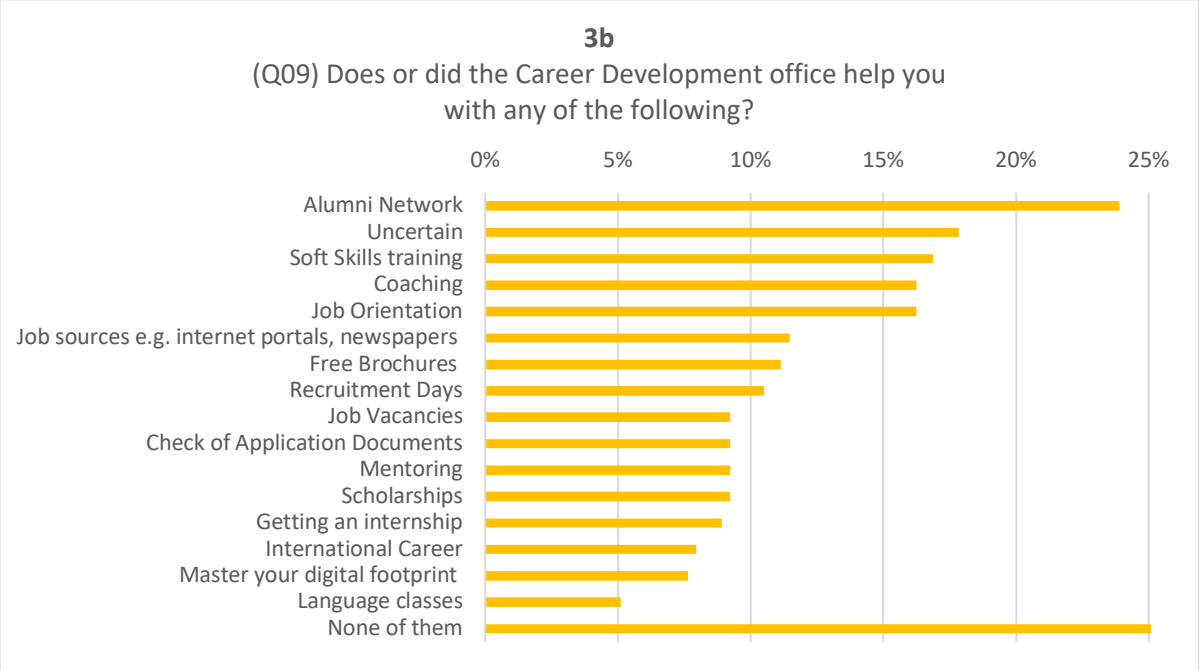
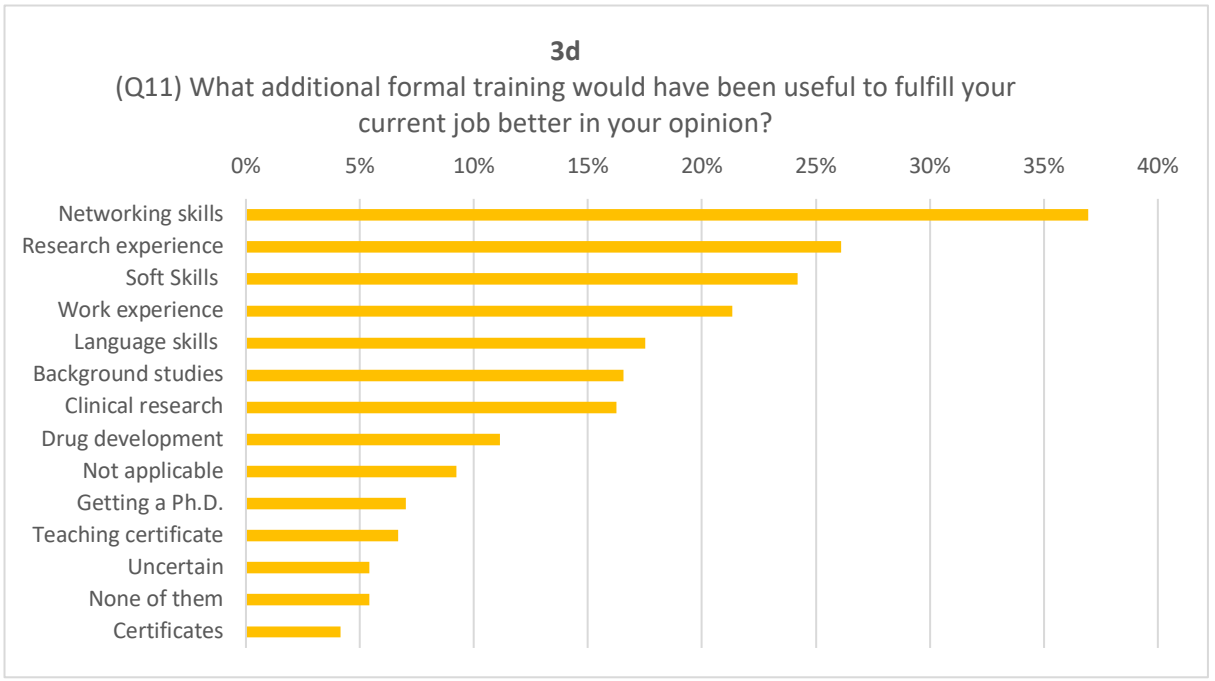


