A QUALITATIVE STUDY ON THE ANXIETY OF IT STUDENTS TOWARDS PROFESSIONAL SKILLS TRAINING

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ABSTRACT

The importance of professional skills in future engineering jobs is beyond discussion. Increasing numbers of universities have integrated training for such skills in their engineering curricula to prepare students to become highly qualified employees. HU University of Applied Sciences Utrecht also implemented professional skills training in the IT Bachelor program to help our students develop towards successful and highly demanded IT engineers. However, these courses consistently score low in our student satisfaction surveys. To find the cause of this negative evaluation, we previously studied the motivation, attitude and anxiety of IT students towards learning soft, or professional, skills. This former quantitative study indicates that our IT students tend to have a positive motivation and attitude toward learning professional skills, while 'anxiety' in learning professional skills increases from the first to the third year.

In this qualitative study, we try to find causes for the increasing anxiety among IT-students. We interviewed six third and fourth year IT students and after analysing these interviews we found that this students have experienced the need for professional skills during their internship. Besides, they emphasize the need of obtaining these skills for future employment. From the analysis of the interviews, it also appears that IT students rather felt difficulty in obtaining communication skills then anxiety. A possible cause for this difficulty mentioned by students was the character of students and the influence of the teacher. To overcome this difficulty obtaining communication skills, students suggested that training skills in an authentic engineering situation is more effective than doing exercises with simulated cases. However, the results of this study did not yield a conclusive insight in the cause of increased anxiety, hence further research is needed.

INTRODUCTION

The urge for professional skills among technical, and especially IT-professionals, is commonly known and acknowledged (Kyllonen, 2013). More and more universities and academies therefore incorporate these skills into their curricula. Nevertheless, business managers, IT-employers and IT-recruiters are still confronted with young professional IT-employees who are not fully skilled to perform in their jobs; they often indicate that the IT graduates they employ, lack the skill sets required by the industry (Calitz, Cullen & Greyling, 2015). Increasing numbers of universities have integrated soft or professional skills in engineering curricula. Our HU University of Applied Sciences Utrecht has also implemented soft skills training in the IT Bachelor program.

However, such courses consistently score low in student satisfaction surveys. To find the cause of this negative evaluation, we previously studied the motivation, attitude and anxiety of IT students towards learning soft skills (Schipper & Van der Stappen, 2018).
Data in this former quantitative study, indicated that our IT students acknowledge the importance of professional skills for their future profession. Furthermore, our IT students have a positive motivation and attitude toward learning soft skills. The anxiety to train these skills increases from the first to the third year, which was unexpected. The obtained results did not explain the low satisfaction scores, or motivational problems for soft skill courses. Neither did it explain the increasing anxiety among students towards learning soft skills moving forward in their study.

Related work

In advance of our qualitative study, further literature research brought us to several studies which gave possible explanations for the negative attitude toward soft skills. According to Claxton, Costa & Kallick, (2016), Itani & Srour, (2016) and Bancino & Zevalkink (2007) this negative attitude is based on the connotation differing between hard and soft skills. "Hard implies objective, clearly defined and reliable data, while soft often imply subjective, fuzzy, and unreliable activities… Soft skills immediately undermine their claim to serious attention, […] and implies that these outcomes are impossible to measure and fall outside any framework of accountability." (Claxton, Costa, & Kallick, 2016, p.62). Hard skills are often referring to the technical expertise and knowledge needed for a job, because of its measurability, and scoring outcomes (Horton, 2001). While soft skills are often used to indicate interpersonal qualities, also known as 'people skills', or personal attributes that one possesses (Robles, 2012). For this reason, we prefer the term 'professional skills'.

A framework for Professional Skills

The subject of our study is 'professional skills'. No single widely accepted definition of professional (soft) skills exists (Schulz, 2008). Even the 21th century skills – a variety of skills and competencies – framework is not clear which competence, body of knowledge, or aspects of character define 'soft skills' best (Partnership for 21st Century Learning, or P21.org).

In the Netherlands, universities of applied sciences which offer an IT Bachelor program developed a framework for professional skills. It's called the HBO-i domain description. The HBO-i domain description serves as a functional qualifications framework for universities and focuses on the starting proficiency of future IT professionals. (HBO-i. (2018). *Domain description Bachelor of ICT*. Retrieved January 29, 2020, from https://www.hbo-i.nl/publicaties-domeinbeschrijving/). Also the HU University of Applied Sciences Utrecht uses this model for training IT-students in professional skills.

