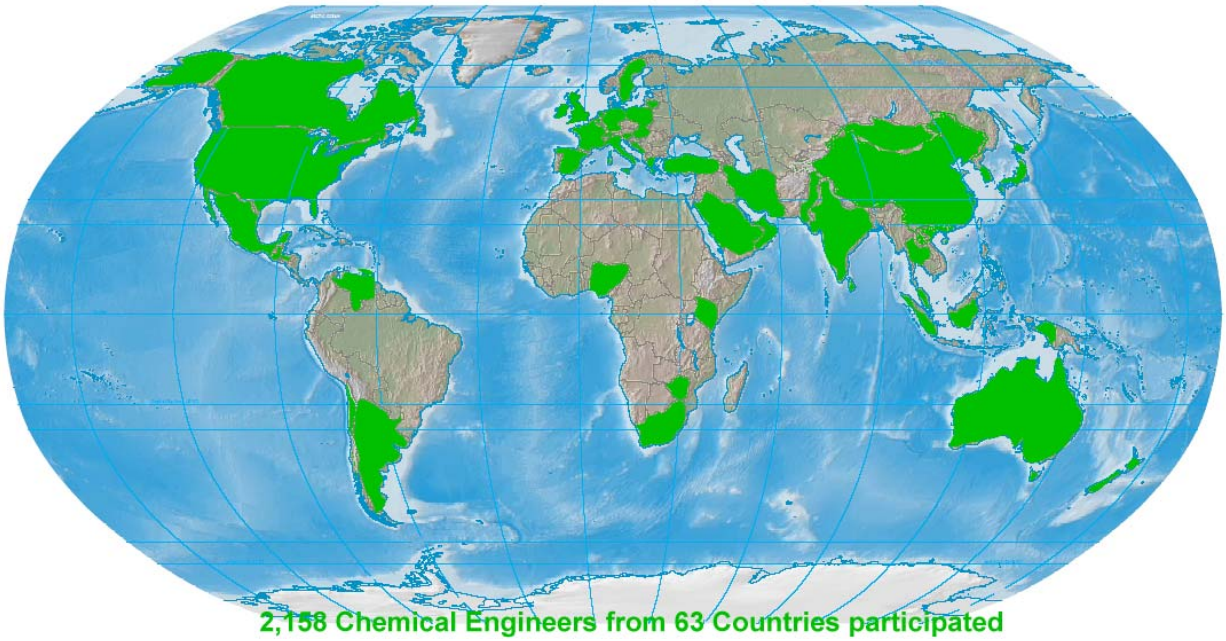
World Chemical Engineering Council WCEC

Survey

How Does Chemical Engineering Education Meet the Requirements of Employment ?



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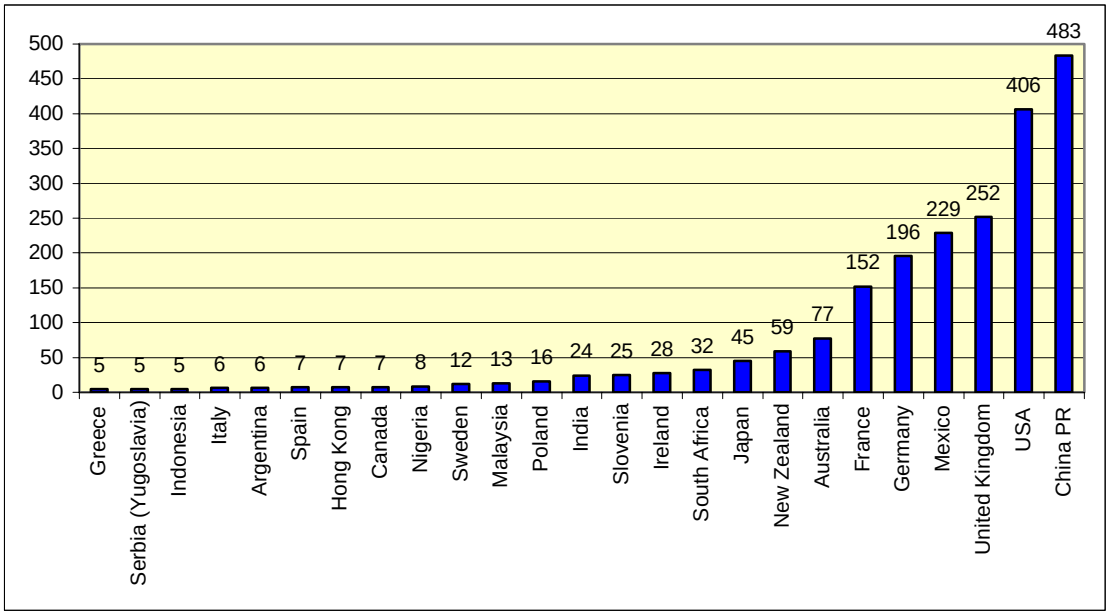
Contents:

Introduction

The project was launched in January 2003 with a questionnaire on the Internet. The questionnaire consisted of twelve questions which deal with general information personal data and generic attributes of the young engineers, who started their professional career no longer than five years ago.
2,158 persons from 63 countries had participated by the end of December. In the following figure, distribution by selected countries (more than five answers from this country) is shown. A list of all countries is given in Annex 1.



Participation of selected home countries (2,158 answers)

A list of 402 universities and departments where the participants attended their courses and obtained their degrees is given in Annex 2.

For the following investigations countries with a high participation (> 70) were chosen. The countries are: Germany, France, United Kingdom, USA, Mexico, China and Australia. In the next table some characteristic values are shown regarding the type of degree. For statistical relevance, only correlations with a reasonable number of data points (> 10) were calculated. Not all participants gave information about their degree. The results for the different questions are presented in the following chapters.

	Total	Germany	France	United Kingdom	USA	Mexico	China	Australia
Participation								
total	2158	196	152	252	406	229	483	77
female	769	67	68	74	174	92	130	32
male	1389	129	84	178	232	137	353	45
Bachelor								
total	1091	7	11	103	307	152	273	70
female	384	1	4	31	140	56	66	29
male	707	6	7	72	167	96	207	41
Master								
total	709	64	95	146*	60	44	153	1
female	243	15	43	42	25	20	50	0
male	466	49	52	104	35	24	103	1
PhD								
total	205	71	15	2	35	3	41	4
female	47	9	7	0	5	2	6	1
male	158	62	8	2	30	1	35	3
Others								
total	153	54	31	1	4	30	16	2
female	95	42	14	1	4	14	8	2
male	58	12	17	0	0	16	8	0

Participation: Absolute values by university degree for selected countries

(*this includes a large number of the British responses from graduates with a MEng degree, which is their first degree)

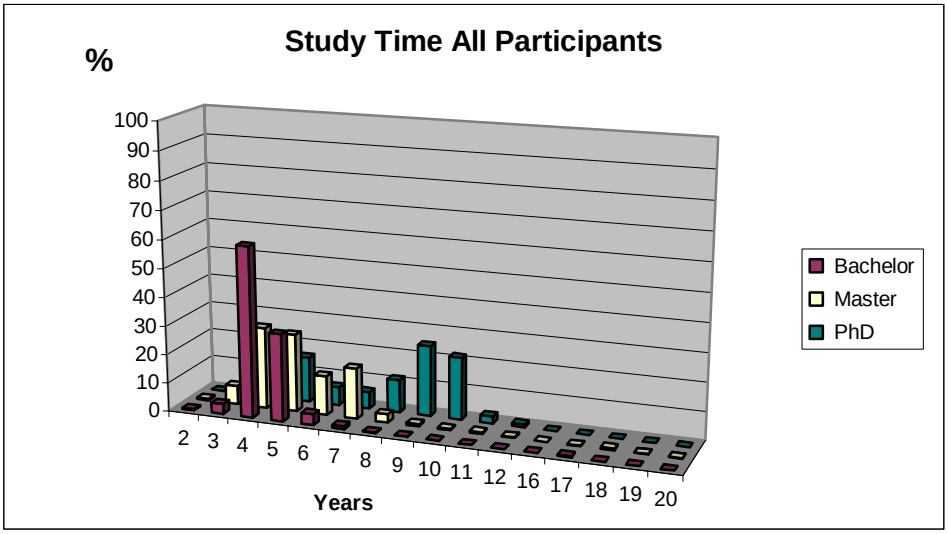
1. Study Time

1.1 Study Time by Type of Degree and Country

The first questions participants were asked was

"How long did you study Chemical Engineering?".

The answers to this question depend strongly on the type of degree and the country of the studies. The following figures 1.1 – 1.8 show the distribution of study time for the different degrees.



(this includes a large number of the British responses from graduates with a MEng degree, which is their first degree, see chapter 3)

Fig. 1.1: Study Time (All Participants)

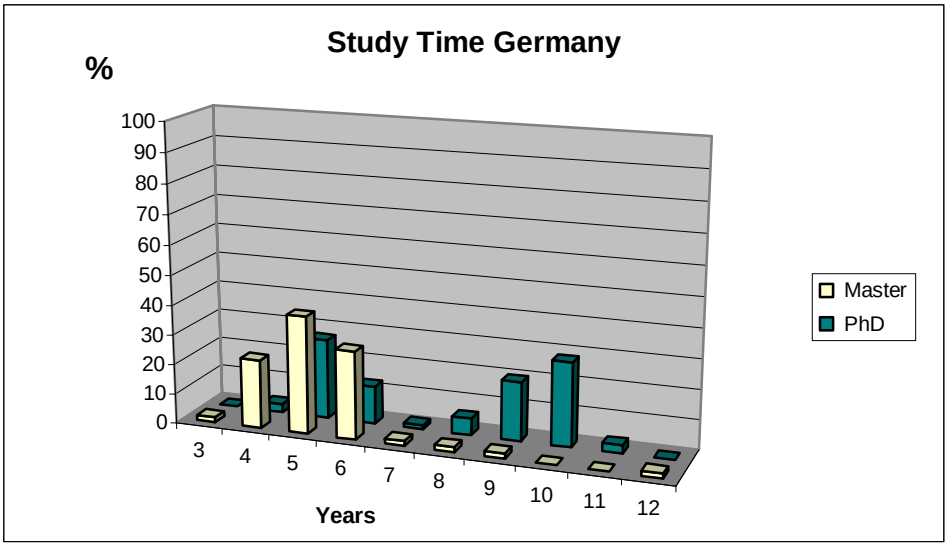


Fig 1.2: Study Time for Germany

In Fig 1.2 the study time by type of degree is presented for Germany. On account of the low number of returns the bachelor's degree was not considered (Participation Table p. 5).

Looking at the distribution of the study time in Germany it is obvious that the average study time for the master's degree is 5.3 years. For the PhD degree the situation is not so clear. There are two distribution maxima with mean values of 5.2 and 9.4. This results from the fact that some participants regard their study time to be finished on obtaining the master's degree. Some of the participants were also already employed by industry and worked in parallel on their PhD thesis.

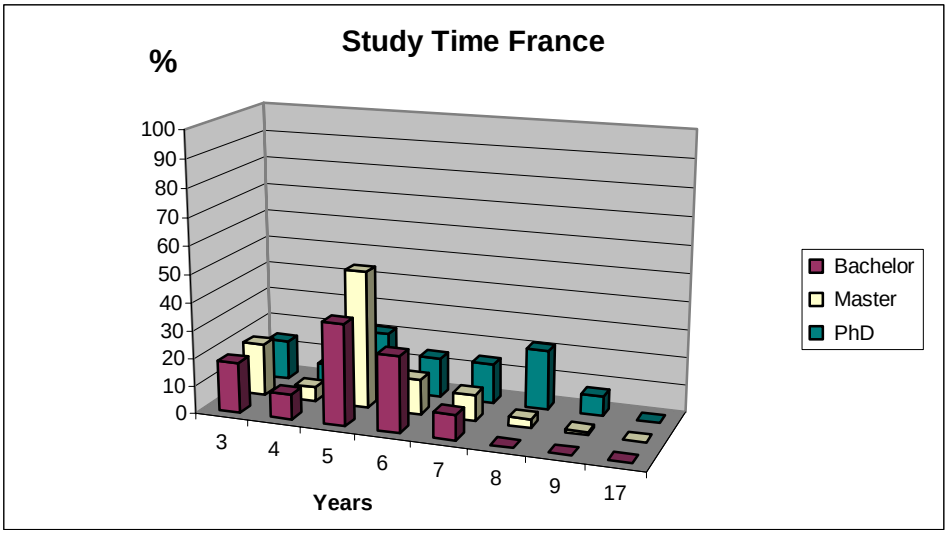


Fig. 1.3: Study Time in France

The study time distribution in France (see fig. 1.3) shows no specific shape. Nearly 25 % of the French participants took their study courses abroad (see chapter 1.2). Therefore the diagram shows characteristics of several countries. 7.9 % of the French participants studied partly in United Kindom, 5.2 % in Canada.

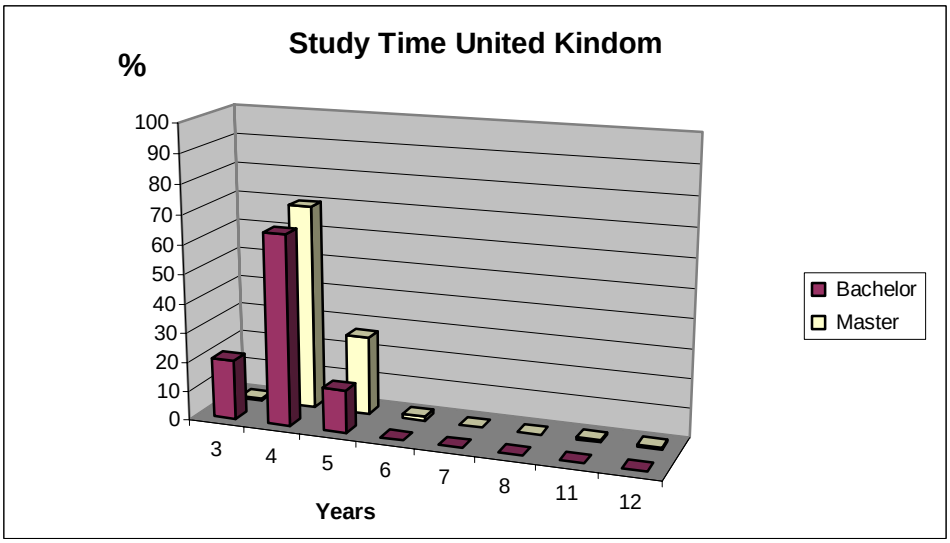


Fig. 1.4: Study Time United Kingdom

In Fig 1.4 study time by type of degree is presented for United Kingdom. On account of the low number of answers the PhD degree was not considered (see Participation Table p. 5).