Figure 2. Responses to questions related to individually envisioned career paths for life science students. a) Bar graph of data collected in question Q05 representing the plans of individuals after graduation (multiple answers possible). b) Bar graph of data collected in question Q06 representing envisioned career areas of the respondents (multiple answers possible). c) Bar graph of data collected in question Q07 representing long term job strategies of the respondents (multiple answers possible).

Figure 3. Development of Job Skills







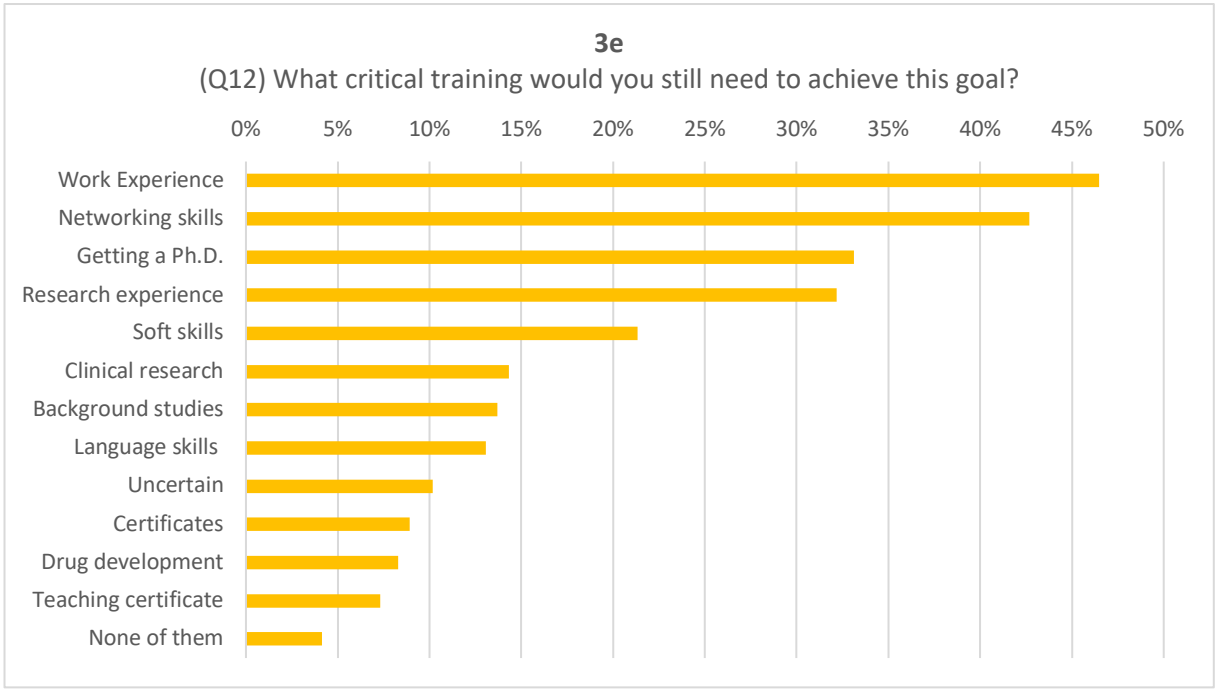


Figure 3. Responses to questions related to developing job skill in the life sciences. a)Bar graph of data collected in question Q08, reflecting the awareness of career development offices at attended universities (one answer accepted) b) Bar graph of data collected in question Q09, reflecting the type of services/support provided by those career development offices (multiple answers possible). c) Bar graph of data collected in question Q10, representing the effect of academic training on the general development of specific job skills (multiple answers possible). d) Bar graph of data collected in question Q11, representing the perceived need for additional training that would have helped in their current jobs (multiple answers possible). e) Bar graph of data collected in question Q12, representing the perceived need for additional training to excel in a desired future job (multiple answers possible).

