

Do alumni practise what you teach? Impact of Science master-tracks: preparation for academic careers versus preparation for societal-oriented careers

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Abstract

Career development of Science students seems dependent on more than disciplinary education, such as the nature and focus of career preparation. In this study we compare graduate outcomes of science students at the University of Groningen, completing two master-level program streams with different focal points, by using career progress surveys from alumni (n=242) with self-reported societal development data. The first program is a classical research-oriented master (ROM), that aims to prepare students for a career within academia. The second program, called Science, Business and Policy (SBP) focusses on a societal profile and aims to prepare for a career outside academia.

SBP is different from ROM because it has a practical and multidisciplinary orientation (vs a theoretical and mono-disciplinary orientation in ROM) and it includes a long work-placement outside academia, a form of work based learning. The differences in the tracks translate to differences in career paths. Both profiles resulted in good but distinct career opportunities, corresponding to alumni's discipline and sector. Although ROM-alumni felt especially prepared for an academic career, only a quarter actually continued in academia and many were employed in education. In contrast, most SBP-alumni were employed in business or policy. Targeting specific job preparation seems more successful with a societal profile. Reflecting on skills, in both groups research-related skills decreased during careers while soft skills increased. Alumni were generally satisfied with their first job and also with their current job, with SBP-alumni scoring significantly higher on satisfaction with income, status, appreciation and perspective. It can be concluded that diversification in educational profiles changes the societal career paths of science students.

Keywords

Science and society, master track impact, employability, career development, alumni satisfaction

Introduction

Today's science students face more diverse career decisions during their studies than a few decades ago (Grooters et al., 2021b). The rather self-evident focus on a research career has been widened towards more societal oriented perspectives, leading to careers in business and policy. The Bologna process (Bologna Working Group, 2004) aimed at coherence in higher education systems across Europe as well as strengthening the quality and societal relevance of academic

learning (Keeling, 2006). One of the consequences of the European Bologna Process for Dutch Science master programs has been an extension from a one-year to a two-year master curriculum. In view of the Bologna process, it seems logical for science faculties to broaden their educational scope and focus on more than only how to do research. Otherwise, a career fallout is likely created since there is no room to facilitate all master graduates with a PhD position (Enders, 2004). Inevitably master students will continue in jobs outside academia (Leyman, 2009), where there is a high demand for well-educated and well-skilled personnel (De Grande et al., 2014).

However, preparation for an academic career requires different skills compared to a career outside academia (Enders, 2004). Differentiating between programs thereby goes further than offering more disciplines, it is also about offering programs fine-tuned to different career perspectives including work based learning approaches (Grooters et al., 2021a). Consequently, three different science master profiles (all International Standard Classification of Education (ISCED) level 7) were introduced at the university of Groningen, the Netherlands, after the introduction of Bologna in 2002 with a research, an educational and a societal orientation. Whereas the interest of students for a societal orientation has increased over the years (Grooters et al., 2021a), an evaluation of how effective this policy aimed at a better alignment of higher education and societal demands, has been suggested (WEXHE Consortium, 2019) but hardly undertaken.

This paper will compare the retrospective view on career perspectives of science master alumni from two different profiles within the University of Groningen. Alumni from a research-oriented master (ROM) program, and a societal profile, the science, business and policy (SBP) program, were surveyed on career and societal development and skills obtained during and after graduation. The ROM-profile corresponds to a classical research master's program, from which a comparable program is available at every science university. Currently this is the regular education form of science masters and the common way to prepare students for an academic career around the world. However, very few graduates will go on to be academics and often Universities offer some kind of alternative program to prepare students for a career outside academia (Enders, 2004). In Groningen a very outspoken example of this alternative is the SBP-profile, that is aimed at applying scientific knowledge to business and policy cases in order to solve societal challenges. By exploring the differences between SBP and ROM, a broader translation to other educational settings or regions can be made. The results of this paper will therefore be of interest for science policy makers, educational staff and potentially future students of research-, and societal- master profiles.

Societal education profile: the position of students

A relatively high social engagement among people entering higher education (Egerton, 2002) is found, which implies a purported desire to tackle social problems within their degrees. This is in line with what we found in our own previous study in Groningen, where an important factor to choose a science degree program turned out to be the potential for those degrees to offer opportunities for disciplinary learning from a societal perspective and with direct societal relevance (Grooters et al., 2021a). Learning the right skills is important in terms of (future) job satisfaction, and a match of skills can be a good predictor for higher wages to be expected (Allen & van der Velden, 2001; De Santis, 2021). However, students often do not know which skills are required and are thus not sufficiently prepared for the non-academic labour market (Leyman, 2009). For instance, among doctoral candidates there seems to be an underestimation of the importance of transferable skills like project management and business skills (De Grande et al., 2014). There seem to be a remarkable lack of awareness of the mismatch in skills among students (Usher, 2002). For master students it is also important to make a well-timed decision for a career outside academia, since over-qualification in general, with for example a PhD, can

result in negative outcomes on the labour market (Mavromaras et al., 2013). It is found that the industry prefers experienced and broadly oriented master students over doctorate holders, especially in smaller companies (Borrell-Damian et al., 2010).

More generally, policy institutions and the industry have a different appreciation of research skills compared to academia (Borrell-Damian et al., 2010). Besides research skills, governmental agencies and companies expect soft skills, like leadership skills. A combination of these skills can influence the future career perspective of the individual student, for instance by supporting knowledge validation in general (De Grande et al., 2014). Master students can play a big role in university-industry collaboration (Santos et al., 2020) and can help companies with the application of scientific knowledge, as recently also shown by de Wit-de Vries et al. (2019).