It is obvious that the mean values of 3.9 and 4.4 years for bachelor's and master's degrees respectively are very close. For a detailed discussion of the British MEng degree, which is a first cycle degree, see chapter 3.

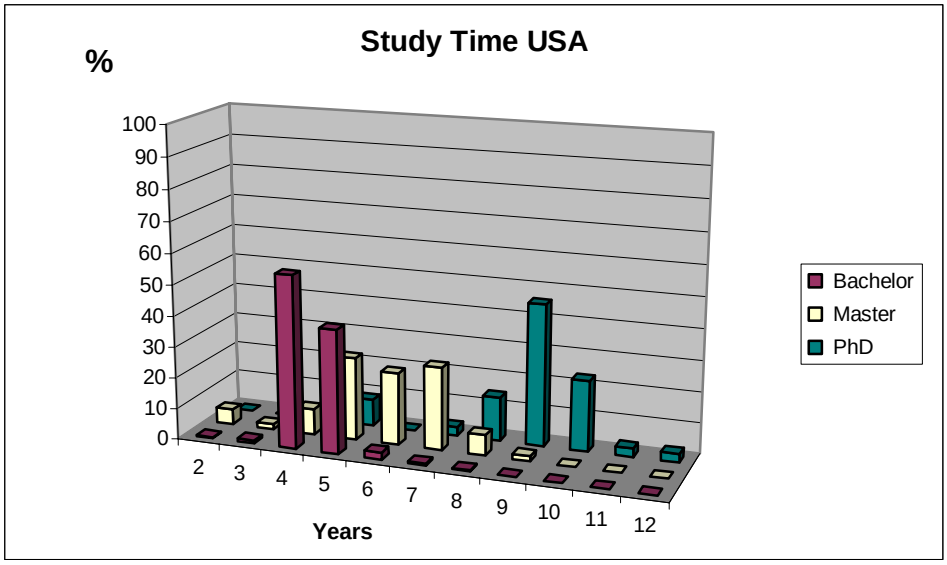


Fig. 1.5: Study Time in the USA

The figures for US participants show the expected bachelor's, master's and PhD scheme with mean values for study times of 4.5 for bachelor, 5.8 for master and 9.2 for PhD degrees.

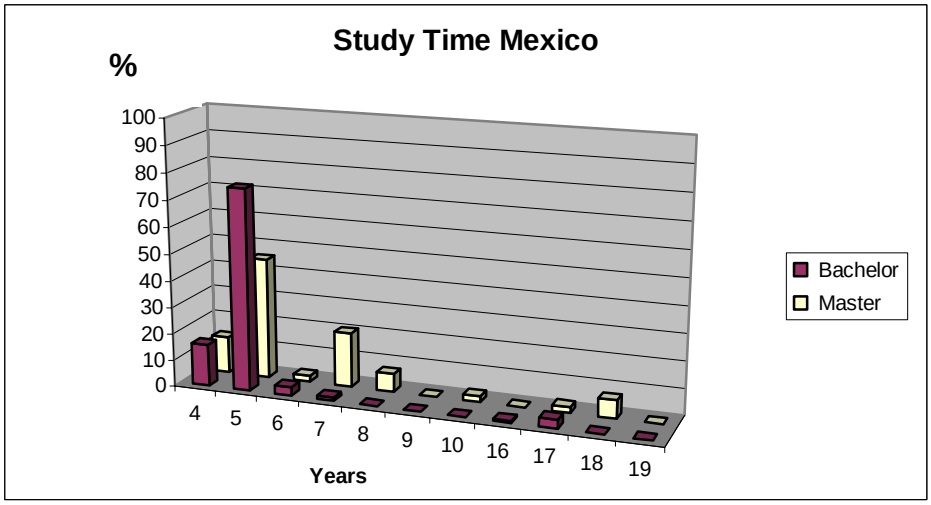


Fig. 1.6: Study Time in Mexico

In Fig 1.6 study time by type of degree is presented for Mexico. On account of the low number of answers the PhD degree was not considered (see Participation Table p. 5).

The average value for bachelor's and master's degrees is 4.9 and 6.8 years for Mexico.

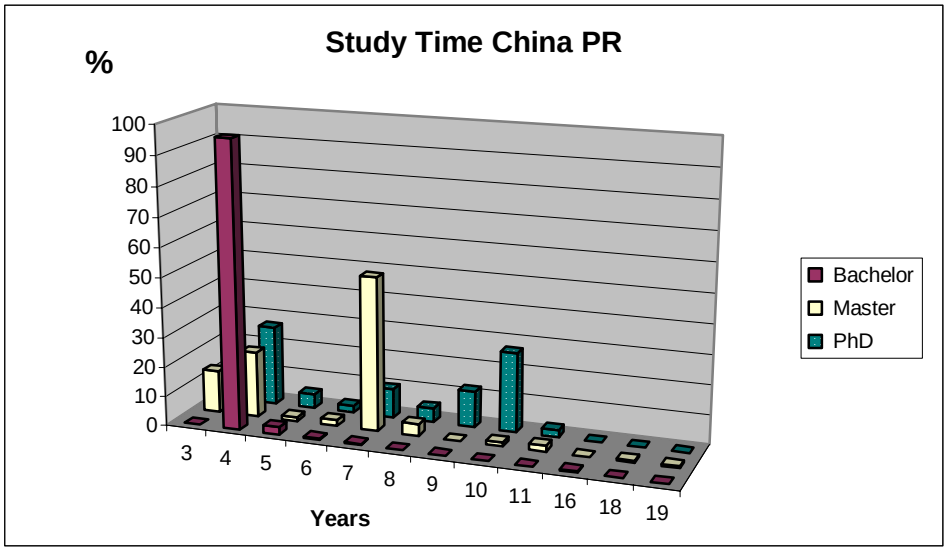


Fig. 1.7: Study Time in China

The mean values for bachelor's, master's and PhD degrees for China are 4.1, 6.0 and 8.7 years (not considering the replys for 4 years duration) respectively.

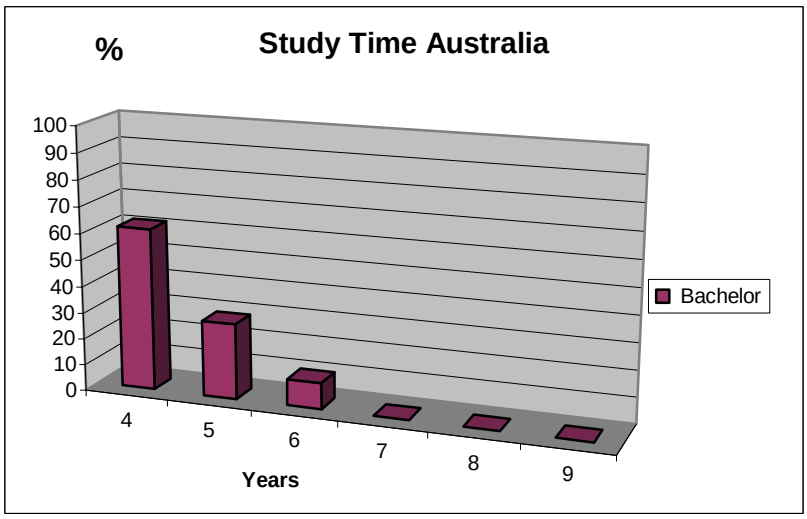


Fig. 1.8: Study Time in Australia

In Fig 1.8 the study time by type of degree is presented for Australia. Regarding the low number master's and PhD degrees were not considered (see Participation Table p. 5). It took 4.5 years on average to obtain a bachelor's degree in Australia. Many students take combined degrees for example Bachelor of Engineering / Bachelor of Commerce which are normally of five years' duration.

1.2 Studying and Working Abroad

Most of the participants have studied and found a job in their home countries. But there are interesting differences between the countries investigated in detail. The following two figures show the portion of participants who have not studied or have studied only partially in their home countries and participants who work abroad. It is quite obvious that there is a strong correlation between studying abroad and finding a job outside the home country. Countries with a big home market like China or the US offer many chances for young people to enter a professional career in industry. Hence there is not a perceived need to leave the country for study or employment.

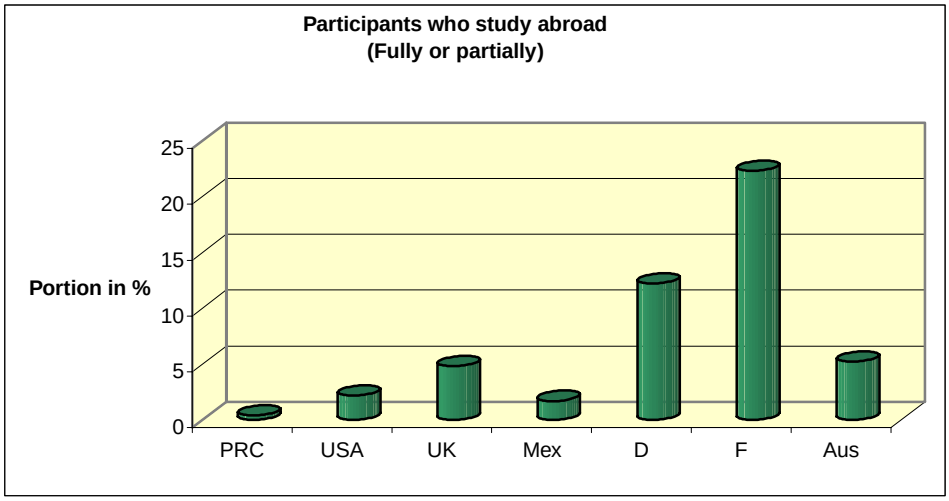


Fig. 1.9: Participants who study abroad for selected countries

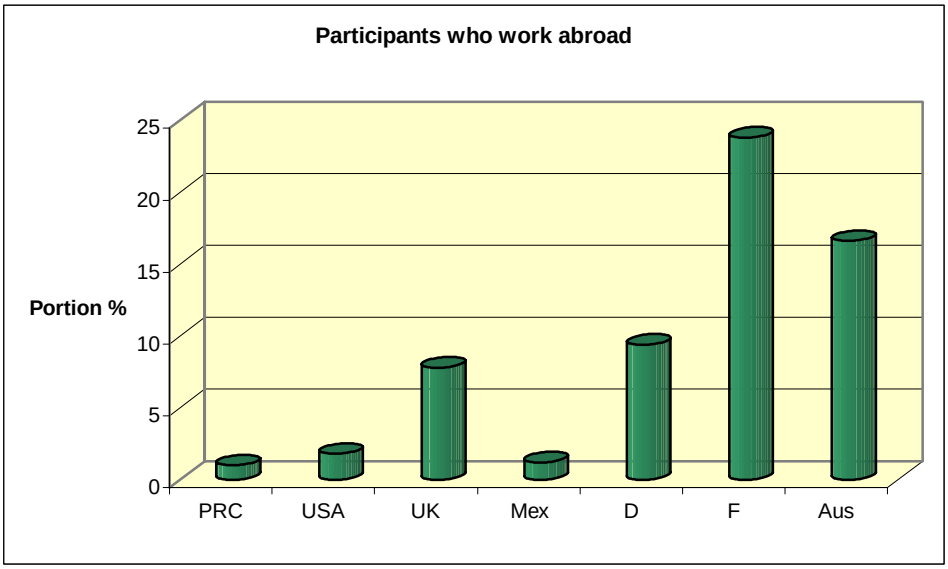


Fig. 1.10: Participants who work abroad

1.3 Universities and Institutes

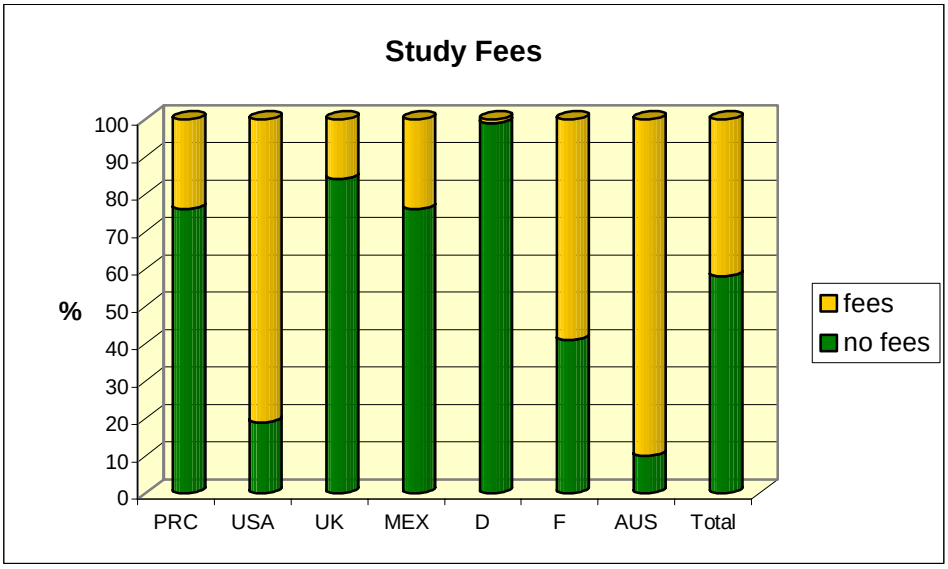
The participants specified 402 different universities and institutes where they took their courses. A complete list of the institutions is given in Annex 2.

2. Study Fees

The second question the particpants had to answer was

Did you pay fees for your studies ?.

Figure 2.1 shows the distribution of the answers for the yes-no requirement. Only fees higher than 1,000 US $ per year were considered.



(Prerequisite: Annual fee > 1.000 US $)

Fig. 2.1: Study Fees

The amount of university fees also differs significantly from country to country. Figure 2.2 shows that fees in the USA are significantly higher than in the other countries.