Figure 4. Understanding the Mindset

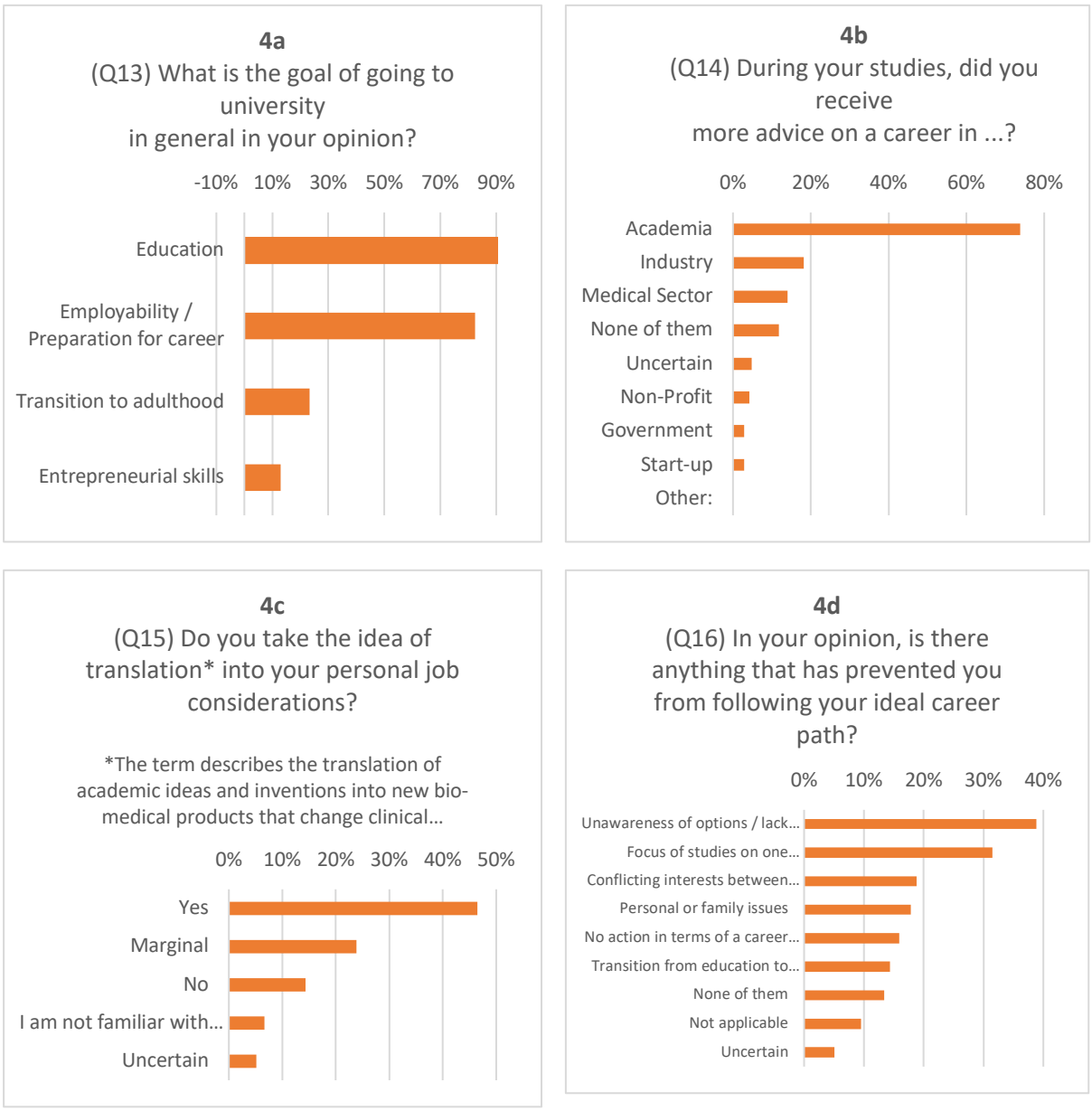


Figure 4. Responses to questions related to understanding the mindset of individual in the life sciences. a) Bar graph of data collected in question Q13, representing the general goal of students attending university (multiple answers possible). b) Bar graph of data collected in question Q14, representing the types of career advice received while attending university (multiple answers possible). c) Bar graph of data collected in question Q15, reflecting whether individuals considered the concept of translation of biomedical inventiveness in the development of their personal job strategy (multiple answers possible). d) Bar graph of data collected in question Q16, representing individual career barriers (multiple answers possible).

REFERENCES

1. A Practical Guide to Drug Development in Academia: The SPARK Approach. Editors: Mochly-Rosen, D. and K. Grimes. SpringerBriefs in Pharmaceutical Sciences and Drug Development. (2014)
2. Duda GN, Grainger DW, Frisk ML, Bruckner-Tuderman L, Carr A, Dirnagl U, et al. Changing the mindset in life sciences toward translation: a consensus. Science translational medicine. 2014;6(264):264cm12.
3. Gehr S, Garner CC. Rescuing the Lost in Translation. Cell. 2016;165(4):765-70.
4. Sauermann H, Roach M. Science PhD career preferences: levels, changes, and advisor encouragement. PLoS One. 2012;7(5):e36307.
5. Fuhrmann CN, Halme DG, O'Sullivan PS, Lindstaedt B. Improving graduate education to support a branching career pipeline: recommendations based on a survey of doctoral students in the basic biomedical sciences. CBE life sciences education. 2011;10(3):239-49.
6. Sydow J, Schreyogg G, Koch J. Organizational Path Dependence: Opening the Black Box. Acad Manage Rev. 2009;34(4):689-709.
7. Roach M, Sauermann H. The declining interest in an academic career. PLoS One. 2017;12(9):e0184130.
8. Begg MD, Bennett LM, Cicutto L, Gadlin H, Moss M, Tentler J, et al. Graduate Education for the Future: New Models and Methods for the Clinical and Translational Workforce. Clin Transl Sci. 2015;8(6):787-92.