In the past, the main tasks of universities were focussed on conducting research and providing education on research. Recently, cooperation with companies and other societal partners as well as valorisation, integrating social awareness and responsibility into broader university operations, and also into curriculum have become important additions. The University of Groningen added 'the use of knowledge' as the third pillar of its mission (University of Groningen, n.d.) besides education and research, indicating its appreciation of transferring academic knowledge to society and direct application of knowledge. This approach fits an increasing trend of community engagement of universities (Chile & Black, 2015). Corporate social responsibility is becoming more important for universities (Ali et al., 2021) like most organizations. It seems to contribute not only to a positive brand but also to positive outcomes for individual students (Chile & Black, 2015). However, shifting towards a broader role and creating a social pact between academic science and society (Gimenez & Bonacelli, 2021) can be challenging to universities (Göransson et al., 2009).

The social responsibility of universities has, in a curious way, focused mainly on entrepreneurship. Academic transition towards entrepreneurship has been encouraged by governments now for two decades (as already described by Etzkowitz et al., 2000) and an explicit societal role has been stimulated simultaneously, as exemplified by the society profile in the Bologna papers (Bologna Working Group, 2004). Recent European policy initiatives comprise projects on work-based learning and entrepreneurship (WEXHE Consortium, 2019), aimed on cooperation with small-medium enterprises, (RECAPHE Consortium, 2021) and employability (International Teaching & Learning for Employability and Citizenship (INTELEC), 2018). All of these projects stimulate universities to pay attention to broad competences and skills of students by gaining onsite experience.

Universities often do offer programs to promote entrepreneurial skills of students (Etzkowitz et al., 2000). One can raise doubts on how effective these programs are, as these programs tend to focus too much on the economical side of running an own business. (Siegel & Wright, 2015). The translation of social responsibility of universities in only entrepreneurship seems too narrow. For academics, entrepreneurial engagement might be more feasible within policy and business institutions, in other words in an intrapreneurial context (Blanka, 2019) rather than in the role of the independent entrepreneur. Thereby stimulation of different transferable and career management skills, besides strict scientific skills, can be considered as social responsibility of universities. (Olesen et al., 2020). Still, transferable skills are often described in policy recommendations for universities as important values (European University Association, 2007), but are often absent in practise (Enders, 2004).

Societal program in practice: Science Masters in Groningen

Inspired by the Bologna process, the Faculty of Science and Engineering (FSE) of the University of Groningen asks master students to select both a scientific discipline (for example chemistry or biology) and a type of profile to adjust to their future career plans. So, a student not only has to pay attention to what to study, but also to how their choices influence their employment after graduation (Grooters et al., 2021b). The three types of profiles mentioned before that are available as two-year master programs are laid out here:

1. A research-oriented master program (from now on ROM), in which students spend both years of their master on research courses and carrying out large research projects (at least two master theses), colloquia and learning to write scientific articles. Students are trained to become a researcher. The employment perspective is one within academia, ideally continued in a PhD.
2. The Science, Business and Policy program (from now on SBP), that shares an identical first year with the ROM (i.e., research courses, thesis and colloquium). In the second year, business and policy courses based on work-based learning, and a long work-placement (experience on the work floor) are offered. By pursuing this option, the students can build their societal profile and are trained to become a science advisor and use scientific knowledge to solve problems in society. The matching careers are typically outside academia, as an intrapreneur in a company or a (non-) governmental organisation.
3. A communication and education program, with an identical first-year program and training on education and pedagogy or journalism in the second year. This program prepares students for careers as (high-school) teachers or for a job in science communication.

In this paper, we will focus on SBP and ROM only as we will evaluate the effectiveness of a differentiation between a research and societal profile, that leads to the main research question of this article, which is whether a track aimed at preparation for an academic career really leads to other career paths as a track that aims to prepare for a career outside academia. A comprehensive survey among SBP, and ROM-alumni was conducted on their career path after graduation.

Previously we reported on assessments in the same cohorts of alumni to investigate motivation for their master programs, self-perceived learning outcomes and skills, as well perceived preparation for a career within or outside academia (Grooters et al., 2021b). This study showed that alumni of both SBP-, and ROM-programs felt well prepared for their career, although each for a different career. For a career outside academia, the SBP-alumni felt significantly better prepared and for a career within academia, the ROM-alumni felt significantly more prepared. But the question that remains is how this appreciation translates in their actual career. The current article therefore compares the reflections of ROM and SBP-alumni both right after graduation and the state of their current career. We will relate the outcomes to the employment expectation of the university's master profiles. Specific questions touch on aspects of employment (initial employment search time, initial and later employment sectors), on the development of skills during the career and on the satisfaction with the career development (e.g., income, status, appreciation, career perspectives). The final balance has to be made up whether the investments needed for the development of a specific societal and research profile (Grooters et al., 2021a) pays off, at least in view of the appreciation and wishes of (former) students.

Materials and Methods

The ethical committee of the University of Groningen approved the approach of alumni to participate in a web-based questionnaire (CETO submission number 63104880). The web-based survey contained two main parts, one on evaluation of the study program (Grooters et al., 2021b) and one on career progression (current article).

Participants

A total of 242 Faculty of Science and Engineering (FSE) alumni of the University of Groningen participated in the study, with 111 SBP-alumni and 131 ROM-alumni. In total, 2473 FSE alumni who graduated between the academic years 2001/2002 and 2017/2018 were approached. The response rate was higher in the SBP-alumni group (32.0%) than in the ROM-alumni group (6.2%). There are at least two possible explanations of the higher response rate among the SBP-alumni approached. First, SBP-alumni were approached by staff of the SBP organization, which former students may have perceived as more direct and personal than communications from the general alumni organization of the University of Groningen. As such, SBP-alumni may have had a greater tendency to participate in the survey. In addition, SBP-alumni received a reminder email that contained a second invitation to participate in the survey, whereas ROM-alumni did not receive a reminder. A total of 34.2% of all SBP respondents ($n = 38$) participated after the reminder email, making it likely that ROM responses would also have increased if they received a reminder to participate.