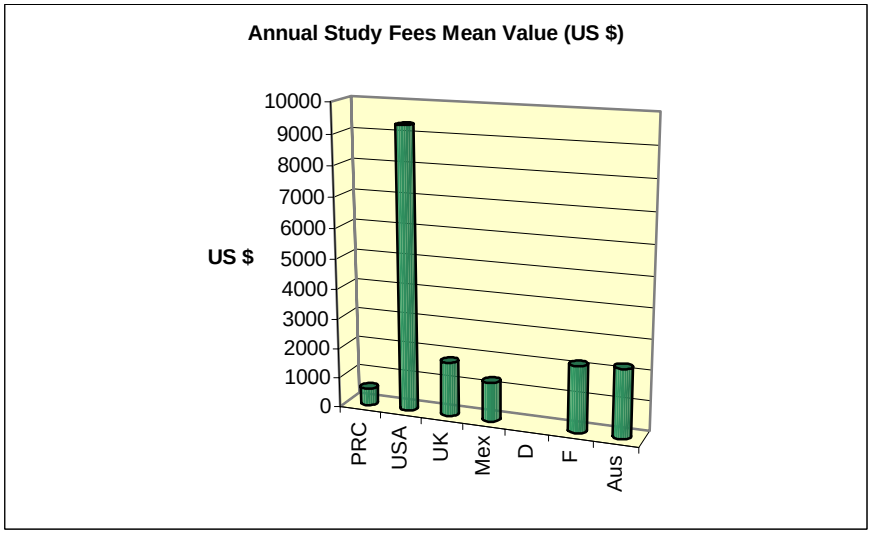


Fig. 2.2: Mean value of Annual Study Fees (US $)

3. University Degrees

Participants were asked:

What are your university degrees?.

It was possible to give multiple answers for bachelor's, master's and PhD degrees or to specify other degrees.

In the Participation Table (see p. 5) the absolute values of the university degrees are presented. The problem that arises is that the different degrees in different countries are not comparable. Even within a country there may be significant differences between master's degrees of different universities that only the combination of the university name and degree specification make it clear which qualification the graduates actually have.

The University of Birmingham for example offers Undergraduate Degree Programmes to obtain a BEng Chemical Engineering degree in three years and a MEng Chemical Engineering degree in four years. The first two years of all full time Chemical Engineering programmes are common, after which the student can opt to study for an additional year to obtain the BEng qualification or for an additional two years for the MEng qualification.

At Melbourne University the Bachelor of Engineering is a four-year full-time course. The master's degree can be obtained in Postgraduate Programmes.

The two examples illustrate how difficult the situation is. In this report all figures and tables are, where necessary, annotated to draw the attention to the problem.

It is obvious that only 142 out of 196 German participants gave information about their degree (see Particpation Table p. 5). This may be due to the fact that in Germany the degree categories bachelor, master and PhD are not so familiar than in the Anglo-

Saxon countries. Chances for those with a bachelor's degree to find a job in Germany are considered by the German Industry to be very poor. There are recommendations for Germany to introduce Bachelor and Master Degree Programmes. It is recommended to setup a three-year Bachelor's followed by a two-year Master's Programme.

Fig. 3.1 - 3.3 show the distribution of degrees in the different countries.

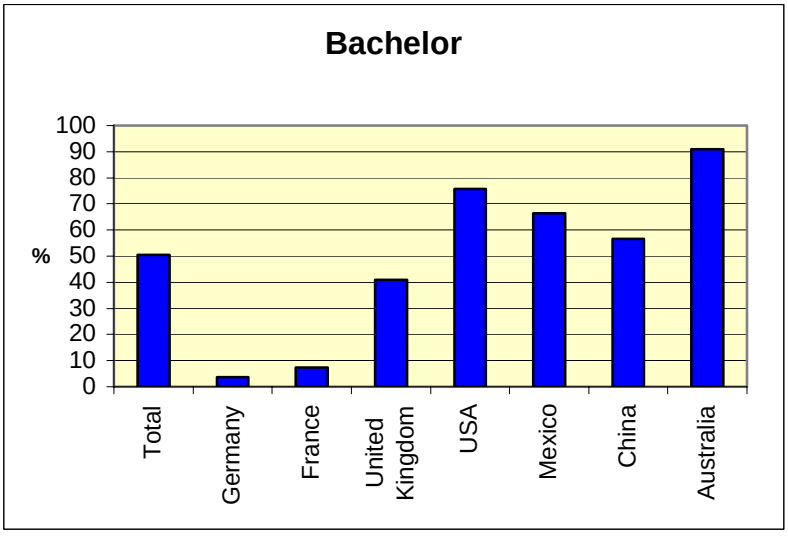


Fig. 3.1: Percentage of Bachelor Graduates per Country (see also Table p. 5.)

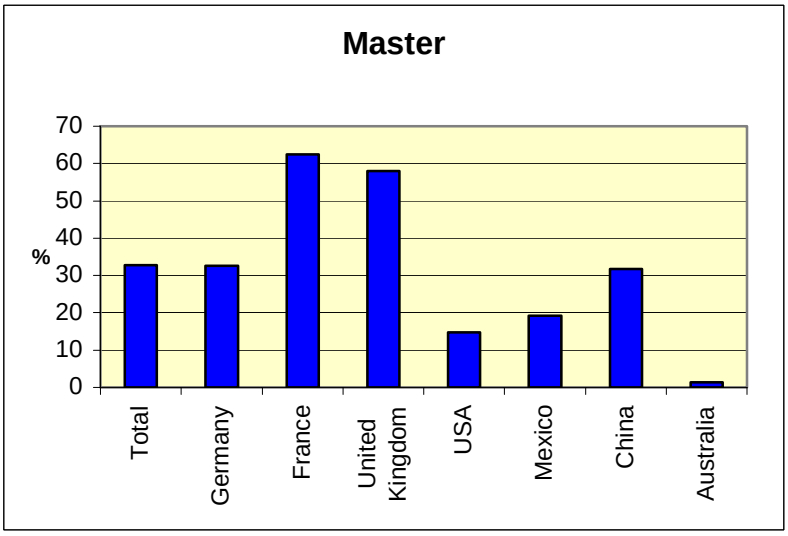


Fig. 3.2: Percentage of Master Graduates per Country
(including BEng see p. 14, see also Table p. 5.)

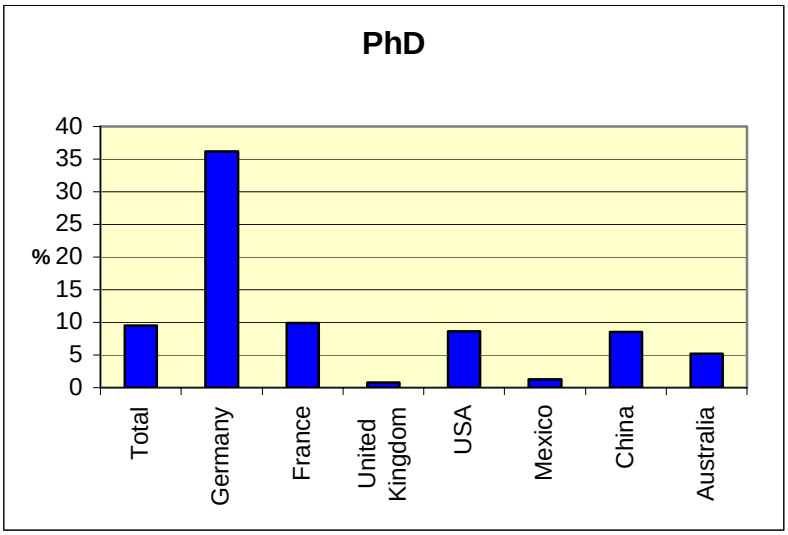


Fig. 3.3: Percentage of PhD Graduates per Country (see also Table p. 5.)

4. Age, Date of Birth

The following figures (4.1-4.8) show the age distribution of the participants. One pre-requisite was that participants should not be older than 35.