The model provides a systematic description of the professional skills needed in order to operate as an IT professional. The professional model has three dimensions: activities (what does an IT professional do?), architectural layers (within which context?) and proficiency levels (how complex is it?). An integral part of these skills is the IT professional learning from every assignment and in this way developing his own profile for future work. IT professional duties, skills and personal development are thereby inseparably linked. The professional skills have been formulated into four areas of interest: future-oriented organisation, investigative problem solving, personal leadership and targeted interaction. The four areas of interest overlap one another and complement each other.

Figure 1: fragment of the framework 'HBO-i domain description'. (HBO-i, 2018. Retrieved January 29, 2020, from https://www.hbo-i.nl/publicaties-domeinbeschrijving/)

Future-oriented organization focuses on structuring project activities and ethical issues. Investigative problem solving implies skills as: critical thinking, creativity and research skills. Personal leadership pays attention to personal development and skills like reflecting practice. Finally, Targeted interaction also referred to as 'effective interaction' contains skills as communication and teamwork. This framework is only recently used in our curricula, which is why it is not yet commonly known amongst our IT Bachelor students.

RESEARCH METHOD

We performed a qualitative study in which we interviewed six third and fourth year IT students about their motivation, attitude and anxiety towards learning professional skills, during courses in their IT curriculum. Our goal was to obtain insight in the contradiction between the motivation for learning these skills and the negative evaluation of courses. Also, we hoped to find factors which cause growing anxiety among our older students.

The main research question we aim to answer is: 'Which aspects explain the negative student satisfaction for professional skills training, and the increasing anxiety towards learning professional skills, among IT Bachelor students?'

To further detail the conceptual framework for the object of our study, we first asked the interviewees what their definition for professional skills is.

The other questions in the semi-structured interviews concerned:
1)   In what way and when did you develop your professional skills during college years?
2)   How do you evaluate the courses in which you trained your professional skills?
3)   What –eventually– causes anxiety in learning soft skills and if so: did this anxiety differs between your first year of college and your present year?
4)   In your opinion, how could we prevent this anxiety?

Participants

To obtain the qualitative data, we interviewed six students who studied various specializations in our IT Bachelor program (see Table 1).

Interviewee	Gender	Age	Year	Specialization
A	M	23	4th	System & Network Engineering
B	M	24	4th	Computer Engineering
C	F	21	3rd	Business Informatics
D	M	22	4th	Software Engineering
E	M	25	4th	Software Engineering
F	M	24	3rd	Computer Engineering

Table 1: Characteristics of the six interviewed IT students

The interviewees were recruited during a third-year course in the second semester (the term subsequent to the internship). Although this is a small self-selected sample, the dispersion of students over the specializations is similar to the entire student population in our institute. The gender ratio (less than 10% female) corresponds with the ratio between genders in the entire population.

Analysis

The interviews were recorded (approximately 30 minutes each) and transcribed. The transcripts were next analyzed by open coding using Atlas.ti. This resulted in 233 coded text fragments.

For analyzing these categories and for answering our research questions, first we performed axial coding. This resulted in four main categories, which are similar to the variables in the Social Educational Model (MacIntyre et al. (2012) which was based on the initial model of Second Language Acquisition by Gardner (1985), Figure 2).
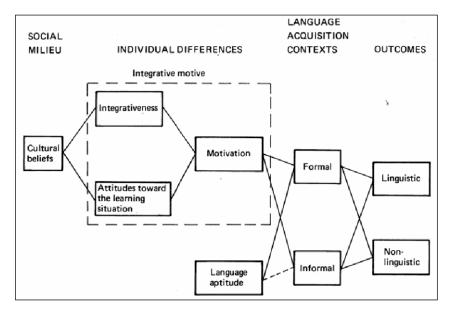
Figure 2: schematic representation of the Social Educational Model of second language acquisition (SE-Model) (Gardner (1985)

In our former study (Schipper & Van der Stappen, 2018), we also used the insight found by MacIntyre et al. (2012) who studied anxiety towards learning musical skills. MacIntyre indicated that motivation and attitude towards training music skills is comparable to second language acquisition. From this point of view, we suggest that although second language learning, related to the content differs from professional skills training, some similarity between their curricula exists. For example: exercising listening and writing skills as well as presentation skills are part of both courses. Hence, we deem it suitable to use this model to measure attitude and motivation towards learning professional skills.