Table 1: Age and Years Since Graduation of Study Participants, per Gender/Program (modified after Grooters et al. 2021)

	Age in years			Years since graduation		
	N	Mean	SD	N	Mean	SD
SBP	111	31.13	5.48	111	7.21	4.59
Male	61	32.15	5.78	61	7.67	4.48
Female	50	29.88	4.86	50	6.64	4.70
ROM	131	29.84	3.60	130	5.95	3.37
Male	64	29.61	3.79	64	5.38	3.24
Female	62	29.09	3.27	61	6.43	3.39
Other	4	31.80	5.07	4	7.00	4.40

Table 1 shows descriptive demographic information for all participants, and for the SBP and ROM-participants separately. In the SBP-group, male participants were significantly older than female participants ($F_{1,109} = 4.87, p = .029$). No other age differences between or within groups were found.

On average, alumni graduated 6.5 years before survey participation. ROM respondents participated 1.36 years significantly closer to their graduation than SBP respondents ($F_{1,239} = 94.06, p = .016$). Hence, a slightly different timespan in career development is reported by ROM and SBP-participants. This may have caused differences in how they retrieved details about their first job (Bradburn et al., 1987) and current income and it needs to be taken into account while interpreting the results.

The disciplinary background of the students were comparable in both groups, and covered a wide range of disciplines. Biology was the most presented discipline for both SBP, and ROM-alumni, followed by Biomedical Sciences or Medical Pharmaceutical sciences (for further description see Grooters et al., 2021b).

In both groups there were participants who finished a PhD or postdoc after their master's program. There were more finished PhD and postdoc tracks in the ROM-group than the SBP-group. In addition, there were participants in both groups who were at the time of filling out the surveys still involved in a PhD or postdoc. These numbers were higher in the ROM-group compared to the SBP-group. Here, we perceive starting a PhD-track after one's master's program as the start of one's professional career, and not as an extension of one's educational program.

Questionnaire

The questionnaire contained standardized items as well as items designed by the authors of this paper. Questionnaire design recommendations were used (cf. Dijkstra et al., 2014) in constructing the questionnaire. In addition, the questionnaire was extensively pre-tested by means of cognitive interviewing (Beatty & Willis, 2007; Collins, 2003). First, thirty bachelor students carried out two or more cognitive interviews as part of a course on questionnaire design. Based on reports of these cognitive interviews, the questionnaire was revised. This improved version was pre-tested by means of cognitive interviewing again by one of the authors of this paper and a student-assistant. Problematic questions were altered or omitted from the questionnaire. Lastly, the final questionnaire was extensively discussed by all authors of this paper and finalized. More details and protocols are described in Grooters et al. (2021b).

The questionnaire used for this paper consisted of five different elements. First, demographic questions were included in the questionnaire (e.g., age, gender, academic background, graduation year). Second, questions were asked on the time participants needed to search for a job after graduation (employment search time), whether their first employment after graduation was their current employment, hours per week working in their first and/or current employment, and the sector of their first and/or current employment (business, policy, education, research or another sector).

Third, in order to measure perceived learning skills gained right after graduation and currently, we derived items from the Science Student Skills inventory, a tool specifically developed to measure science student's learning outcomes (Matthews & Hodgson, 2012). We used all six items from the SSSI: Scientific content knowledge in your field(s) of study, Communication skills (i.e., scientific presentations), Writing skills (i.e., scientific writing), Quantitative skills (i.e., mathematical & statistical reasoning), Teamwork skills (i.e. working with others to accomplish a shared task), and Ethical thinking (i.e. ethical responsibilities and approaches). In addition, we added items based on the learning outcomes of the SBP program that were not included in the SSSI: Practical research skills (i.e., lab work and modelling), Academic reasoning (i.e., analytical and critical thinking), Project-based working skills (to achieve a certain goal with limited resources), and Leadership skills (i.e., guiding & managing a team). Participants had to rate on a five-point scale their development on SSSI and SBP learning outcomes items based on skills they felt they had developed during their entire master's degree, and during their professional life until now (1= negative, and 5=positive about their development).

Fourth, we included items to measure participants' career satisfaction for their current and/or first employment and career perspective for the future. Participants had to give a grade (between 1=very bad and 10= very good) with regard to their general satisfaction, income, everyday work activities, status, function, recognition received professional network and career perspective. Lastly, a question on participants income for first and/or current employment was

included in the questionnaire. Participants were able to enter a rounded number for one of the four following options: 1) Gross income (before taxes), monthly; 2) Net income (after taxes), monthly; 3) Gross income (before taxes), annually; 4) Net income (after taxes), annually.

Since the income question included multiple options for filling in a salary, steps have been taken for calculating the income. First, the salaries were all converted to a 40-hour work week. For the conversion from gross to net, the gross monthly amount has been used and is deducted by the known taxes in the Netherlands, in this case a fixed tax for unemployment according to the guidelines of the tax authorities (Redactie Salaris rendement, 2019), followed by income tax (Belastingdienst, 2021). The final step was to calculate the general tax credit (Belastingdienst, 2020a) and the labour tax credit (Belastingdienst, 2020b). When salary was filled in per year, we took into account 8% holiday pay set by the Dutch government (Rijksoverheid, 2021).

Data collection, procedure and analysis

We used survey software Qualtrics for data collection. We asked respondents for informed consent before participation. If participants agreed to participate in the survey, they first were posed demographic questions. Then they evaluated items from the SSSI and added learning goals. Current employment questions were asked after this in the following sequence: employment search time, sector, working hours, income, job satisfaction and career perspective. If the current employment was not the first employment, participants received the same questions in the same order for their first employment. The program SPSS was used to carry out statistical analyses. These analyses were parametric (ANOVA's) or non-parametric (Welch & Brown-Forsythe test) depending on whether assumptions were met (e.g., equality of variances, normality).

Results

Start of career

When we look at how quickly FSE students found a job (Figure 1), about half of the former students already had a job before or at graduation. For the SBP-group this is even slightly more. The initial difference in cumulative percentages between SBP and ROM (23% vs 16%) disappeared immediately after graduation (52% vs 50%). Almost 90% of the alumni from both groups had a job within six months. After one year, 3% of SBP-alumni were still without a job, compared to 8% of the ROM-alumni.