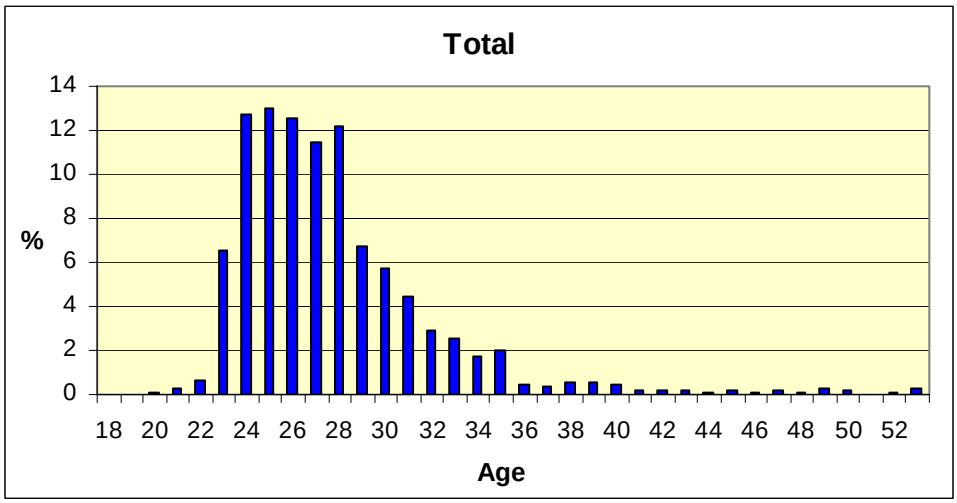


Fig. 4.1: Age Distribution for All Participants

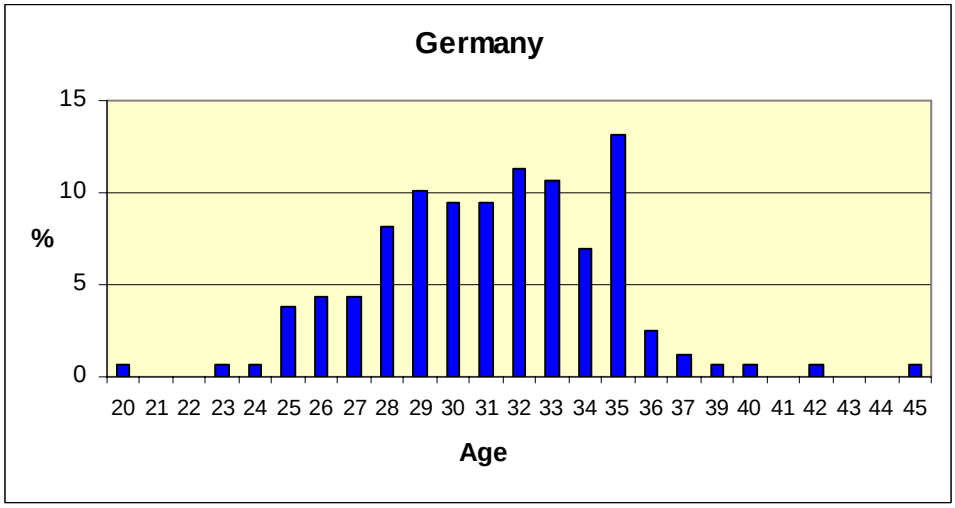


Fig. 4.2: Age Distribution for Germany

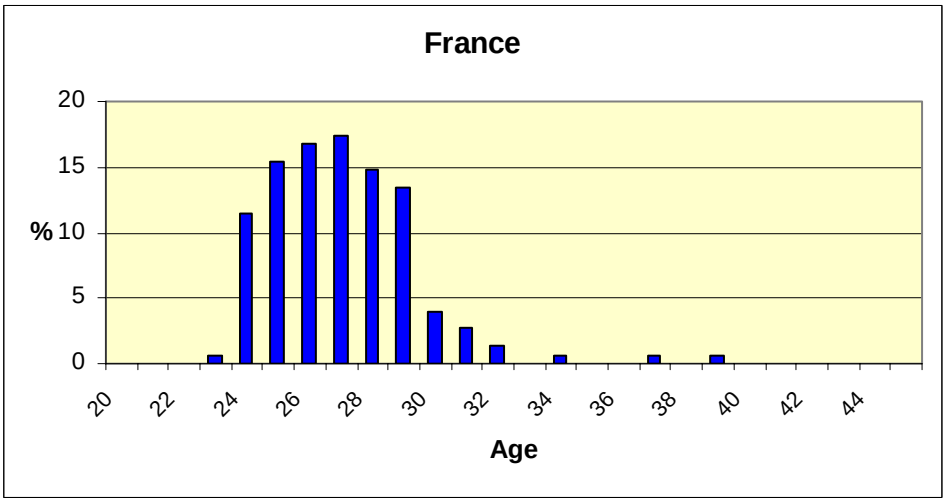


Fig. 4.3: Age Distribution for France

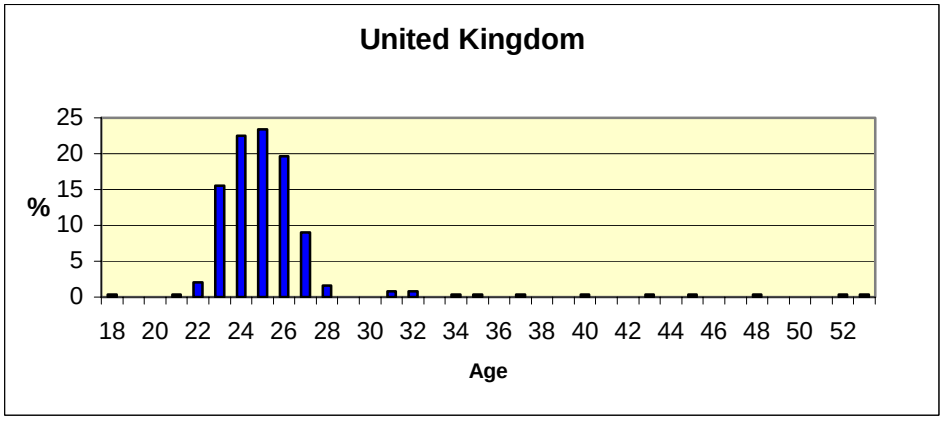


Fig. 4.4: Age Distribution for United Kingdom

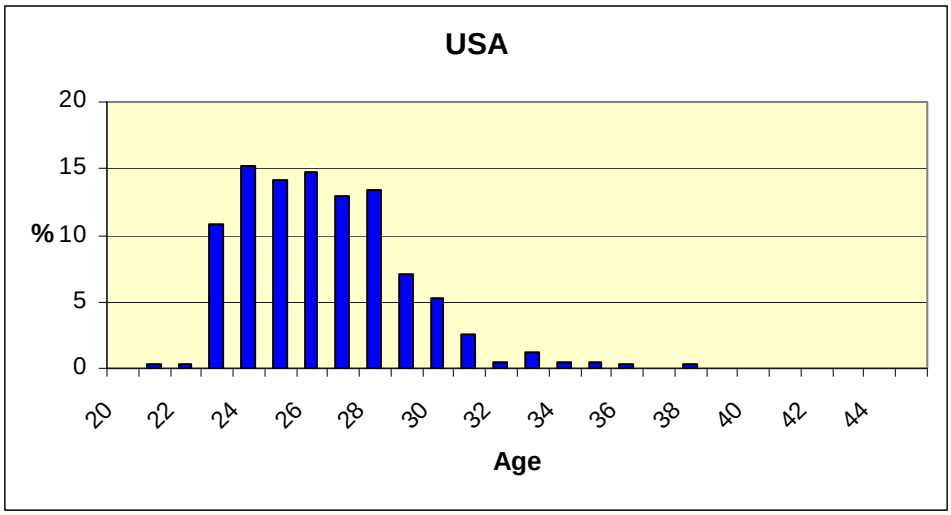


Fig. 4.4: Age Distribution for the USA

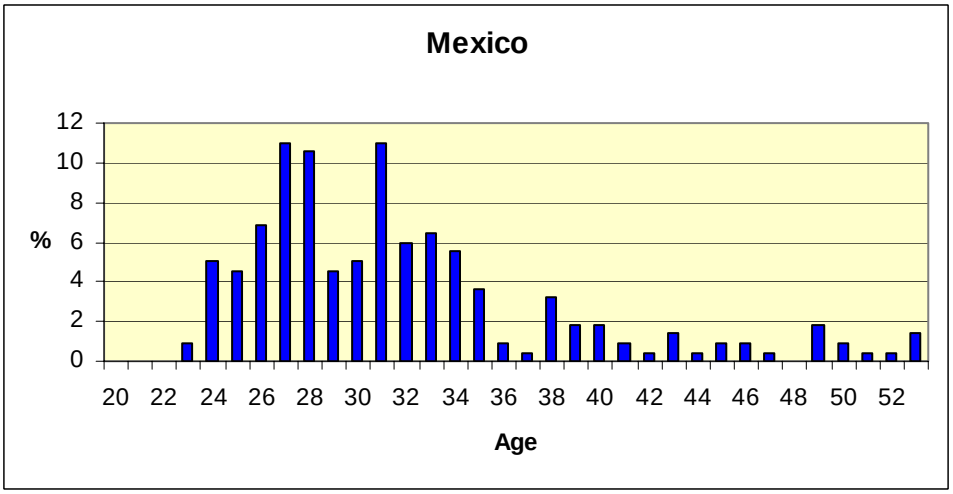


Fig. 4.5: Age Distribution for Mexico

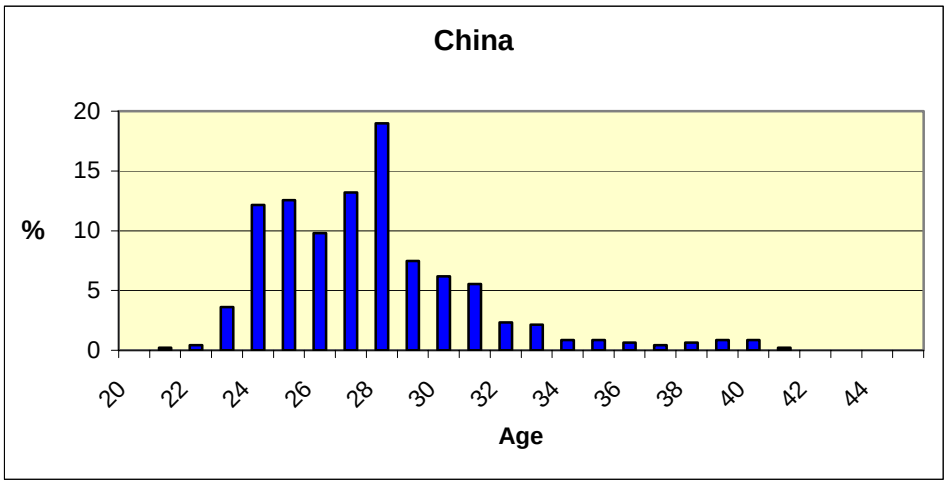


Fig. 4.7: Age Distribution for China

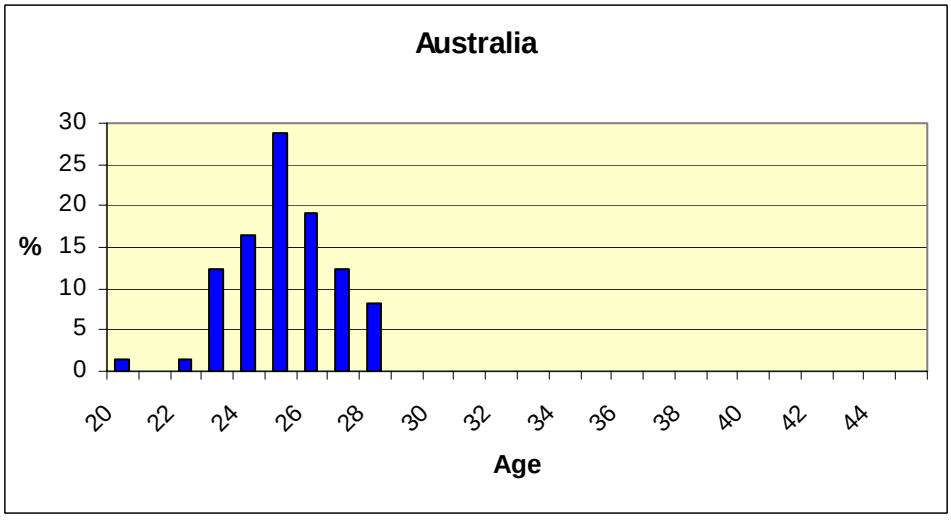


Fig. 4.8: Age Distribution for Australia

5. Professional Societies

Participants were asked

To which professional Society do you belong?.

The information given was very heterogeneous. Beside the required information about membership in professional learning societies, including vaiants, people also stated

their employing companies here. For an overview, a list of the 101 societies cited is given in Annex 3.

6. Distribution of Participants by Gender

In Fig. 6.1 the distribution of gender is shown. 35.6% of all participants are female, 64.4% male.

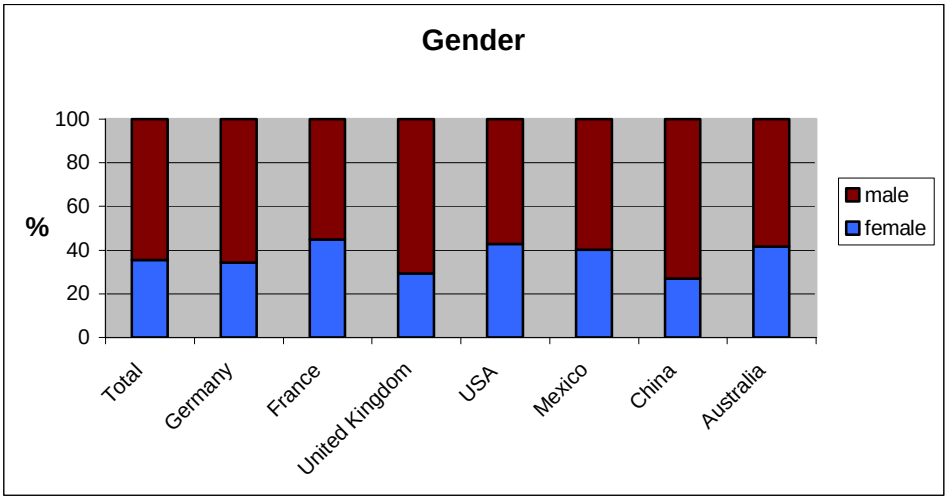


Fig. 6.1: Distribution by Gender

7. Employment status

In Fig. 7.1 the employment status of the participants is presented. Most of the participants are employed full-time permanent or full-time temporary. Only a few participants have different employment status.

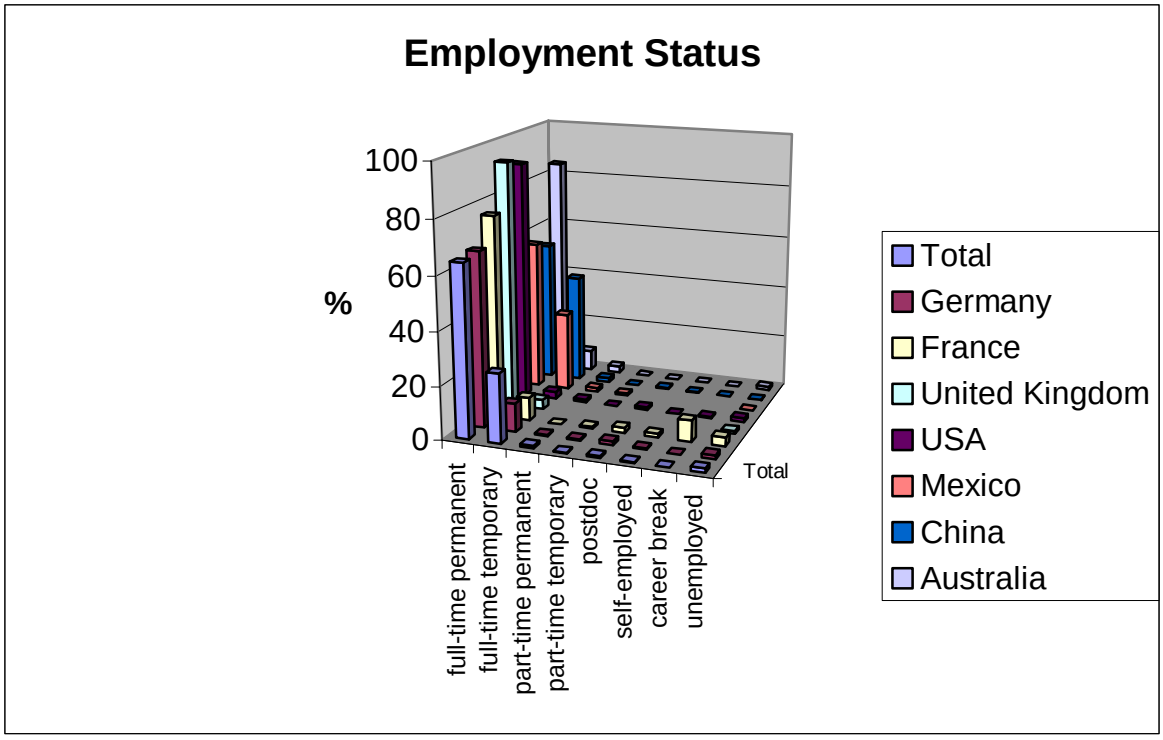


Fig. 7.1: Employment Status of Participants

8. Employment Details

8.1. Time to Find First Professional Job

The participants were asked

How long did you take to find your first professional job (months)?.

The influence of type of degree and gender on the time to find the first job was investigated in detail. The following figures show the results.

In Fig. 8.1 the distribution of the time-to-find-job values for the different countries is shown.

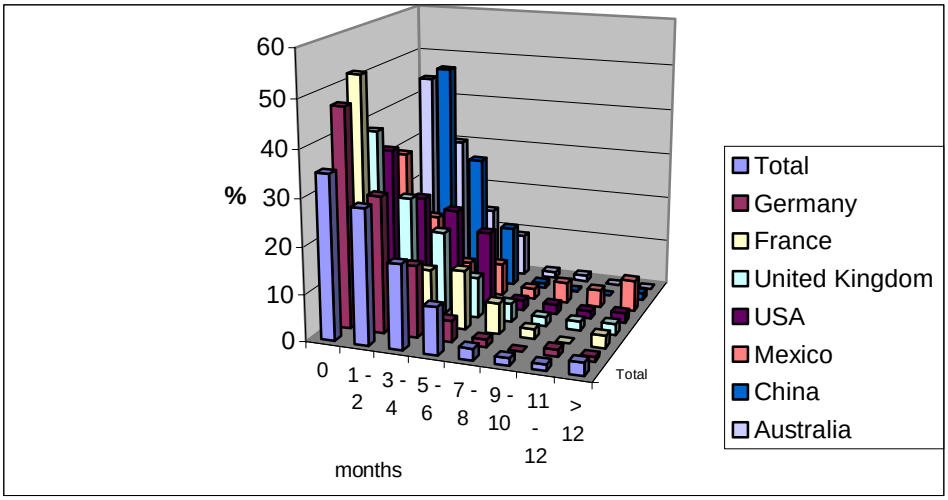


Fig. 8.1: Distribution of Time-to-Find-Job Values

In Fig 8.2 the time-to-find-job values for the different degrees are presented. Two-thirds of the participants found a job within two months of finishing their studies. There is no evidence that the time-to-find-job value depends strongly on the type of degree.

In Fig 8.3 the corresponding values are plotted for males and females separately. It is interesting that nearly 50 % of the female participants found a job immediately after they had finished their studies.

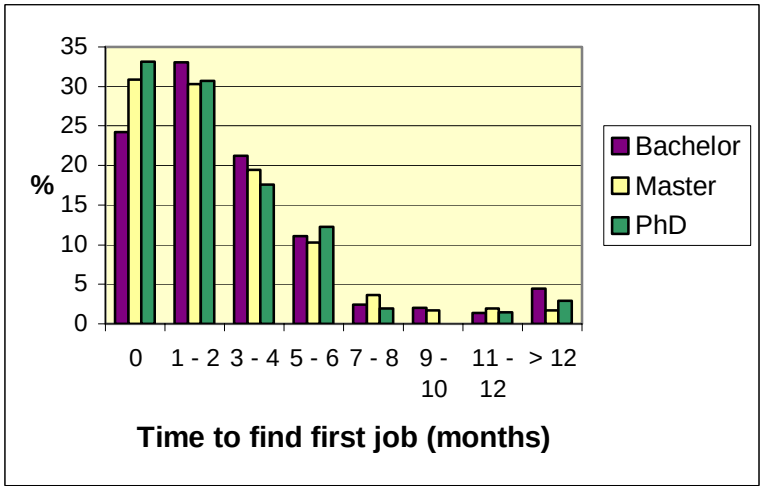


Fig. 8.2: Time-to-Find-Job Values for the Different Degrees

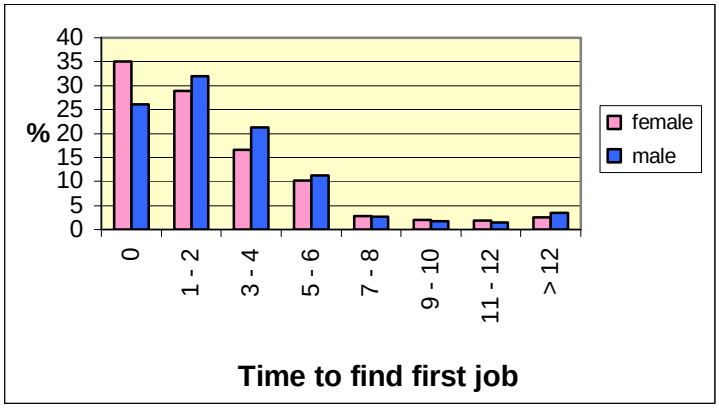


Fig. 8.3: Time-to-Find-Job Values for Male and Female

8.2 Duration of Employment

The second question concerning employment details was

How long have you been employed?.