9. Rubio DM, Robinson G, Gabrilove J, Meagher EA. Creating effective career development programs. J Clin Transl Sci. 2017;1(2):83-7.
10. Langer LJ. Building a curriculum for bioentrepreneurs. Nature Biotechnology. 2014;32(9):863-5.
11. Rosier J, O'Connell D. Nuances in the entrepreneurship training tool box. Nature Biotechnology. 2015;33(2):133-4.
12. Robinson GF, Schwartz LS, DiMeglio LA, Ahluwalia JS, Gabrilove JL. Understanding Career Success and Its Contributing Factors for Clinical and Translational Investigators. Acad Med. 2016;91(4):570-82.
13. Shcherbinin S, Grimes J, Bator A, Cwikla JB, Celler A. Three-dimensional personalized dosimetry for (188)Re liver selective internal radiation therapy based on quantitative post-treatment SPECT studies. Phys Med Biol. 2014;59(1):119-34.
14. Woolston C. Graduate survey: A love–hurt relationship. Nature. 2017;550(7677):549-52.
15. Woolston C. PhDs: the tortuous truth. Nature. 2019;575(7782):403-6.
16. Froshauer S. Careers at Biotech Start-Ups and in Entrepreneurship. Cold Spring Harb Perspect Biol. 2017;9(11).
17. Börner K, Scrivner O, Gallant M, Ma S, Liu X, Chewning K, et al. Skill discrepancies between research, education, and jobs reveal the critical need to supply soft skills for the data economy. Proc Natl Acad Sci U S A. 2018;115(50):12630-7.
18. Thomas CJ, McKew JC. Playing well with others! Initiating and sustaining successful collaborations between industry, academia and government. Curr Top Med Chem. 2014;14(3):291-3.
19. Freedman S, Mullane K. The academic-industrial complex: navigating the translational and cultural divide. Drug discovery today. 2017;22(7):976-93.
20. Garbutt J, Antes A, Mozersky J, Pearson J, Grailer J, Toker E, et al. Validating curricular competencies in innovation and entrepreneurship for biomedical research trainees: A modified Delphi approach. J Clin Transl Sci. 2019;3(4):165-83.
21. van Dijk SJ, Domenighetti AA, Gomez-Ospina N, Hunter P, Lindemans CA, Melotte V, et al. Building a Professional Identity and an Academic Career Track in Translational Medicine. Front Med (Lausanne). 2019;6:151.