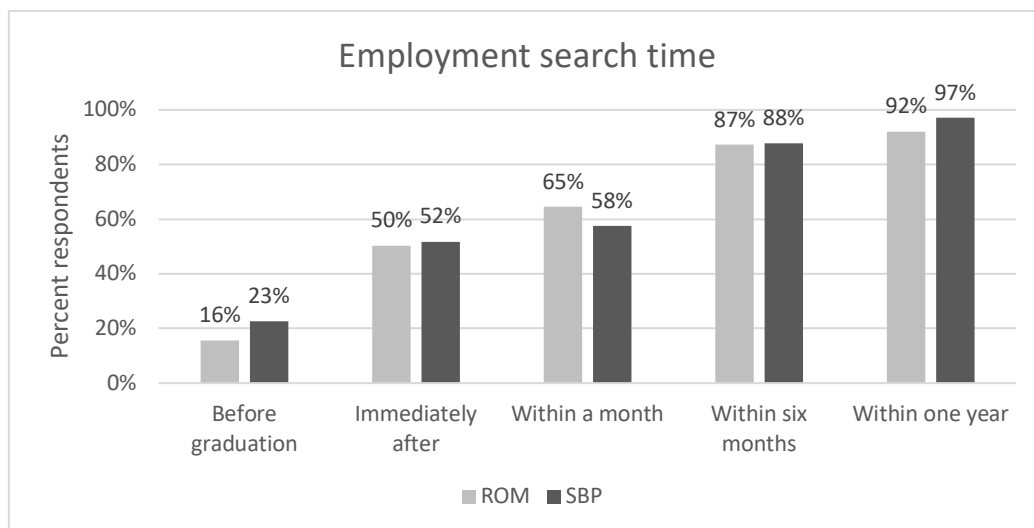


Figure 1. Self-Reported Employment Search Time After Graduation from the ROM (n = 127) and SBP (n = 106) programs

There were several ways in which alumni obtained their first job, via: application, personal network or mediator such as talent scouts or employment agencies. Remarkably, 31% of the SBP-alumni got a job offer at their work-placement (and of those 78% accepts this offer). Most alumni started with an (almost) fulltime job, with an average of 35.6 hours a week for the SBP-alumni and 37.4 for the ROM-alumni (in the Netherlands a full-time job is 35 or more hours per week (Centraal Bureau voor de statistiek (CBS), 2021)). Almost all participants worked for an employer in their first job. For the SBP-alumni, this concerns 97% and for the ROM-alumni 100%. When progressing in their career the percentage of entrepreneurs or self-employed persons rises slightly, within the SBP-group from 3% to 6%, and within the ROM-group from 0% to 1%.

Career development

The majority of the participants switched jobs after their first employment, either continuing in different positions or working for different employers. From the SBP-alumni 43% was still in their first employment at the time the survey was held. For the ROM-participants, this was 39%. Ways in which participants obtained their current job were again based on applications, network or mediators. In their current position, alumni that switched jobs were again on average working full time, with 37.0 hours per week for the SBP-alumni and 37.5 hours per week for the ROM-alumni.

Acquiring a first employment in Business or Policy was more common for SBP-alumni than ROM-alumni, and this trend was even more pronounced in self-reported current employment. By contrast, ROM-alumni first employment was most often in research or education. In the current job, working in research decreased in both groups with an increase in educational jobs for ROM-alumni specifically. In the ROM-alumni the category other jobs is relatively large compared to SBP-alumni. Further exploration showed that employments in healthcare accounted for 18% of the 23% in the category other for first job, and for 12% of the 16% for current job.

Alumni usually acquired employment that corresponded with the science discipline of their bachelor or master. For current employment, this difference increased in opposite directions for SBP-, and ROM-alumni. For SBP-alumni, working in a matching discipline dropped slightly from 67% to 63% whereas for the ROM-alumni a small increase from 81% to 84% can be observed. It should be noted that from the ROM-alumni only 27% continued within research in the first employment and this percentage drops to 21% in their current employment. These percentages are lower in the SBP-group but almost halved from 14 to 8%.