One prerequiste of the project was, that the participants should have started their professional career no longer than five years previously. In Fig. 8.4 the distribution of employment time for selected countries is shown. It is obvious that most participants started their professional careers longer than two years beforehand.

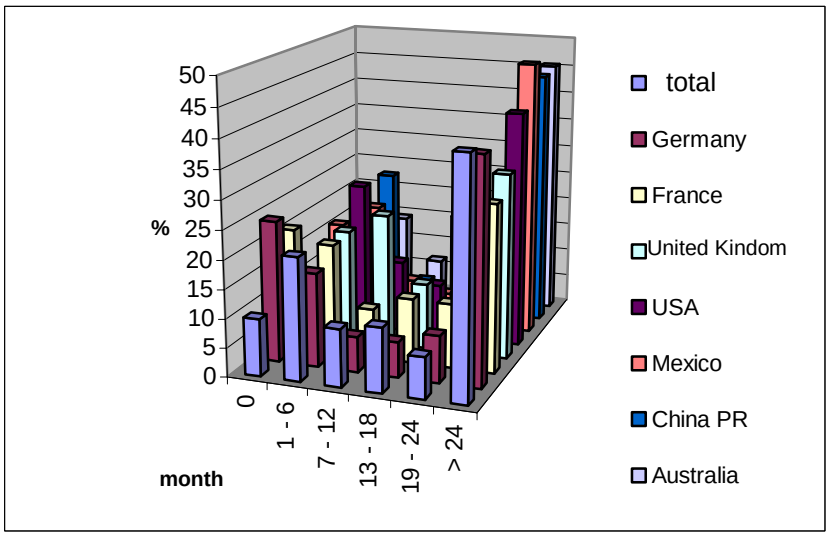


Fig. 8.4: Distribution of Employment Time

8.3 Number of Employers

The participants were asked

How many employers have you had?

The number of employers is shown in Fig. 8.5. Due to the fact that only job starters should have participated it is not surprising that most of the people had only one employer.

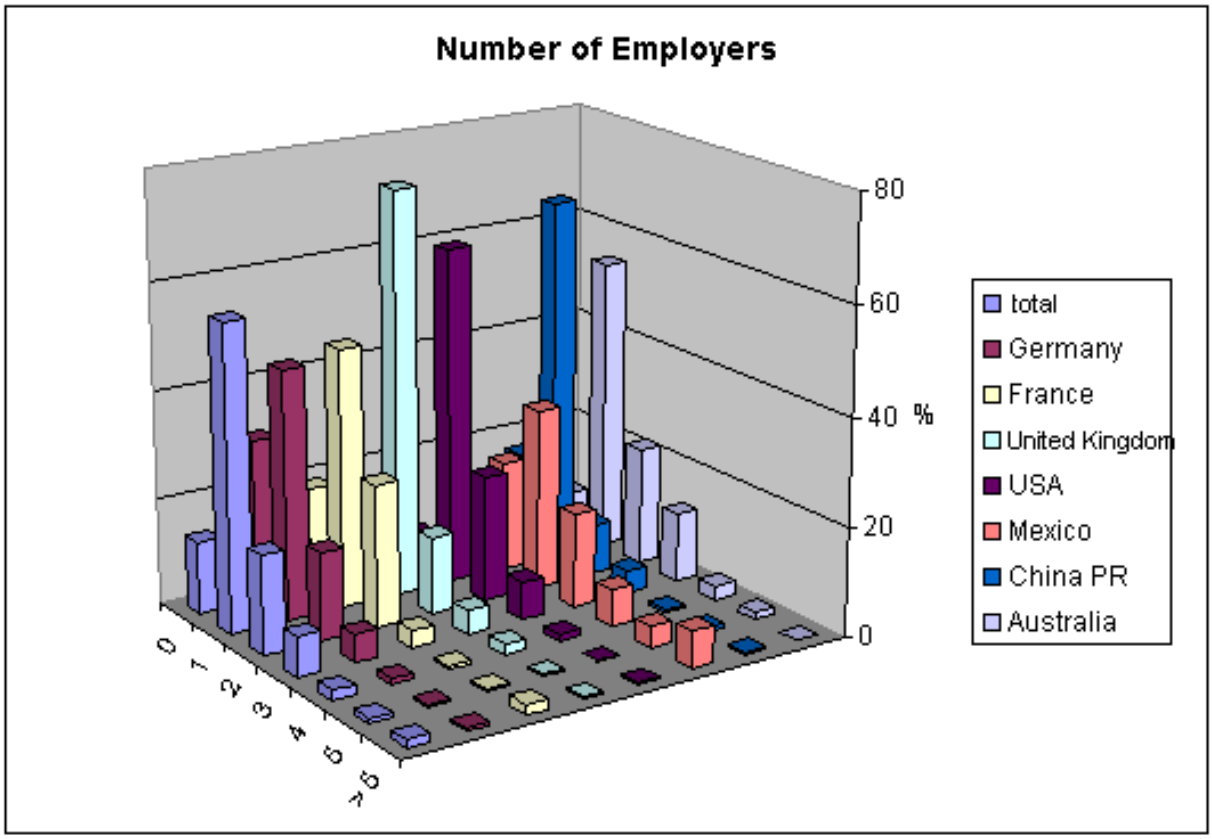
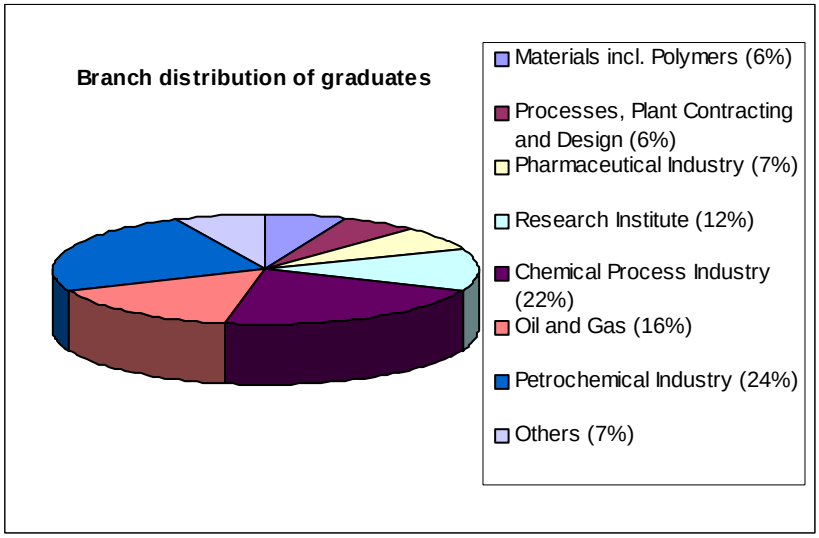


Fig. 8.5: Distribution of the number of Employers

9. Branch/Area of Present/Most Recent Occupation

One particularly interesting finding is the distribution of young chemical engineers among various sectors of the profession since it reflects the trend for an increasing

number of graduates to find employment outside the traditional areas, such as the chemical, pharmaceutical and oil industries. A total of 23 sectors were nominated, but the outcome from the survey increased this number to 27. Worldwide, 7 sectors each



employed more than 5% of the graduates (see Figure 9.1.)

Fig. 9.1 Branch distribution of graduates

This acceptance by industry varies greatly by country. With regard to the range of employment for chemical engineers, the leading countries are USA, UK, F and PRC. The results do not permit conclusions to be drawn as to whether this is a consequence of the breadth of education or the receptiveness of the individual sectors within the Industry.

The following figures (9.2-9.9) show the branches and working areas of the participants for the different countries. Multiple selection was possible for this question.

It is remarkable that more than 50 % of German participants work in the Chemical Process Industry. There are very high participations of people working in the Oil and Gas and Petrochemical Area in China and Mexico.