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Supplemental data (S1)

1) Current Job Decisions

Q01. What is your current job area of employment?

	Academia	Industry	Start up	Non-Profit	Medical Sector	Government	Not applicable	Other
n selected	236	16	13	11	8	7	30	0
n non-selected	78	298	301	303	306	307	284	314
total (n = 314)	314	314	314	314	314	314	314	314
selected in %	75%	5%	4%	4%	3%	2%	10%	0%

Q02. What is your current job position (choose 1)?

	Research	Management	Teaching	Medical Sector	Administration	Business development	Commercialization	Faculty position	Communication, Science writing	Consulting	Marketing	Regulatory Affairs	Intellectual Property	IT	Science Policy	Not applicable	n missing data	Other
n selected	169	7	6	6	5	4	3	3	2	2	2	2	1	1	1	28	100	0
n non-selected	145	307	308	308	309	310	311	311	312	312	312	312	313	313	313	286	215	314
total (n = 314)	314	314	314	314	314	314	314	314	314	314	314	314	314	314	314	314	315	314
selected in %	54%	2%	2%	2%	2%	1%	1%	1%	1%	1%	1%	1%	0%	0%	0%	9%	32%	0%

Q03 How did you find your current job?

	Newspaper / Internet	Network	Via Internship	Student job	Alumni	Not applicable	Career days	Career development	Other
n selected	74	68	26	14	7	49	0	0	0
n non-selected	240	246	288	300	307	265	314	314	314
total (n = 314)	314	314	314	314	314	314	314	314	314
selected in %	24%	22%	8%	4%	2%	16%	0%	0%	0%

Q04. What helped you to get the job in your opinion?

	Knowledge and/or experience e.g. background, studies	Soft skills	Connections / Network	Certificates	Career development office	Not applicable	Other
n selected	232	76	70	39	1	45	0
n non-selected	82	238	244	275	313	269	314
total (n = 314)	314	314	314	314	314	314	314
selected in %	74%	24%	22%	12%	0%	14%	0%

2) Envisioned Career Paths

Q05. What are your plans after graduation?