The second step in analyzing our data was to use the Co-occurrence Explorer function in Atlas.ti. This shows us where (groups of) codes appear in an overlapping manner and it helps us to gain insight in the relations between the variables as mentioned in the SE-model.

RESULTS

The coded fragments were categorized into 29 categories. Next, these categories are accommodated within the SE-model (see Table 2).

Axial coding resulted in the four groups of codes based on the variables in the Social Educational Model (Gardner, 1985 and MacIntyre et al, 2012).

These four groups are as shown in Figure 2:
• Social milieu (concerning external influencing factors, such as common of cultural beliefs),
• Individual differences (as character, motivation and attitude),
• Acquisition contexts (learning settings, such as courses (i.e. formal learning) and internships (i.e. informal learning) situations)
• Outcomes (referring to the 'professional skills').

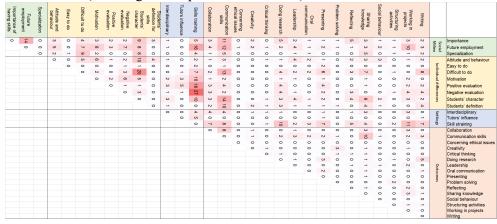|	Importance of having skills	Future employment	Specialization	Attitude and behaviour	Easy to do	Difficult to do	Motivation	Positive evaluation	Negative evaluation	Students' character	Students definition for skills	Interdisciplinary	Tutors influence	Skills training	Collaboration	Communication skills	Concerning ethical issues	Creativity	Critical thinking	Doing research	Leadership	Oral communication	Presenting	Problem solving	Reflecting	Sharing knowledge	Social behaviour	Structuring activities	Working in projects	Writing		
	0	14	0	3	0	4	3	2	2	9	3	1	0	5	3	11	12	0	2	0	5	2	1	1	1	5	3	3	2	1	3	2	Social Milieu	Importance
		5	0	7	9	3	7	8	0	7	8	0	0	16	4	4	5	0	0	0	0	4	0	1	0	0	5	0	1	10	3	2		Future employment
			0	2	1	0	0	2	0	0	0	0	2	0	0																		Specialization
				0	5	8	1	0	2	10	4	1	0	2	1	3	0	0	0	0	0	2	6	3	7	1	0	0	0	8		Individual differences	Attitude and behaviour
					0	0	0	0	3	5	0	0	7	0	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0			Easy to do
						0	2	5	20	0	0	2	3	10	18	2	0	0	0	1	1	0	4	0	1	0	0	2	2			Difficult to do
							0	6	1	0	3	5	27	3	0	0	0	1	0	4	0	0	2	0	4	9	2	4	2			Motivation
								0	1	3	0	0	10	3	14	0	0	1	3	1	0	0	3	0	0	0	0	3	4			Positive evaluation
									0																							Negative evaluation
										0	0	0	4	4	4	0	1	1	1	0	0	0	1	3	0	0	3	0				Students' character
											0	0	5	0	0	0	0	0	0	0	0	0	0	0	4	0	0	1				Students' definition
												0	7	8	0	0	1	10	2	3	7	0	5	4	0	2	11	7			Settings	Interdisciplinary
													0	8	0	0	0	0	2	3	2	2	1	0	10	1	0	2	3			Tutors' influence
														0	0	0	0	3	0	3	0	1	0	0	0	0	0				Skill straining
															0	0	1	0	0	0	0	3	0	1	1	0	0	2	5		Outcomes	Collaboration
																0	0	0	0	3	0	0	0	1	1	0	0	0	0			Communication skills
																	0	0	0	2	0	0	0	0	0	2	0	0				Concerning ethical issues
																		0	0	3	0	0	1	0	0	0	0	0				Creativity
																			0	0	0	2	0	1	1	0	0	0	5			Critical thinking
																				0	0	0	3	0	1	0	0	2	0			Doing research
																					0	0	0	0	1	0	0	0	0			Leadership
																						0	2	0	0	0	0	0	1			Oral communication
																							0	0	0	0	0	0	0			Presenting
																								0	0	0	0	2	0			Problem solving
																									0	0	0	0	0			Reflecting
																										0	0	0	2	3			Sharing knowledge
																											0	0	0	1			Social behaviour
																												0	1	1			Structuring activities
																													0	0			Working in projects
																														0			Writing