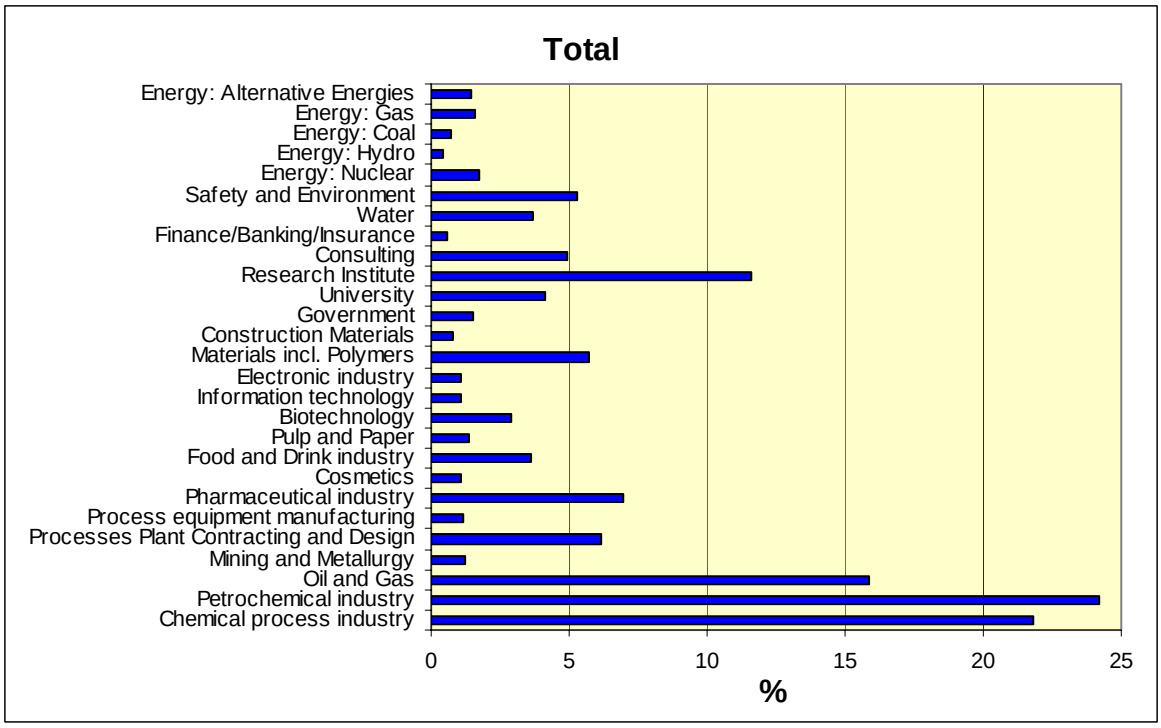


Fig. 9.2: Distribution of branches for all participants

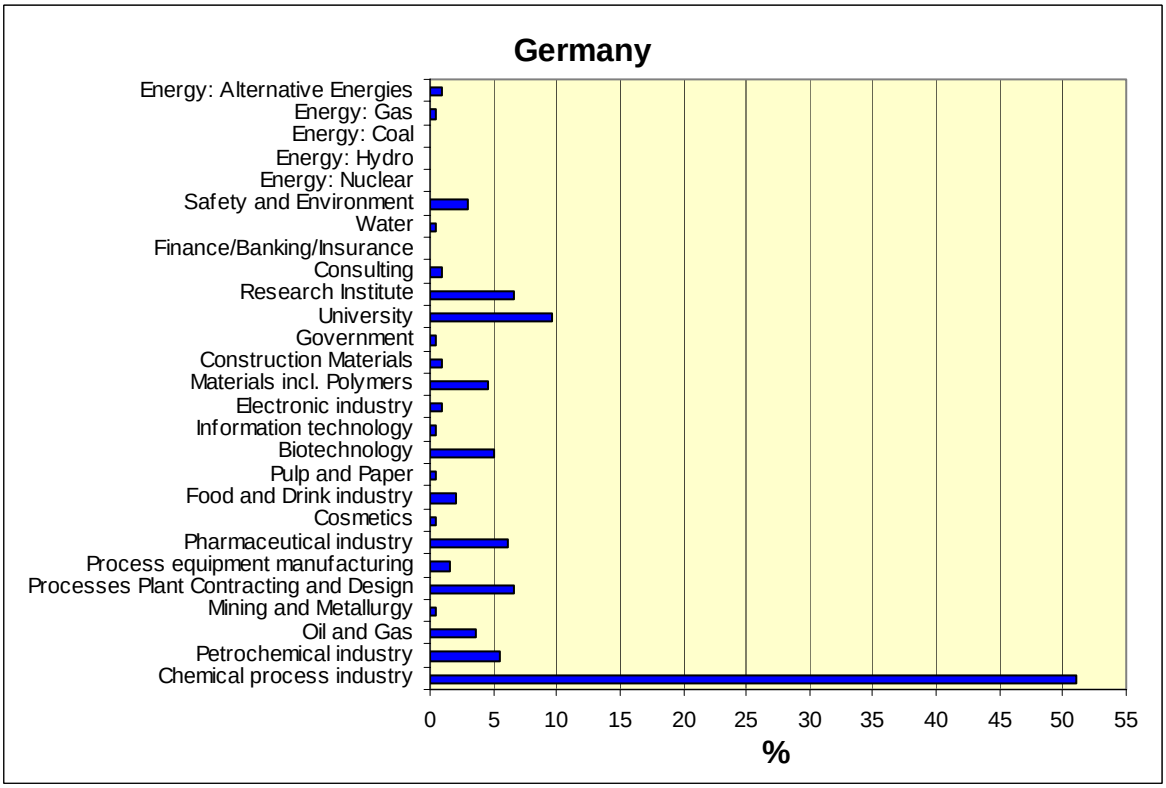


Fig. 9.3: Distribution of branches for Germany

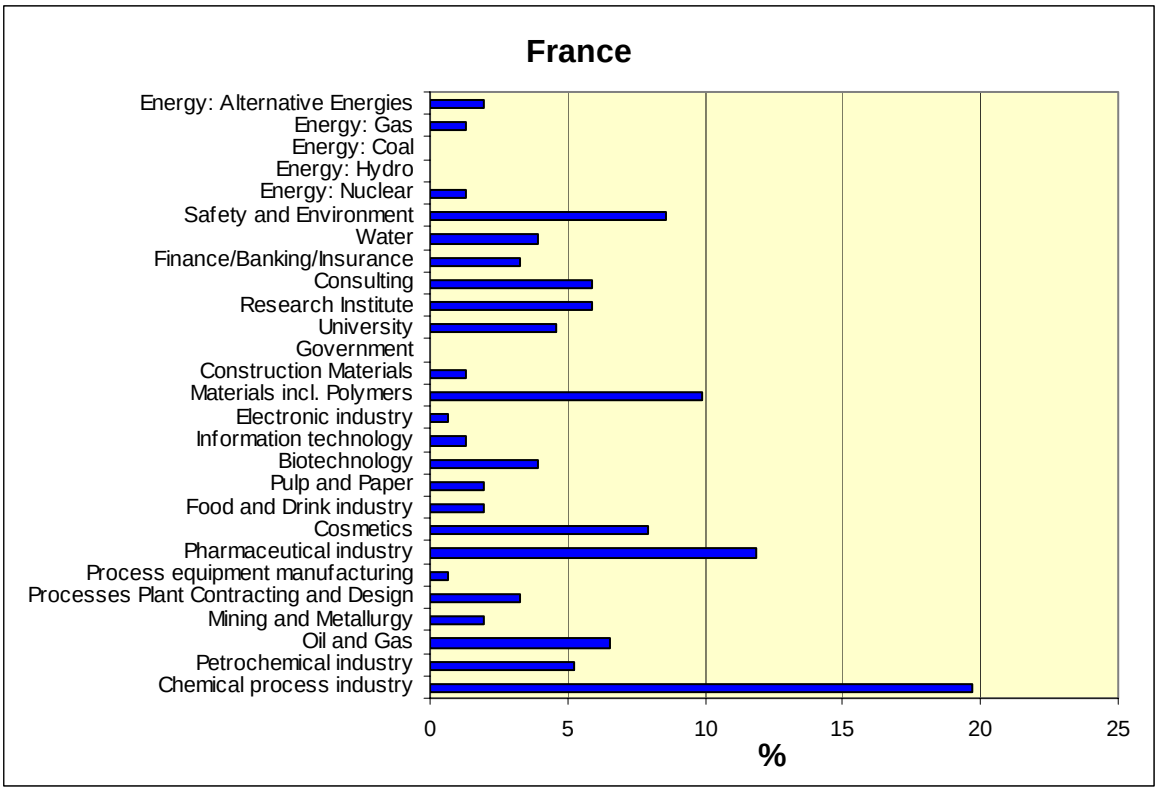


Fig. 9.4: Distribution of branches for France

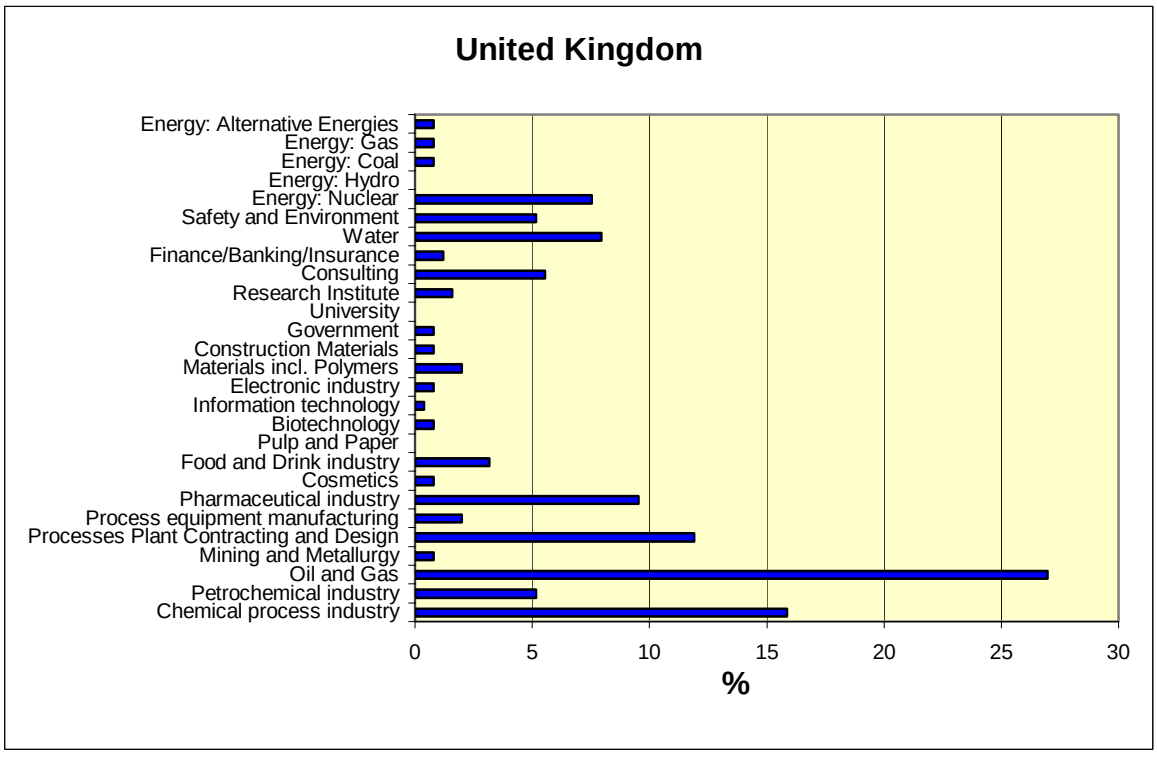


Fig. 9.5: Distribution of branches for United Kingdom

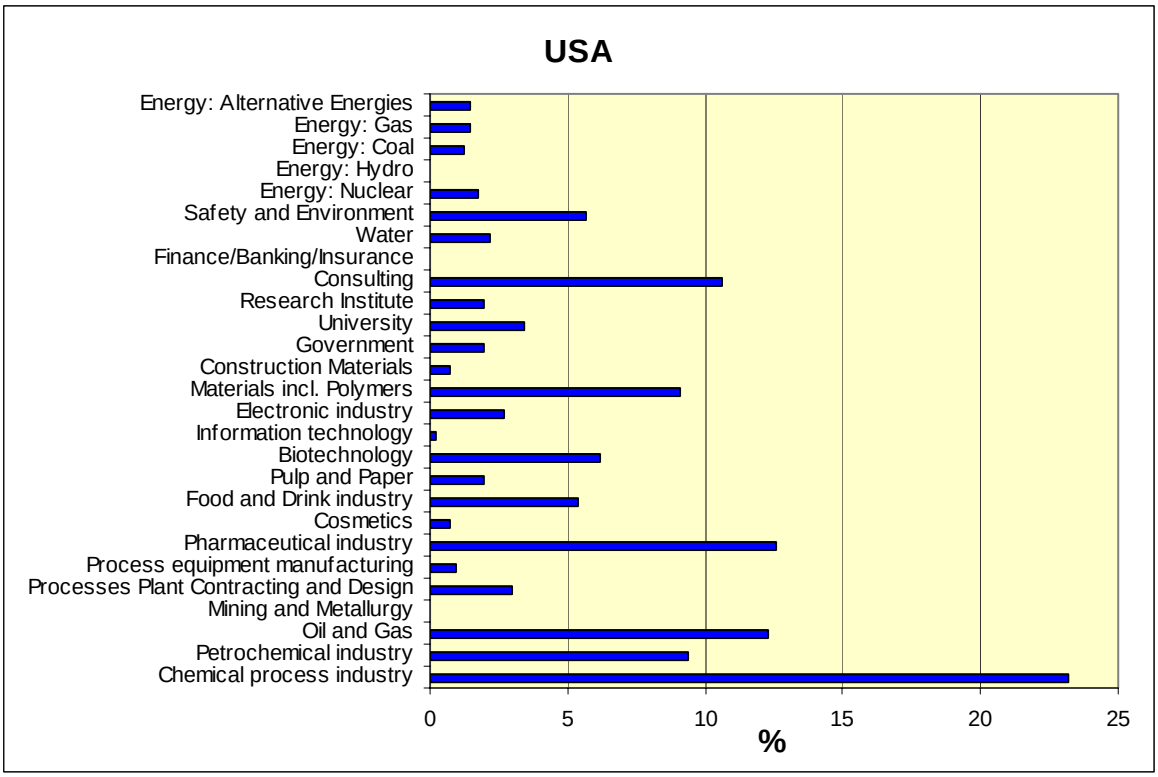


Fig. 9.6: Distribution of branches for USA

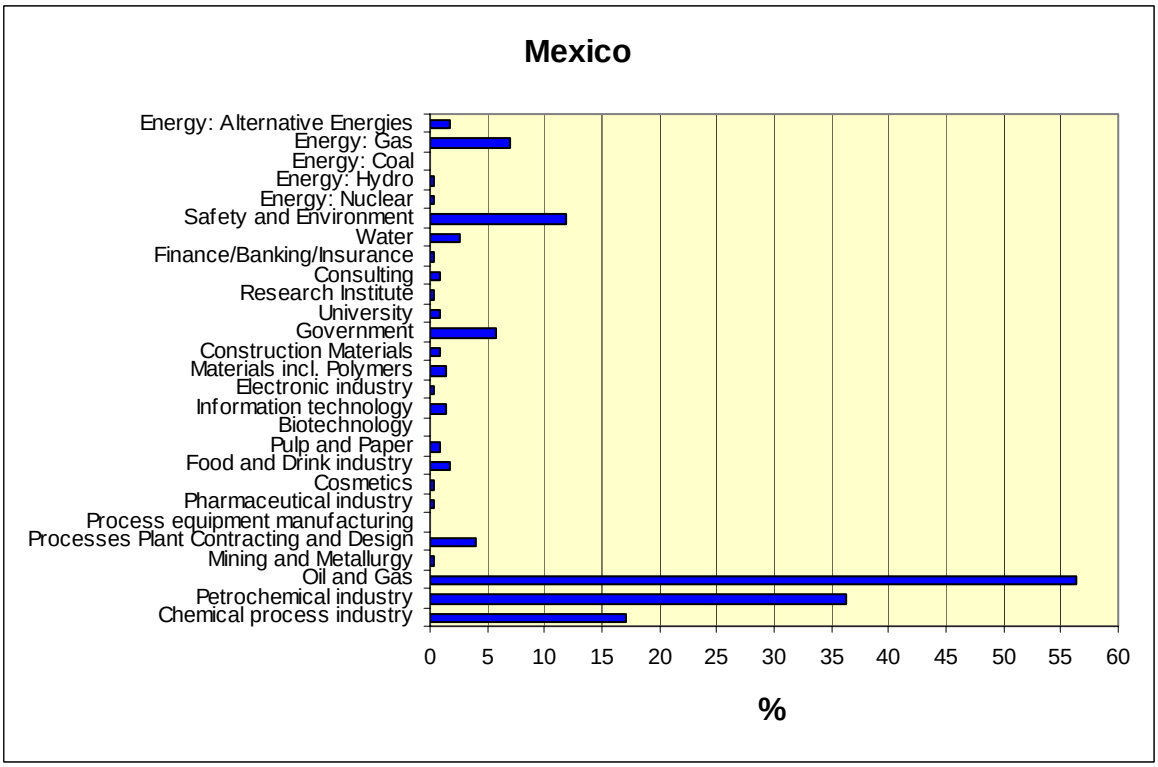


Fig. 9.7: Distribution of branches for Mexico

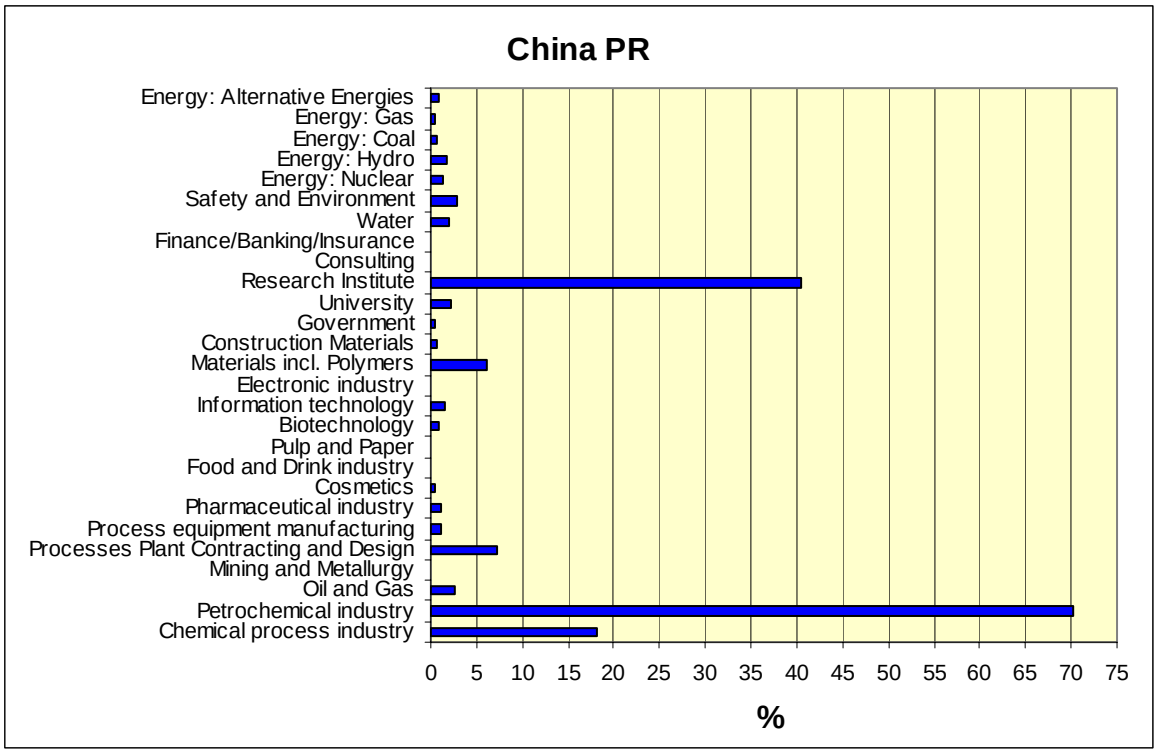


Fig. 9.8: Distribution of branches for China

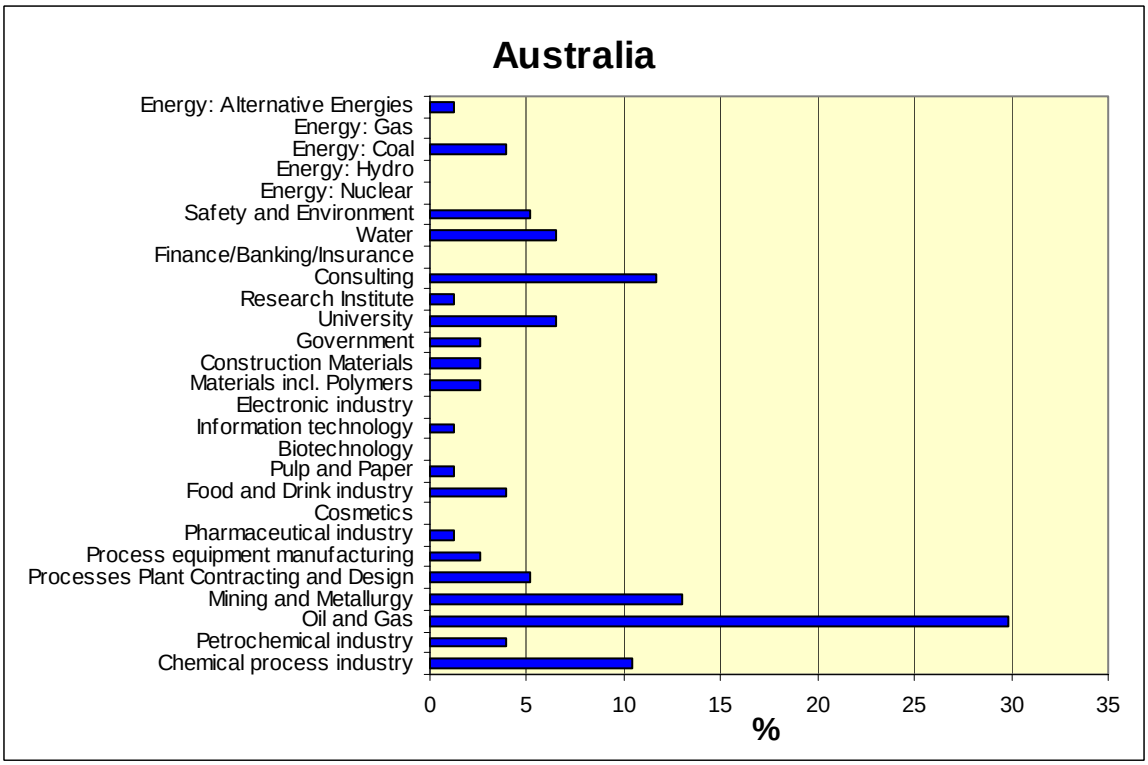
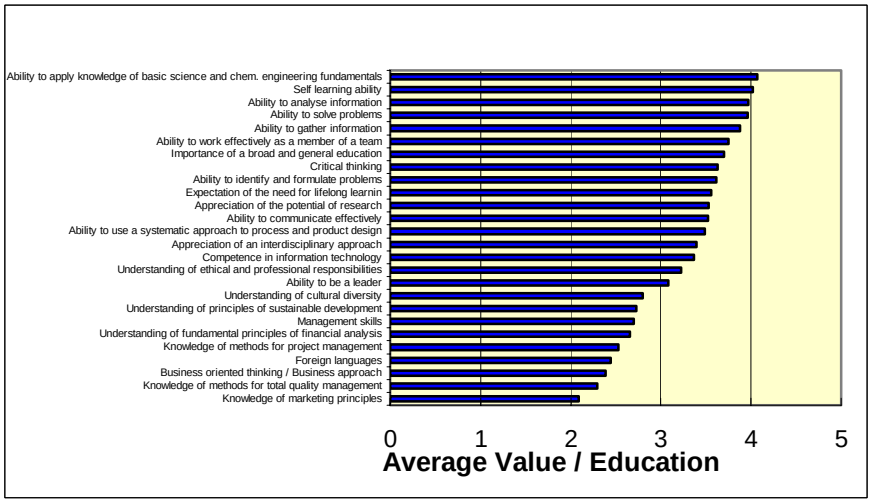


Fig. 9.9: Distribution of branches for Australia