	Exploring Career Options	Getting high paid job	Family	Ph.D.	More Education	Uncertain	Not applicable	Travel / gap year	Study Abroad	Internship	Social Services	Military Service	Other
n selected	149	63	51	51	43	37	32	19	18	13	6	0	0
n non-selected	165	251	263	263	271	277	282	295	296	301	308	314	314
total (n = 314)	314	314	314	314	314	314	314	314	314	314	314	314	314
selected in %	47%	20%	16%	16%	14%	12%	10%	6%	6%	4%	2%	0%	0%

Q06. Where do you want to end up working?

	Academia	Industry	Uncertain	Medical Sector	Non-Profit	Government	Start up	Alternative Paths
n selected	117	98	92	46	35	33	32	0
n non-selected	197	216	222	268	279	281	282	314
total (n = 314)	314	314	314	314	314	314	314	314
selected in %	37%	31%	29%	15%	11%	11%	10%	0%

Q07 Is your current job a strategic step to your dream job?

	Yes - directly	Yes - indirectly	Uncertain	No	Not applicable
n selected	119	105	56	25	22
n non-selected	314	314	314	314	314
total (n = 314)	195	209	258	289	292
selected in %	38%	33%	18%	8%	7%

3) Development of Job Skills

Q08. Is/Was there a career development office at your university (current or last attended)?

	ALL	Yes	Uncertain	No
n selected	314	162	94	55
n non-selected	0	152	220	259
total (n = 314)	314	314	314	314
selected in %	100%	52%	30%	18%

Q09. Does or did the career development office help you with any of the following?

	Alumni Network	Uncertain	Soft Skills training	Coaching	Job Orientation	Job sources e.g. internet portals, newspapers	Free Brochures	Recruitment Days	Job Vacancies	Check of Application Documents	Mentoring	Scholarships	Getting an internship	International Career	Master your digital footprint	Language classes	None of them	Other
n selected	75	56	53	51	51	36	35	33	29	29	29	29	28	25	24	16	85	0
n non-selected	239	258	261	263	263	278	279	281	285	285	285	285	286	289	290	298	229	314
total (n = 314)	314	314	314	314	314	314	314	314	314	314	314	314	314	314	314	314	314	314
selected in %	24%	18%	17%	16%	16%	11%	11%	11%	9%	9%	9%	9%	9%	8%	8%	5%	27%	0%

Q10. Does or did your training prepare you for any of the following job skills?

	Ability to work under pressure	Presentation skills	Problem solving skills	Commitment to a project/goal	Planning and Organizing	Teamwork	Initiative / Self-Motivation	Communication skills	Time Management	Project Management	Lifelong Learning	Adaptive skills	Flexibility	Computing skills	Self confidence
n selected	184	177	169	136	135	133	110	106	101	96	94	92	89	83	79
n non-selected	130	137	145	178	179	181	204	208	213	218	220	222	225	231	235
total (n = 314)	314	314	314	314	314	314	314	314	314	314	314	314	314	314	314
selected in %	59%	56%	54%	43%	43%	42%	35%	34%	32%	31%	30%	29%	28%	26%	25%

	Creativity	Decision Making	Integrity	Leadership skills	Translational Skills	Negotiation skills	Numeracy	Entrepreneurial skills	None of them	Uncertain	Business Development skills	Commercial Awareness	Other
n selected	77	73	60	46	30	18	15	11	10	7	5	5	0
n non-selected	237	241	254	268	284	296	299	303	304	307	309	309	314
total (n = 314)	314	314	314	314	314	314	314	314	314	314	314	314	314
selected in %	25%	23%	19%	15%	10%	6%	5%	4%	3%	2%	2%	2%	0%

Q11. What additional formal training would have been useful to fulfill your current job better in your opinion?

	Networking skills	Research experience	Soft Skills	Work experience	Language skills	Background studies	Clinical research	Drug development	Not applicable	Getting a Ph.D.	Teaching certificate	Uncertain	None of them	Certificates	Other
n selected	116	82	76	67	55	52	51	35	29	22	21	17	17	13	0
n non-selected	198	232	238	247	259	262	263	279	285	292	293	297	297	301	314
total (n = 314)	314	314	314	314	314	314	314	314	314	314	314	314	314	314	314
selected in %	37%	26%	24%	21%	18%	17%	16%	11%	9%	7%	7%	5%	5%	4%	0%

Q12. What critical training would you still need to achieve this goal?