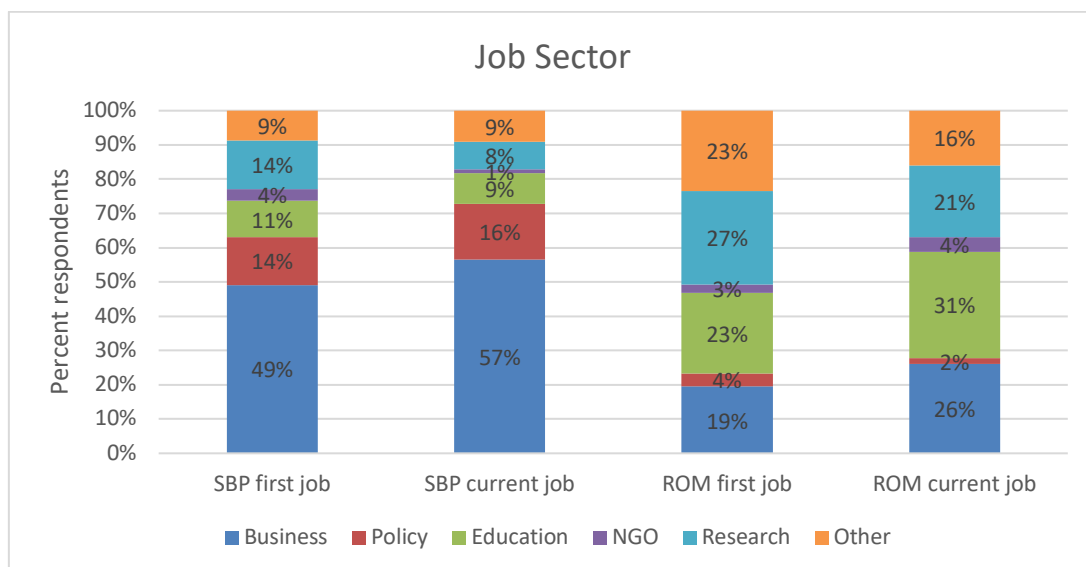
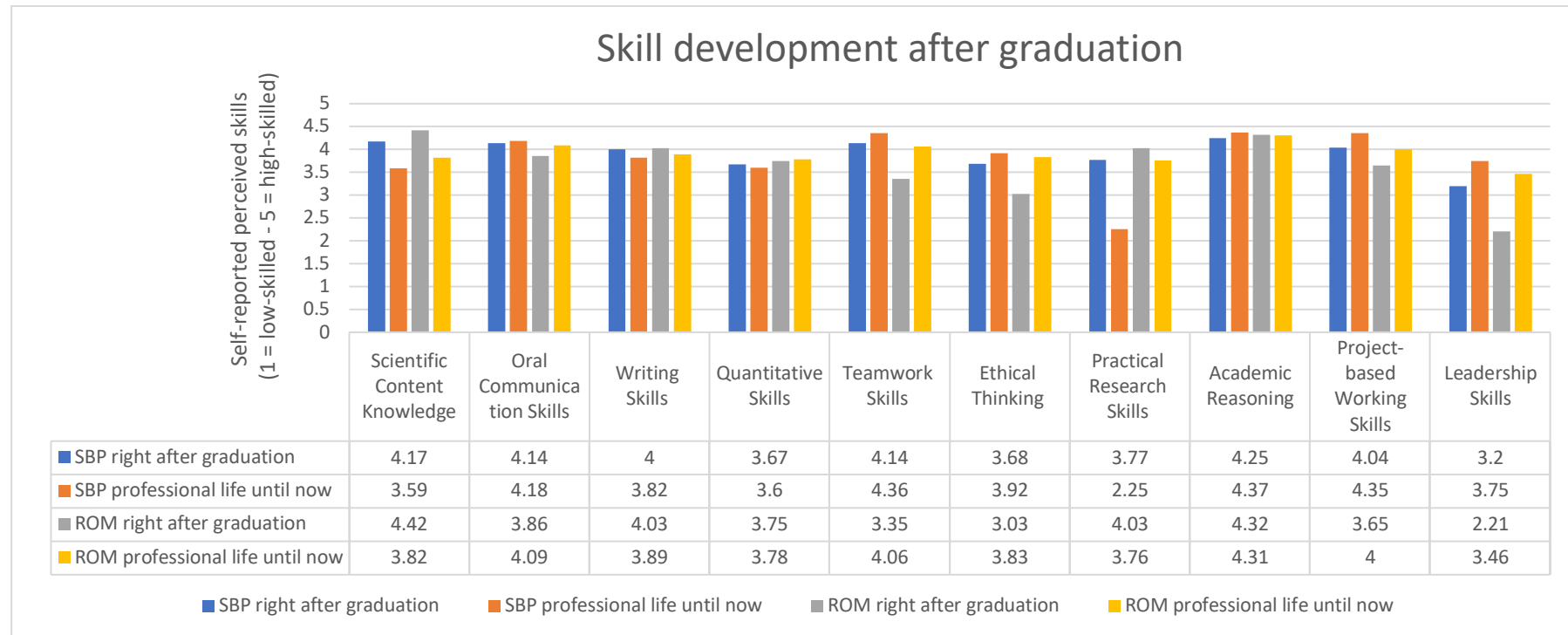


Figure 2. Self-Reported Job Sector Employed in Immediately After Graduation and Current Employment for SBP Alumni (n = 57 & 99) and ROM Alumni (n = 77 & 127).

Perceived skill development after graduation



Significance	SCK	CS	WS	QS	TS	ET	PRS	AR	PWS	LS
Repeated Measure: Within Group	***	*	*	no	***	***	***	no	***	***
Interaction effect	no	no	no	no	***	***	no	no	no	***
Current Difference ROM & SBP	*	no	no	no	***	no	***	no	***	***

Figure 3. Alumni's Self-reported Perceived Skills Immediately After Graduation and Professional Life Until Now, on a 5-point Likert-scale (1 = low-skilled – 5 = high-skilled), with SBP-group n = 109-111, and ROM-group n = 129-131. With Significance at * p <.001 ** p <.01, and * p <.05.**

We compared the perceived level of skills right after graduation with the perceived level of skills in SBP- and ROM-alumni's current profession (Figure 3). A Repeated Measures ANOVA was performed with between-group factor participant group (SBP/ROM) and within-group factor the perceived level of skills (skills right after graduation/current skills). In addition, we carried out a MANOVA to investigate the potential differences in the level of perceived skills in the current employment between the SBP, and ROM-group.

First, we investigated the SSSI skills. Perceived Scientific content knowledge has decreased significantly for both groups ($F_{1,239} = 93.28, p < .001$). The current level was considered acceptable by both groups (i.e., the means are above the mid-point of the scale), with the ROM-group rating their current scientific content knowledge in their field of study higher than SBP-alumni, ($F_{1,235} = 6.06, p = 0.015$). Robust tests of equality of means (Welch & Brown-Forsythe test) confirm that there were significant differences despite inequality in homogeneity of variances ($1,217.1 = 5.69, p = .018$). For Oral communication skills we found a small but significant improvement ($F_{1,239} = 4.31, p = .039$) for both groups. In current perceived oral skills there were no differences between groups. For Writing skills we detected a significant improvement ($F_{1,239} = 6.29, p = .013$) for both groups. In current perceived writing skills we did not find differences between groups. Quantitative skills seemed to have remained stable and did not differ between groups in the current employment. Teamwork skills improved significantly ($F_{1,239} = 54.53, p < .001$), with an interaction effect ($F_{1,239} = 15.31, p < .001$) showing that the improvement in teamwork skills was only significant for the ROM-group. For current teamwork skills, SBP-alumni perceived these to be higher compared to ROM-alumni ($F_{1,235} = 12.75, p < .001$). Ethical thinking also improved significantly ($F_{1,239} = 62.91, p < .001$), with an interaction effect ($F_{1,239} = 16.12, p < .001$) where perceived improvement was again only significant for the ROM-group. We found no differences between groups for their perceived ethical thinking skills in the current employment.