10. Skills and Abilities with Respect to the Quality of Education and its Relevance to Work

10.1 Presentation of Results

The aim of this question was to obtain information about the gaps and needs in chemical engineering education. Participants were asked to rank skills and abilities on a scale of 1 to 5. On this scale 1 means very low, 5 of very high relevance. There was also a distinction between education and work. In the following figures the results for the different countries are presented.



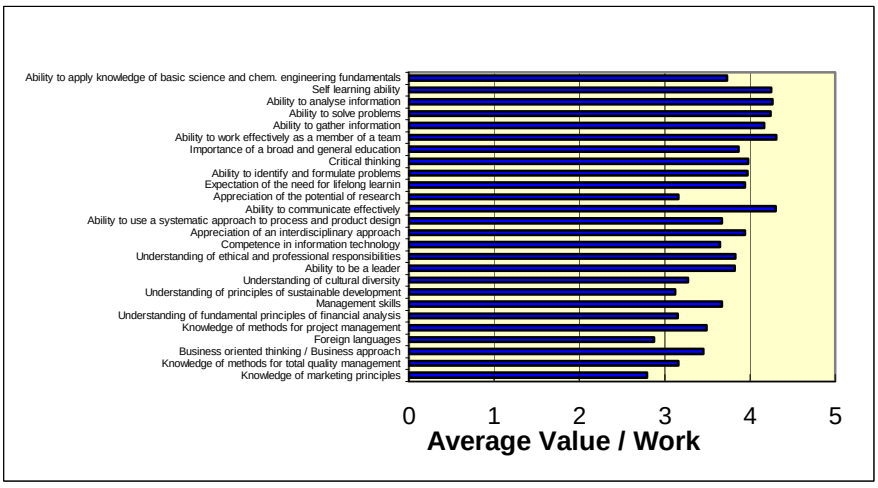
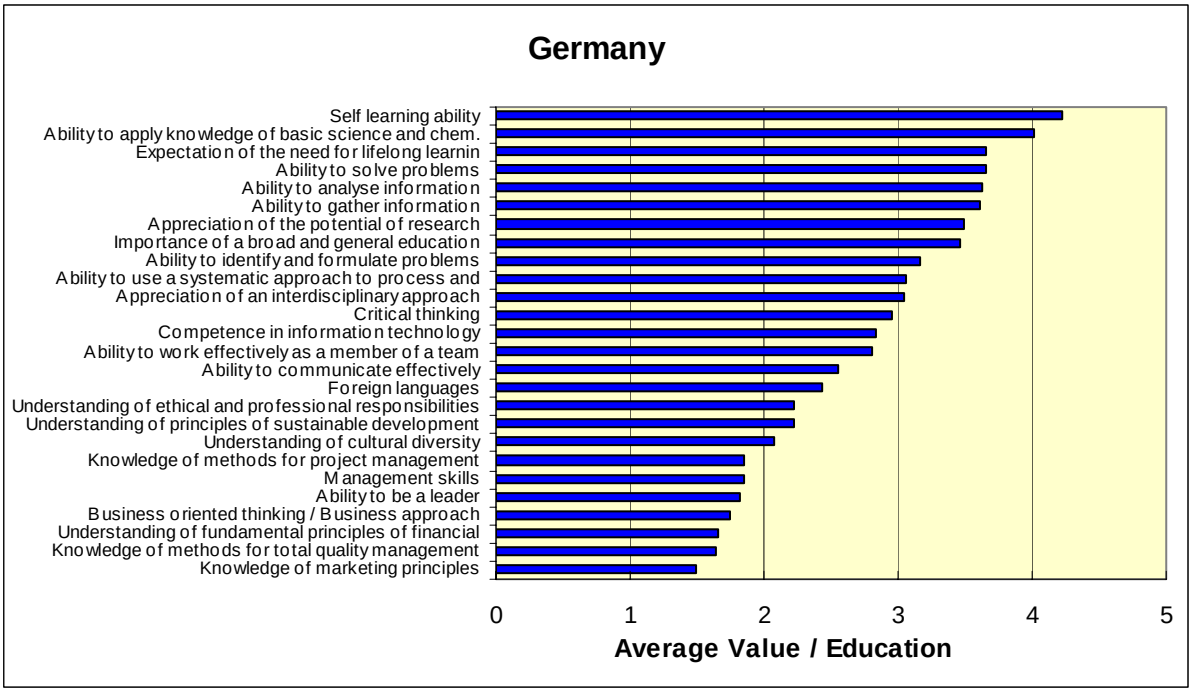


Fig. 10.1: Skills and Abilities Ranking for All Participants



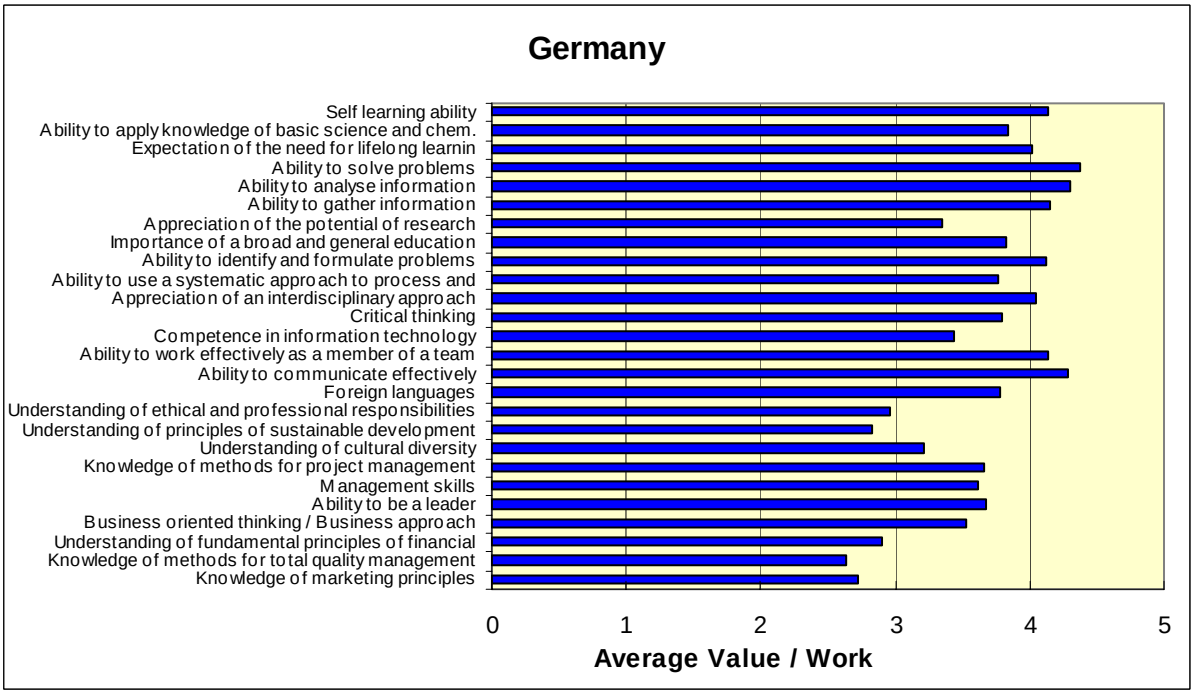
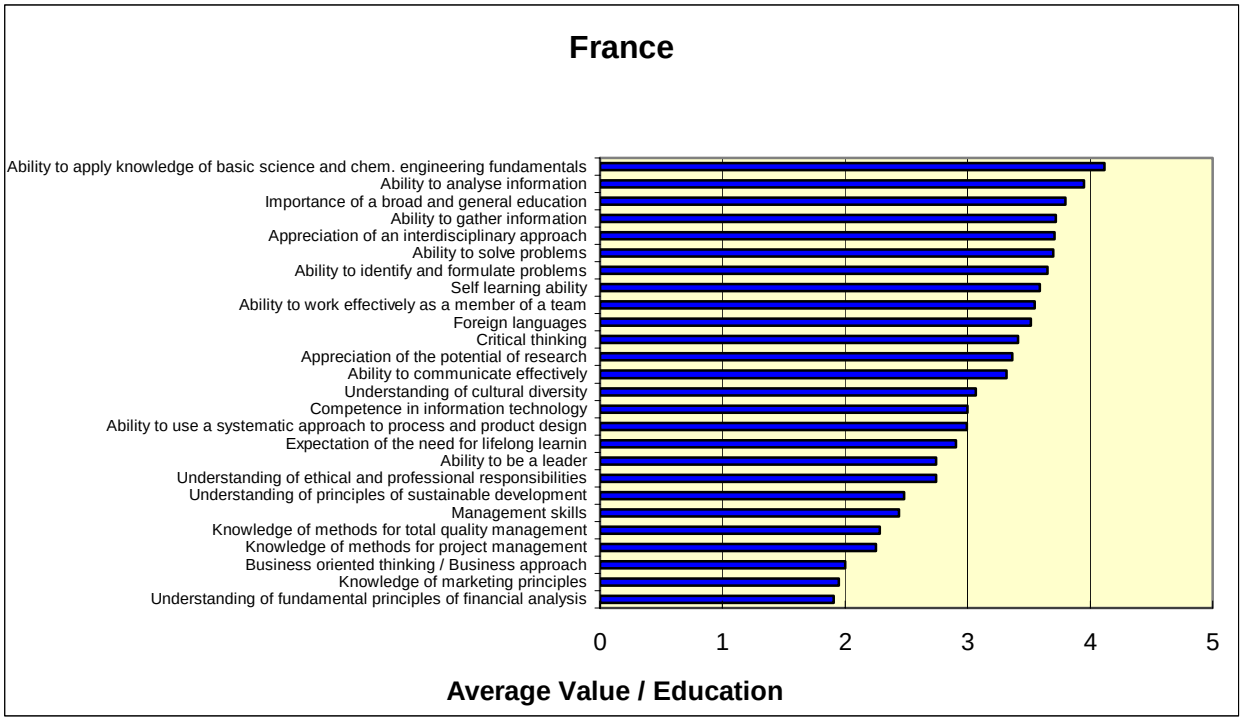