	Work Experience	Networking skills	Getting a Ph.D.	Research experience	Soft skills	Clinical research	Background studies	Language skills	Uncertain	Certificates	Drug development	Teaching certificate	None of them	Other
n selected	146	134	104	101	67	45	43	41	32	28	26	23	13	0
n non-selected	168	180	210	213	247	269	271	273	282	286	288	291	301	314
total (n = 314)	314	314	314	314	314	314	314	314	314	314	314	314	314	314
selected in %	46%	43%	33%	32%	21%	14%	14%	13%	10%	9%	8%	7%	4%	0%

4) Understanding the Mindset

Q13. What is the goal of going to university in general in your opinion?

	Education	Employability / Preparation for career	Transition to adulthood	Entrepreneurial skills	Uncertain	Other
n selected	293	259	73	41	2	0
n non-selected	21	55	241	273	312	314
total (n = 314)	314	314	314	314	314	314
selected in %	93%	82%	23%	13%	1%	0%

Q14. During your studies, did you receive more advice on a career in…?

	Academia	Industry	Medical Sector	None of them	Uncertain	Non-Profit	Government	Start-up	Other
n selected	232	57	44	37	15	13	9	9	0
n non-selected	82	257	270	277	299	301	305	305	314
total (n = 314)	314	314	314	314	314	314	314	314	314
selected in %	74%	18%	14%	12%	5%	4%	3%	3%	0%

Q15. Do you take the idea of translation into your personal job consideration?

	Yes	Marginal	No	I am not familiar with translation	Uncertain
n selected	146	75	45	21	16
n non-selected	168	239	269	293	298
total (n = 314)	314	314	314	314	314
selected in %	46%	24%	14%	7%	5%

Q16. In your opinion, is there anything that has prevented you from following your ideal career path?

	Unawareness of options / lack of support	Focus of studies on one particular career direction (e.g. academia)	Conflicting interests between me and my supervisor/employer / lack of support	Personal or family issues	No action in terms of a career planning on my own behalf	Transition from education to work in a foreign country	None of them	Not applicable	Uncertain	Other
n selected	122	99	59	56	50	45	42	30	16	0
n non-selected	192	215	255	258	264	269	272	284	298	314
total (n = 314)	314	314	314	314	314	314	314	314	314	314
selected in %	39%	32%	19%	18%	16%	14%	13%	10%	5%	0%

Profile of survey participants

Q17. What disciplines have you studied (choose all appropriate)?

	Biology	Neuroscience	Biochemistry	Biotechnology	Medical Neurosciences	Physiology	Bioinformatics	Biophysics	Cognitive Sciences	Pharmacology
n selected	160	136	124	97	79	49	48	35	35	29
n non-selected	154	178	190	217	235	265	266	279	279	285
total (n = 314)	314	314	314	314	314	314	314	314	314	314
selected in %	51%	43%	39%	31%	25%	16%	15%	11%	11%	9%

	Medicine	Physics	Epidemiology	Humanities	Pharmacy	Veterinary Medicine	Other
n selected	27	19	17	17	9	4	0
n non-selected	287	295	297	297	305	310	314
total (n = 314)	314	314	314	314	314	314	314
selected in %	9%	6%	5%	5%	3%	1%	0%

Q18. Highest degree granted

	Master`s Degree	Ph.D.	Bachelor`s Degree	Other	n missing data
n selected	121	82	35	7	69
n non-selected	193	232	279	307	245
total (n = 314)	314	314	314	314	314
selected in %	38,5%	26,1%	11,1%	2,2%	22,0%

Q19. Gender

	female	male	diverse	n missing data
n selected	207	103	1	3
n non-selected	107	211	313	311
total (n = 314)	314	314	314	314
selected in %	65,9%	32,8%	0,3%	1,0%