Table 2: categories according to SEM-model (see also p.15 for an readable version)

To gain insight into what the students meant when mentioning professional skills we first asked the interviewees to define the construct 'professional skills'. In this way we would be sure we study the right construct. Table 3 shows students' definitions in relation to the outcomes (i.e professional skills). Students mentioned communication, or a variety of communication activities most when they were asked about their education in professional skills. Second most mentioned are collaboration (working in teams) and working in projects (indicating doing structured project activities).

Outcomes	students definition
collaboration	2
communication	10
creativity	2
critical thinking	1
doing resarch	3
ethical issues	0
leadership	1
oral communication	1
presenting	1

problem solving	1
reflecting	0
sharing of knowledge	4
social behavior	1
structuring activities	0
working in projects	0
writing	4

Table 3: student's definition for professional skills – the grey coloured cells are all subskills of 'communication'.

Some of the skills (for example 'ethical issues' or 'reflecting') were not mentioned in students' definition of professional skills, but these skills were nevertheless mentioned as outcomes in relation to their skills training as is shown in Table 4. Table 3 indicates that students not define ethics, reflecting activities and structuring activities or working in projects as part of the professional skills framework.

The analysis of collected answers to our question: "In what way and when did you develop your professional skills during college years?" resulted in a co-occurrence table (see Table 4) *Outcomes* (the professional skills) in relation to *Settings* (the acquisitions context).

Outcomes	Settings		
	Interdisciplinary teams	**tutors influence**	**skills training**
collaboration	4	0	7
communication	4	0	8
creativity	1	0	0
critical thinking	1	0	1
doing resarch	1	0	10
ethical issues	0	0	0
leadership	0	0	2
oral communication	0	0	3
presenting	1	1	7
problem solving	0	0	0
reflecting	1	0	5
sharing of knowledge	3	0	4
social behavior	0	0	0
structuring activities	0	0	2
working in projects	3	0	11
writing	0	1	7

Table 4: outcomes vs settings

In our curriculum, we offer two specific courses in which we provide skills training; one basic course in the first year in which students learn presentation and writing skills and one course which focuses on research skills in the second year. Beside this, we integrated training in professional skills in student projects.

Regarding this, it is understandable students mentioned communication, working in projects and collaboration most often as the setting to train their professional skills.

For the next research question: "How do you evaluate the courses in which you trained your professional skills?" we search for *Individual differences* (with negative and positive evaluation amongst it) in co-occurrence with *Settings*.

Individual differences	Settings		
	Interdisciplinary teams	Tutors influence	Skills training
Attitude and behaviour	1	0	2
Easy to do	0	0	2
Difficult to do	0	1	7
Motivation	2	3	10
Positive evaluation	3	5	18
Negative evaluation	1	1	27
Students' character	3	0	10
Students' definition	1	0	0

Table 5: individual differences vs settings

Students refer to their skills training both in a positive (18 times) as in a negative way (27). Below are some quotes illustrating the negative impressions; the Dutch quotes we used below were translated into English.

Student A: For example, we had a 3ʳᵈ year course this semester, and I saw a huge number of people who disliked this course. It really became probably one of the worst courses that was received under IT student - really nobody liked it.[In
Student F: "*Eh… we also got professional skills in the first year, well then we get a very useless topic, I thought uh… a very useless topic to write a thesis about. Ehm ... also with a fixed guideline. So everyone had a subject that we didn't ... uh ... not very much ... that wasn't very fun*." The positive evaluation occurs often in combination with influence of the tutor (5 times).

Student D: "*Yes I have had good teachers for professional skills, always, and that made it most of the times fun to train presentations, so yes I have good experiences with that.*"

The question: "What –eventually– causes anxiety in learning soft skills and if so: did this anxiety differs between your first year of college and your present year?" resulted in *Individual differences* in co-occurance with *the influence of social milieu*.