Second, skills based on learning outcomes of the SBP program were investigated for both groups. Strikingly, perceived Practical research skills decreased significantly in both groups ($F_{1,239} = 30.00, p < .001$). Current perceived practical research skills were significantly higher in the ROM-group compared to the SBP-group ($F_{1,235} = 17.75, p < .001$). Robust tests of equality of means (Welch & Brown-Forsythe test) confirm that there were significant differences despite of inequality in homogeneity of variances ($1,215.89 = 17.31, p < .001$). We did not find any differences for perceived Academic Reasoning skills. Perceived Project-based working skills increased significantly for both groups ($F_{1,239} = 28.14, p = 0.000$). SBP-participants rated their current project-based working skills significantly higher than the ROM-participants ($F_{1,235} = 15.46, p < .001$). Leadership skills improved significantly ($F_{1,239} = 151.48, p < .001$), with an interaction effect, ($F_{1,239} = 22.57, p < .001$), showing that the improvement in perceived leadership skills was only significant for the ROM-group. SBP-participants perceived their current leadership skills higher than ROM-participants ($F_{1,235} = 7.46, p < .001$). Robust tests of equality of means (Welch & Brown-Forsythe test) confirm that there were significant differences despite of inequality in homogeneity of variances ($1,238.24 = 6.86, p = .009$).

Career satisfaction

Job satisfaction was graded with 1 (lowest possible) to 10 (highest possible) on several aspects. Participants gave an overall grade, and graded income, daily activities, status, function, appreciation and professional network separately (Figure 4). A repeated measures ANOVA was carried out with participant group (SBP/ROM) as between-participant factor and job satisfaction (first employment/current employment) as within-participant factor. For all job satisfaction items, the grade for current employment was higher than for the first employment with no interaction effect for participant group ($p < .002$ for all items). Subsequently a MANOVA was carried out to investigate differences between the SBP and ROM-participants on job satisfaction with regard to first employment. No significant differences were found.

For current job satisfaction, again a MANOVA was carried out. Box's test of equality of covariance matrices is significant ($p < .001$). Therefore, all items were checked separately for Levene's test and

visually checked for equality in variances. None of Levene's tests were significant, implicating equality in variances. The groups did not differ significantly from each other in their overall grade. Both alumni groups were also equally satisfied about their current function, their everyday work activities and professional network. With regard to current status, SBP-alumni were significantly more satisfied than ROM-alumni, ($F_{1,201} = 5.06, p = .026$). SBP-alumni also perceived received recognition at work higher, ($F_{1,201} = 13.73, p = .010$). In addition, SBP-alumni were more satisfied with their income compared to ROM-alumni, reaching a marginally significant difference ($F_{1,201} = 3.00, p = .085$).

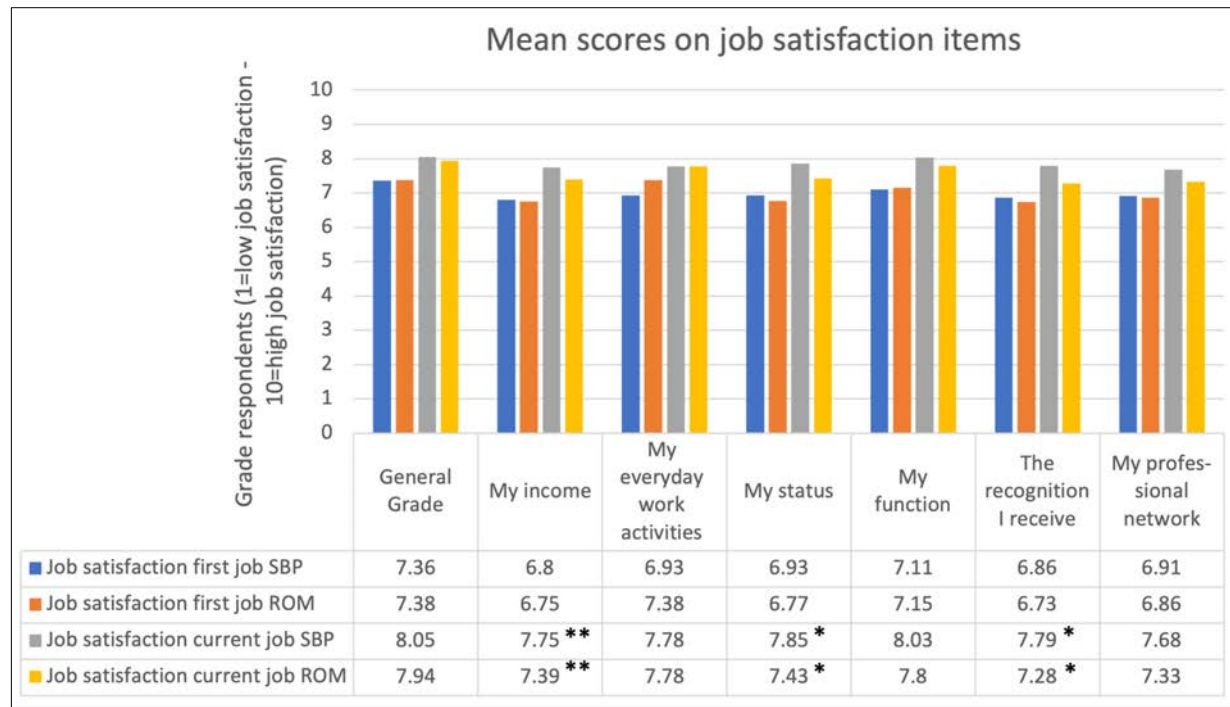


Figure 4: Means of SBP and ROM Alumni's Graded (1-10) Job Satisfaction with an Overall Grade, and Grades on Income, Everyday Work Activities, Status, Function, Recognition Received and Professional Network. * = significant at $p < .05$, ** = marginally significant at $p < .10$.

