Study track dependent values and exam results for master students in Engineering Technology

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INTRODUCTION

In Belgium one distinguishes two types of bachelor degrees: the professional and the academic bachelor. A **professional bachelor degree** focuses on professional training (such as nursing and teaching) and does not grant automatic access to a master's program. The goal of an **academic bachelor degree** on the other hand is to get all the necessary knowledge and skills to start a master's program. However professional bachelors are not excluded from a master programme, they can start a master programme after succeeding a bridging programme.

In this paper we focus on **possible differences in values and skills** between these two types of master students: the ones who enter the master programme by means of an academic bachelor degree (regular students) and those who got admittance after finishing a bridging programme (bridging students). In practice, the professors experience no differences. Our research reveals a significant difference between the two populations in some aspects.

1 METHODOLOGY

1.1 Schein's Career Anchors

We invested the basic values and perceptions of motives and needs of 150 master students in engineering technology in the University College Lessius in Belgium in the academic year

2011-2012. These students got an invitation to fill in an electronic career orientations inventory based on Schein's eight Career Anchors [1] (Table 1). The response-rate was 23%. 26 of the received inventories was useful. 20 inventories were completed by regular students, 6 by the bridging students. The results were analysed with the help of an independent t-test.

Table 1 Schein's eight career anchors [1].

	Career anchor	**abbreviation**
1	Technical/functional competence	TF
2	General managerial competence	AM
3	Autonomy/independence	AO
4	Security/stability	ZS
5	Entrepreneurial creativity	OC
6	Service or dedication to a cause	DV
7	Pure challenge	ZU
8	Life style	LS

1.2 Scores on the exams

We analysed the scores, obtained at the end of the academic year 2010-2011, of 155 master students in engineering technology in the fields of chemistry, electromechanics, electronics-ICT en energy in the University College Lessius. The master of science in engineering technology is a one-year study, equivalent with 60 ECTS-points. We selected all the courses with the same focus and defined 6 groups: theory, laboratory, mixed theory and lab, mixed theory and exercises, project and master thesis (Table 2). We computed for each of these groups the mean scores of all the courses belonging to that group. It was our hypothesis that these means were equal for the regular and the bridging students. With the help of an independent t-test we tested these hypotheses.

Table 2. The number of courses in every defined group

Group	**Number of courses belonging to this group**
Theory	46
Theory and exercises	7
Theory and laboratory	4
Laboratory	27
Project	6
Master thesis	4

2 RESULTS

2.1 Values

For 7 out of the 8 career anchors we did not measure any significant difference between the two types of students, except the anchor 'general managerial competence (AM)' (Table 3). Students who entered the master program after a bridging programme seem to be less interested in becoming a manager.

Table 3 The mean (M), the standard deviation (SD), the sample size (N) and the significance level (p) and t-value of the independent-samples T-test (α = 0.05).

Career anchor	Regular students			Bridging students			p	t
	M (/5)	SD	N	M (/5)	SD	N		
TF	3.92	0.81	20	4.47	0.48	6	0.134	1.551
AM	3.16	0.68	20	2.40	0.76	6	0.027	2.352
AO	3.54	0.67	20	3.57	0.61	6	0.931	-0.087
ZS	3.85	0.67	20	4.17	0.34	6	0.279	1.107
OC	3.41	1.17	20	3.10	0.93	6	0.558	0.594
DV	3.81	0.96	20	3.43	0.46	6	0.367	0.920
ZU	3.57	0.91	20	4.23	0.65	6	0.111	1.654
LS	4.55	0.94	20	4.50	.55	6	0.903	0.123

2.2 Competences

The results of the exams reveal that the regular students perform significantly better for theory, 'theory and exercises' and the master thesis (Table 4).

Table 4. The mean score (M), the standard deviation (SD), the sample size (N) and the significance level (p) and the t-value of the independent-samples T-test (α = 0.05).

Group	Regular students			Bridging students			p	t
	M	SD	N	M	SD	N		
Theory	12.53	3.73	610	11.80	3.40	624	0.0002	3.576
Theory and exercises	12.96	3.48	90	11.80	3.65	84	0.034	2.138
Theory and laboratory	12.21	3.02	58	11.55	3.47	51	0.292	1.058
Laboratory	13.75	2.28	347	13.84	1.90	319	0.59	-0.540
Project	14.67	2.16	84	14.45	1.80	76	0.489	0.694
Master thesis	14.24	1.83	64	13.09	2.17	57	0.002	3.168

The difference between the mean scores is extremely significant for theory. For the mixed group 'theory and exercises' and the master thesis the differences are significant. This means that the proved differences can be assigned to a difference between the two populations.

Laboratory, 'theory and laboratory' and 'project' are working methods focusing on hands-on activities and/or contextualized tasks. We see no significant better results for the bridging students. The mean values of the results of the evaluation are too close to each other.

3 DISCUSSION

According to the career anchors the bridging students share almost the same values in their professional careers as the regular students, except in one domain: the general managerial competence. This means, according to Schein [1], that these students work in a less general way compared to regular students. Generally, they are not as much focused on analytical thinking, taking decisions, working together, communication and knowledge of human nature.

This research also points out that the mean scores of the regular students are significantly better than the results of the bridging students, except for laboratory related and contextualized courses. For the latter there is no statistically measurable difference between the two populations.

The opposite result would be very surprising. Bridging students took practical oriented courses during their professional bachelor program. They apparently take profit of this training and are still motivated to focus on more complex practical problems. The reasons for their less good results for theoretical oriented courses and the master thesis are not yet scientifically invested. We can only guess. A possibility is a lack of necessary prior knowledge, a less good study attitude, etc.. When we focus on the four fields (chemistry, electronics-ICT, electromechanics and energy) and make the same analysis but now for the four fields separately, we obtain very different results. May be this will help us to understand the origin of the observed, significant differences between the two populations. This will be published in a future publication.

When we started this research the teaching staff was convinced that the study track has no influence on the performance of the masterstudents. This is a logical conclusion since the differences are small. During exams, the history of a student is not mentioned, nor written down. A professor focuses on the specific moment in the specific context. The students of the two groups are mixed and they take the same courses.

The outcome of this research has some consequences:

- The higher education institutes should think carefully about the content and goals of the bridging programmes, based on deficiencies observed in the population of the bridging students. More research should be done to define these deficiencies.
- Industry should be aware of the different profiles of bridging and regular students. Each profile has his strengths and during the selection this should be taken into account.
- Industry is a requesting party to increase the importance of managerial skills in the training. This will possibly demotivate some bridging students. A solution is to train these skills more intensively in optional courses. It’s clear that the basic managerial skills are obligatory for everybody.

Extra research is needed in order to find out the possible reasons for these differences. Other variables, such as gender, training at high school, etc. should be taken into account.

REFERENCES

[1] Schein, E. H. (2010), Organizational culture and leadership, Jossey-Bass, San Francisco.