Individual differences	Influence of social milieu			
	Importance of skills	Future employment	Specialization	Tutors' influence
Attitude and behaviour	3	5	2	0
Easy to do	0	0	1	0
Difficult to do	4	7	9	1
Motivation	3	8	2	3
Negative evaluation	2	7	0	1
Positive evaluation	2	3	0	5
Students' character	9	8	8	0
Students' definition	3	0	0	0

Table 6: Code co-occurrence: Individual differences vs Social milieu (cultural beliefs)

Our most remarkable findings were:

1) *Positive evaluation* occurs in combination with the *influence of the tutor* and when the exercises were related to *future employment*. Training one's skills was *valuated negative* when the exercises were too theoretical, or not authentic.
   Student E: "I think in terms of projects I think that it is better for a student if it is a real project, instead of just putting it away into a drawer. I don't know if this is related to learning professional skills or not. But it's great if you're working towards a real product. Instead of something that will disappear in the cupboard."

2) *Motivation* towards learning skills occurs most frequently in combination with *future employment*. Students realize the importance of professional skills, in particular the ability to communicate, for future jobs. During their internships they experienced the need for communication and collaboration with colleagues in projects and in the interviews, they emphasize the necessity of being trained
   Student B: "…and I have really noticed that communication in the field is very important, so communication is perhaps more appreciated than someone who is really only technically good. So a combination of these [the professional skills

and technical skills] is appreciated more than someone who is only very strong in one area."

3) The *character of the student* was mentioned often to explain that students encounter *difficulty* in training their *communication* skills (14 times, see table 2 and p.15), for example during *presentations* or in *sharing information* (written or oral) with other students or colleagues during working in projects (*interdisciplinary teams)*.
Student D: "Yes, some do [felt difficulty]. For example K ... but anyway, he doesn't open his mouth that easily, while he knows quite a bit." Students themselves suggests that *difficult to do* has a relationship with the type of *specialization*; it was mentioned 9 times.
Student C:"I noticed that those two, a software developer and a network engineer, that they really focus on the technical part and that the communication and coordination and making agreements with the project owner is left to us."
The students also observed that students specialized in computer engineering found more difficulty in exercising professional skills, comparing to students in business informatics.

CONCLUSION AND DISCUSSION

In our study the interviewees did have a negative attitude (evaluation) towards training their professional skills. However, students are aware of the importance of professional skills (especially communication skills) in future jobs. They acknowledge and have experienced the advantage of having these skills during their internship. Back in college after an internship, they are extra motivated towards training their skills to become graduated high-potential IT engineers.

When training these skills, students mentioned anxiety. Half of the interviewees indicates a relationship between *negative evaluation* and *difficult to do* in learning skills. This might explain the perceived 'anxiety' towards learning professional skills. In case of anxiety, the interviewees suggested that there seems to be a relationship between students character (extravertism vs introvertism) and students IT-specialization (IT-business vs IT-engineering). Because our sample is (too) small, this needs further research.

Unfortunately, we did not gain a clear insight in the cause of being more anxious towards training these professional skills in comparison with their younger peers. However, based on some quotes, in combination with relevant literature, we suppose that students feel anxiety when they train -in particular their communication- skills, because they are worried of opinions of others, potential failure and/or negative evaluation by the tutor, while a positive evaluation is needed for future success (MacIntyre & Gardner (1991), Yashima, Noels & Takeuchi (2009)). In relation to

our sample, most third en fourth year students had finished their internships. During these internships students experienced the need for professional skills, experienced succesfull moments and therefore emphasized the need of obtaining these skills for future employment. This aspect was also mentioned by Patacsil & Tablatin, (2017). Aknowlegdement of the importance of professional skills for future jobs, may hypothetically cause pressure to obtain the skills and create anxiety during training these, but again, this needs further research.