Income

Table 3 shows means and standard deviations with regard to participants' first employment income and current employment income after controlling for outliers (displayed for participant group and gender separately). Because SBP-participants graduated 1.26 year earlier than FSE participants on average, the relation between years graduated and income was explored for the groups.

Univariate analyses of variance were carried out with academic year graduated and participant group as independent variables and current income as dependent variable. There were no differences between the SBP, and ROM-participants, or academic year graduated with regard to the income of the first employment. For current income, the ANOVA showed main effects for participant group ($F_{1,180} = 7.06, p = .007$, and year graduated ($F_{1,180} = 13.94, p < .001$, and an interaction effect ($F_{1,180} = 3.06, p = .001$). While it seemed that SBP-participants received a significantly higher income than ROM-participants, more data is necessary because there are no clear trends in income received when we zoom in on the main effect of year graduated or the interaction effect. That is, it was not the case that the longer participants were graduated, the higher the income, or that SBP received significantly more income than ROM-participants within all specific graduation years. In addition, no gender effect was found for first and current income.

Table 3: Self-reported Income in Euros Net Per Month of SBP and ROM Alumni, Based on Fulltime (40h) Work Week

	First employment			Current employment		
	N	M	SD	N	M	SD
SBP	44	1996,86	411,45	74	2923,40	1080,28
ROM	57	2001,39	384,76	101	2638,77	664,53
Male	51	2006,06	424,68	97	2850,03	993,62
Female	48	1991,16	367,50	81	2648,22	695,15

Career perspective

Alumni were asked to reflect on how satisfied they were with their future career perspectives (Table 4). SBP-alumni were marginally significant more satisfied with career perspective compared to ROM-alumni ($F_{1,201} = 3.74, p = .055$). To the question whether alumni want to keep working in their current position 57 % of the SBP-alumni answered with Yes, 14 % with No, and 29 % with maybe or I don't know. From the ROM-alumni a similar percentage answered with Yes, 58%, 22% said No, and 21 % was still in doubt.

Table 4: Perceived Satisfaction with Future Career Perspective for SBP and ROM Alumni, Graded from 1-10

Career perspective	N	Min	Max	M	SD
SBP	98	3.40	10.00	8.12	1.36
ROM	119	1.80	10.00	7.79	1.51

Discussion

The impact of a societally oriented master profile and a research-oriented master profile on the career development of science students is examined in this paper. Does the profile of science master education matter, with more or less emphasis on soft skills and on research skills respectively, for the first steps in a career? We examined a classical research-oriented master (ROM) program and a program that has a societal-profile, the Science Business and Policy program (SBP). Alumni from both programs filled in a web-based survey regarding their perceptions on career progress, and thereby societal development. Do alumni really practice what you teach?

The first important conclusion is that both groups have good and fast career prospects, since alumni find a job quickly and are generally satisfied with their job. The alumni scored their satisfaction within their current job as higher than within their first job in terms of satisfaction, which indicates a positive development. General impression, position, work activities, professional network and career until now all improve with no difference between the groups. Income, status and the appreciation and career perspective also score well for both groups, but SBP-participants give here significantly higher grades than the ROM-participants. In the actual income we see no clear difference between groups. This corresponds to previous research of Borooah (2009), in which is found that for job satisfaction, income is not the most important factor but internal aspects of a job, like responsibility, doing something useful and having a nice social environment seem to be most important. SBP students often have a kickstart in their career in the form of a job-offer at their work placement. Combined with the career satisfaction of the SBP-alumni, a societal focussed education program therefore certainly does not seem to reduce opportunities on the labour market.

The nature of the jobs is similar for both groups in terms of fulltime working hours and working for an

employer. Entrepreneurship is rare to non-existent in both groups but training students as intrapreneur seems to fit their actual career path, since the majority continues in a job in a company or organisation. The results of this study are in line with Blanka (2009) that focussing on intrapreneurial skills is needed for better career preparation. This also seems like a better way for universities to take responsibility for knowledge validation compared to investing in entrepreneurial skills like universities did often in the last decades (Etzkowitz et al., 2000).

When profiles are translated into career paths, SBP-graduates felt more prepared for a career outside academia (Grooters et al., 2021a). This seems to be reflected in employment, where the majority (63%) finds a starting job in business and policy, and an even larger percentage (73%) had a job in a company or (non)governmental organisation in their following career. The ROM-alumni on the other hand felt especially prepared for a career within academia. This does not seem to give any guarantees as only 27% start a career in research after graduation and this percentage lowers (21%) when progressing into further jobs. This finding matches the idea that it is simply not possible to facilitate all master graduates with a PhD (Enders, 2004; Gemme & Gingras, 2012;) and after the PhD changes on pursuing an academic career are even smaller (Waaiker, 2017). The percentage of ROM-alumni that work in education is quite high and increases in the current job. This is remarkable since a specific profile for teaching is also provided. The results suggest that targeting specific preparation for a job is more successful when there is a focus on societal careers than on research careers. A consideration that alumni practise what you teach seems to be true for the SBP-alumni but less for the ROM-alumni. Thus, SBP-alumni have a more optimal fit between their profile and their career. This is perhaps also confirmed by the finding that the percentage of SBP-alumni that were still in their first job is higher than in the ROM-group (even though the ROM-group graduated more recently on average, which even strengthens this effect).