Less anxiety towards learning professional (communication) skills among IT students is needed to achieve these skills successfully; as shown in the Social-Educational Model, anxiety influences the achievement of (second language) skills. The better students have developed their professional skills, the better their skills match the demands for future employment. In this research, students suggested that training skills in an authentic, engineering-based situation is more effective than doing exercises with simulated cases. Students also indicate that the tutor has to be familiar with the IT industry. This is also mentioned by Javernick-Will & Maul (2016), who indicate that engineering students claimed to learn professional skills more from their service learning experiences (for example in voluntary projects) than from their coursework. Even more, "engineering service participation, especially a high level of participation, builds Professional Skills because of the additional experience with realistic, contextualized, and complex engineering projects" (Javernick-Will & Maul (2016), p 86).

A limitation of this study is the small number of participants. Nevertheless the results of our qualatative study are in line with the outcomes of several other studies: although students are motivated towards learning skills for future employment, they felt some anxiety training these skills in formal learning situations. The amount of anxiety depends on one's character. To obtain a positive evaluation or to diminish difficulty in training skills, students suggest to train the professional skills in authentic settings.

In developing future skills training we can incorporate these insights to create a more positive experience for IT students in training their skills, resulting in more positive course evaluations as well. We can conduct empirical research to test whether such skill training indeed overcomes the problems we currently observe in practice.

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	Importance	Future employment	Specialization	Attitude and behaviour	Easy to do	Difficult to do	Motivation	Positive evaluation	Negative evaluation	Students' character	Students' definition	Interdisciplinary	Tutors' influence	Skill straining	Collaboration	Communication skills	Concerning ethical issues	Creativity	Critical thinking	Doing research	Leadership	Oral communication	Presenting	Problem solving	Reflecting	Sharing knowledge	Social behaviour	Structuring activities	Working in projects	Writing
	Social Milieu			Individual differences								Settings			Outcomes															
Writing	2	3	2	2	0	8	0	2	4	2	4	0	1	7	0	3	0	0	0	5	0	1	0	0	0	1	0	1	0	0
Working in projects	3	10	1	1	0	0	2	2	4	3	0	3	0	11	3	2	0	1	0	0	2	0	0	0	2	3	0	1	0	
Structuring activities	1	1	1	0	0	1	0	0	1	0	0	0	0	2	0	0	0	0	0	1	0	0	0	2	0	0	0	0		
Social behaviour	1	2	0	3	0	0	0	0	0	2	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0			
Sharing knowledge	3	3	5	3	0	7	1	1	0	9	4	3	0	4	3	10	0	1	1	1	1	1	1	0	1	0				
Reflecting	5	1	0	2	0	3	0	0	3	4	0	1	0	5	0	0	0	0	1	0	1	0	1	0	0					
Problem solving	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	3	1	0	0	0	0	0						
Presenting	1	2	0	1	2	6	1	4	2	2	1	1	1	7	0	2	0	0	0	3	0	2	0							
Oral communication	1	1	1	2	0	2	0	0	0	1	1	0	0	3	0	2	0	0	0	0	0	0								
Leadership	2	4	1	4	0	2	1	0	1	4	1	0	0	2	1	3	0	0	0	1	0									
Doing research	5	2	0	1	0	4	1	4	4	3	3	1	0	10	0	2	0	0	1	0										
Critical thinking	0	1	0	1	0	0	0	0	0	1	1	1	0	1	0	0	0	1	0											
Creativity	2	2	0	0	0	0	0	0	0	0	2	1	0	0	1	1	0	0												
Concerning ethical issues	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0													
Communication skills	11	12	5	3	1	13	2	4	2	14	10	4	0	8	8	0														
Collaboration	3	4	1	1	0	2	1	3	3	3	2	4	0	7	0															
Skills training	5	16	4	2	2	7	10	18	27	10	0	4	5	0																
Tutors influence	0	0	0	0	0	1	3	5	1	0	0	0	0																	
Interdisciplinary	1	1	0	1	0	0	2	3	1	3	1	0																		
Students' definition for	3	0	0	4	0	0	0	0	0	0	0																			
Students' character	9	8	8	10	1	20	5	1	3	0																				
Negative evaluation	2	7	0	2	1	3	6	1	0																					
Positive evaluation	2	3	0	1	0	0	2	0																						
Motivation	3	8	2	6	0	2	0																							
Difficult to do	4	7	9	5	0	0																								
Easy to do	0	0	1	0	0																									
Attitude and behaviour	3	5	2	0																										
Specialization	0	0	0																											
Future employment	14	0																												
Importance of having skills	0																													

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