An improvement in such a fit seems also desirable for other profiles. It would be fair to prepare students for the potential fall out of their career perspective. In case of a ROM program this means informing ROM students they have a high chance to enter a career in education. This is even more relevant since there is a special master profile for education. More in general, it should be clear it is an intrinsic property of academic programs to prepare students for different career routes, since academic education is used as preparation for many different work fields. This is actually seen in the careers of the alumni, since there are still SBP-alumni that continue in academia (doing PhDs for example) and ROM-alumni that work in Business or Policy. Thus, there is no exclusion of a certain sector by study choice, reflecting flexibility and all-roundness of both study programs. As a suggestion for further research, it would be interesting to pull in evidence from other generalist vs specialist program graduate outcomes to compare, and to discuss the concept of the importance of both broad skills development across master's programs and communicating possible career pathways to students.

Concerning skills needed for the career paths, both profiles seem to differ in how skills change over time according to alumni. ROM-alumni perceive research skills like Scientific content knowledge and practical research skills to be higher than SBP-alumni in their current employment. At the same time, these perceived skills decreased in both groups compared to right after their graduation. Perceived academic writing skills also decreased in both groups, with no differences in current perceived writing skills. This is remarkable because one could expect people with an academic education to improve on these types of skills if they continue in a professional career on an academic level. This might suggest alumni are at their top right after graduation in terms of the former mentioned skills regardless of their profile. It could be that these skills are perceived to 'rust' if one does not use these skills in professional life. Looking at the remarkably negative postgraduate skill development it seems a necessary and logical demand for universities to start and offer specific research skill training for those who continue in academia or want to keep up their research skills (for example offering refresher courses rewarded in micro-credentials (Andersen et al., 2021). Another explanation could be that these skills not actually worsened, but one's perceptions about having these skills were higher right after graduation compared to their current perception. Or in other words, alumni potentially needed to keep practicing these skills in order to feel they were on top of them. Additionally, their perception

of what constitutes a 'research skill' may differ from what they are actually executing in their roles. Both options are interesting points for further investigation.

In the dynamics of soft skills, we found that that ROM-participants perceived to have significantly improved their ethical thinking, teamwork and leadership skills from graduation on, but that SBP-participants still perceive their current teamwork and leadership skills to be higher compared to the ROM-group. Both the ROM-group and the SBP-group perceive to have improved on Oral communication skills and Project-based working skills, with again the SBP-group perceiving their project-based working skills to be significantly higher in their current employment.

These results suggest that the SBP-group right after graduation perceived a number of soft skills (teamwork & leadership skills) already to be relatively high, as their ratings remained higher in their current job despite of the perceived growth of the ROM-group. In addition, for almost all soft skills the SBP-group scored higher, with the exception of ethical thinking and oral communication skills. Skills needed for a societal career differ from skills needed for a career within academia (Borrell-Damian et al., 2010). Also, employers expect more soft skills besides research skills (Green et al., 2009) which can influence the future career of the individual student, but also relevant for knowledge validation in general (De Grande et al., 2014) or to more specific to a relevant industry sector (Hammer et al., 2021). Hence, SBP-alumni seem to offer a higher level in these soft skills. We suggest here that soft skills could be characterised as 'practice makes perfect' skills that get better during work experience. In order to be maximally prepared for a societal career it makes therefore sense to start as early as possible with soft skill training in the societal profile.

For gaining soft skills it is known from literature that not only the development needs attention but also the awareness of the importance of these skills, so they can become more visible in the curriculum (Kensington-Miller et al., 2018). This way, the student skills can match the expectations of the workplace and can change with the changing professional context in which alumni constantly find themselves (Oliver & de St. Jorre 2018).

Two perceived - more general - skills, Academic Reasoning and Quantitative skills follow a different dynamic and remain the same in time, for both groups. Hence, more general skills that are learned during academic education might be really stable.

In sum, the ROM profile improved a number of research skills right after graduation, which decreased after their education. The SBP profile resulted in alumni already being proficient in soft skills right after graduation that were sometimes even improved further after training. The reported skills of SBP-alumni seem to match the needs from the industry where non-academic skills are often lacking (Borrell-Damian, 2010).

Policy stipulates that European universities include transferable skills in their curriculum (European University Association, 2007) since these are often missed (Enders, 2004). In the SBP curriculum these skills are present, and alumni continue to improve on these after graduation. The group characteristics should be taken into account here; SBP-alumni seem better at SBP skills, but they have also been working in their profession for a longer time on average. Since these skills seem to improve with gaining experience, you might expect the ROM-group to score higher the longer they are working, making the gap smaller. Perhaps this also works the other way around for the reduction of the research skills, perhaps those of the SBP are only worse now because they have been working for longer and therefore these skills have been decreasing for a longer period of time. The dynamics in postgraduate skill development might need a more central role in curriculum development for both profiles, since they seem crucial for career development.

To evaluate the exact meaning of the difference in skills and the dynamics of this, further research is recommended. Suggestions for further research are based on attitudes and appreciation of the work floor towards the transition of preparing more students for careers outside academia. The need for different skills (Borell-Damian, 2010) has been discussed, so finding out whether a societal profile offers the answer for the demand of employers in business and policy organisations from their point of view would be interesting. From the university perspective DeGrande et al. (2004) are suggesting a

need for change in attitude within the academic world towards non-academic careers. Whether this suggestion has been followed would also be an interesting topic for further research. An even more specific question concerns how to get practices like SBP to be more generally implemented, so it will not be an alternative but a main route, as seems logical when looking at the final career path of most alumni.

Altogether, a societal profile of a science master leads to a different career path, one that can be better predicted compared to a research profile. The dynamics in postgraduate skill development are more positive for SBP-alumni compared to ROM-alumni. The different skills that are used and required during a societal oriented career path seem to match the societal master's profile, while the research profile seems to decrease in matching skills. No clear differences were found between groups in terms of income and employment searching time. Job satisfaction seemed to grow over time for both the research profile and the societal profile, with SBP-alumni being even more satisfied in terms of current income, status, appreciation and career perspective. Summarizing, based on the actual career perception of alumni, offering a societal science master seems a good idea and can contribute to bridging science and society and to establishing a broader university.

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