Fig. 10.2: Skills and Abilities Ranking for Germany

1 – very low; 2 – low; 3 – medium; 4 – high; 5 – very high



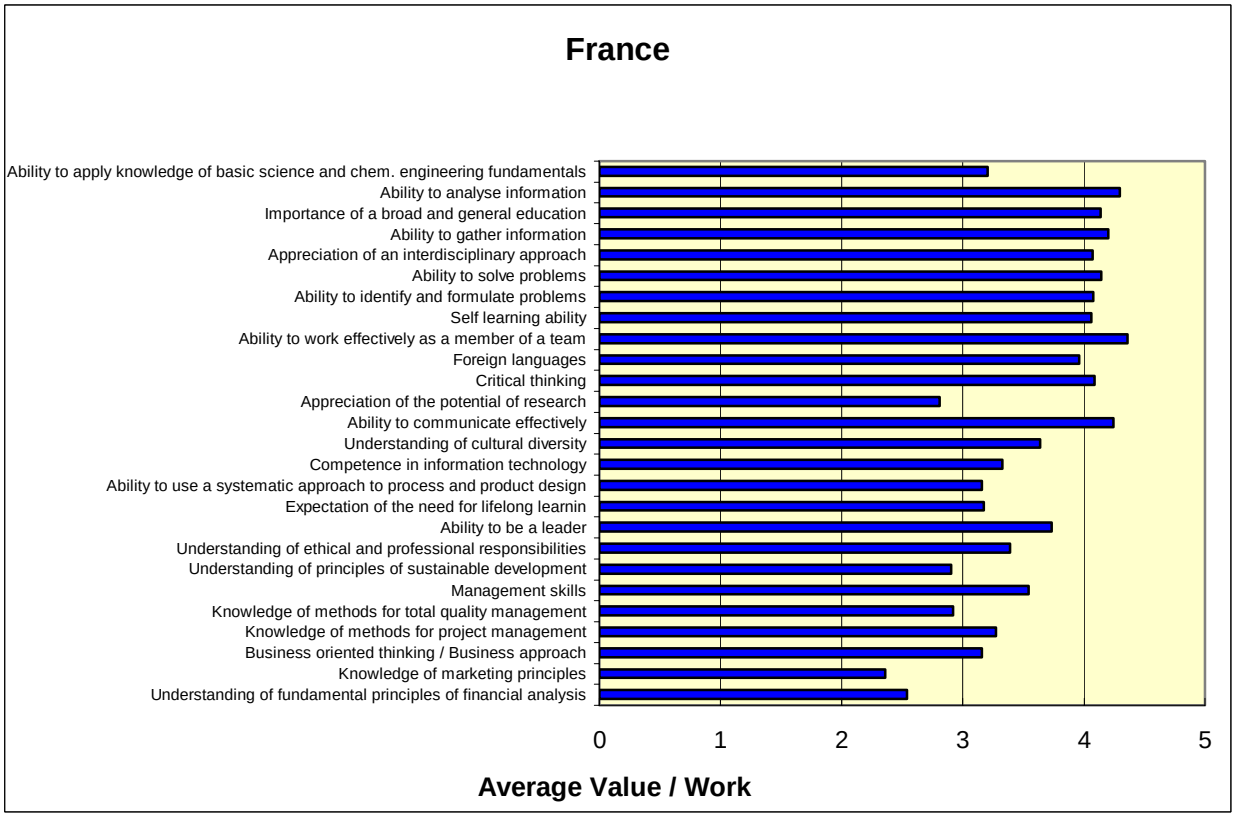
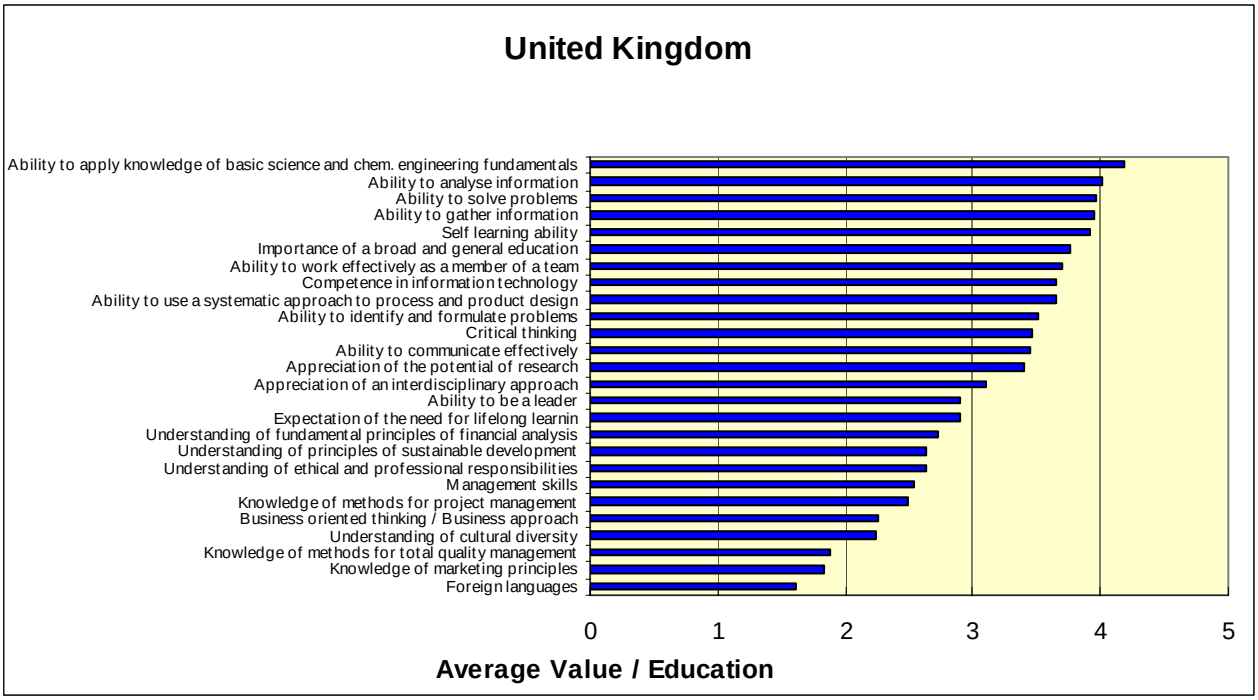


Fig. 10.3: Skills and Abilities Ranking for France

1 – very low; 2 – low; 3 – medium; 4 – high; 5 – very high



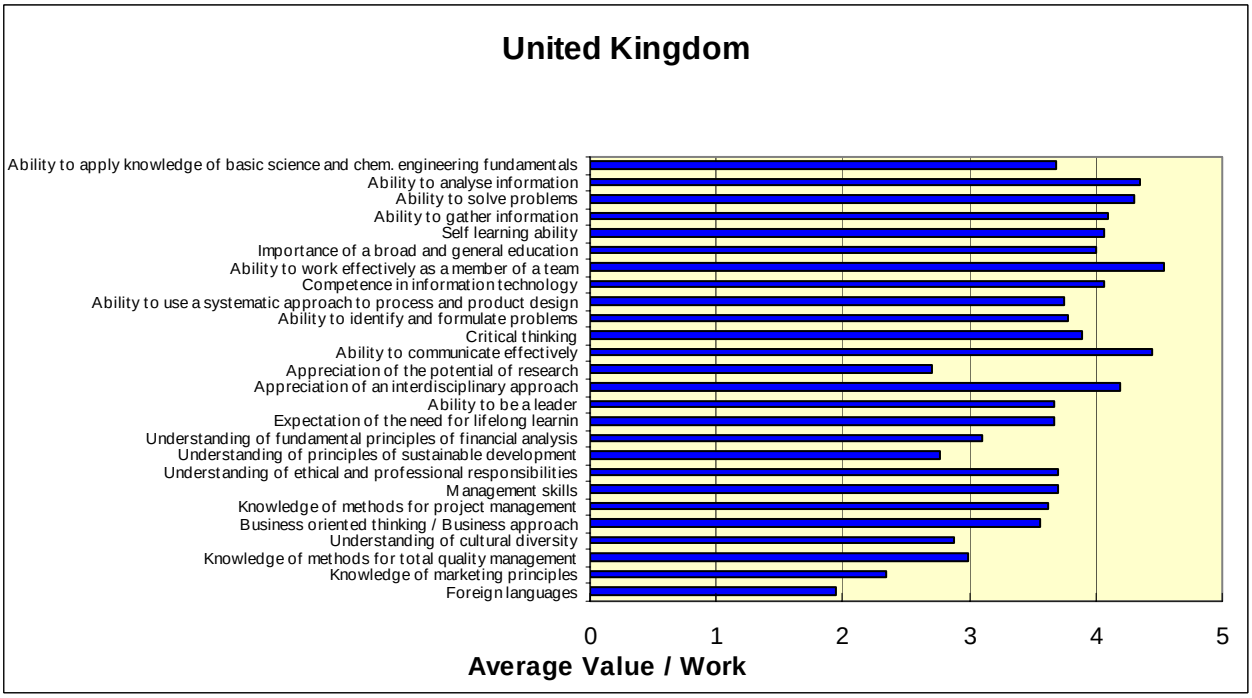
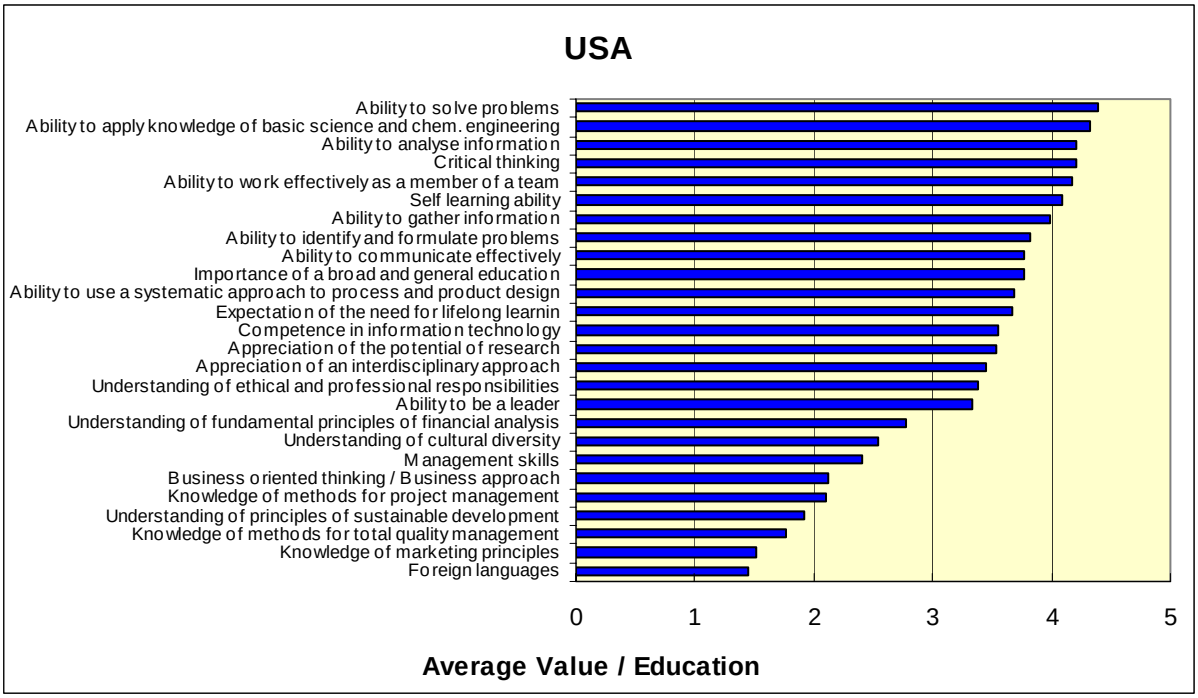


Fig. 10.4: Skills and Abilities Ranking for United Kingdom

1 – very low; 2 – low; 3 – medium; 4 – high; 5 – very high



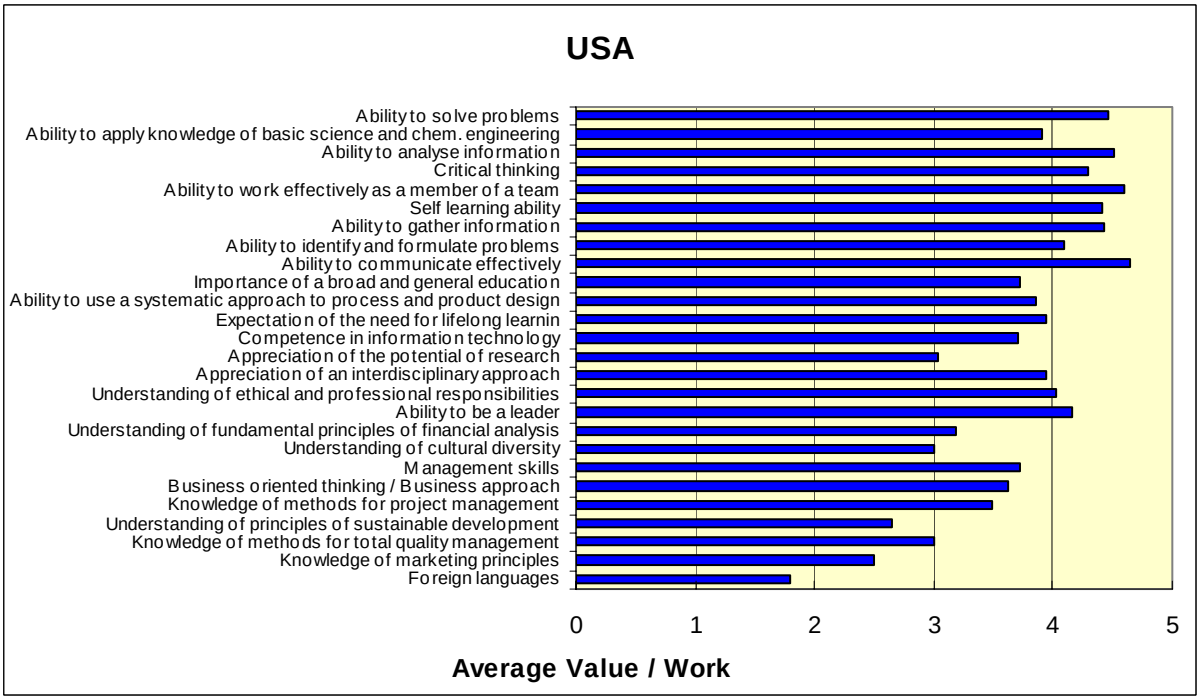
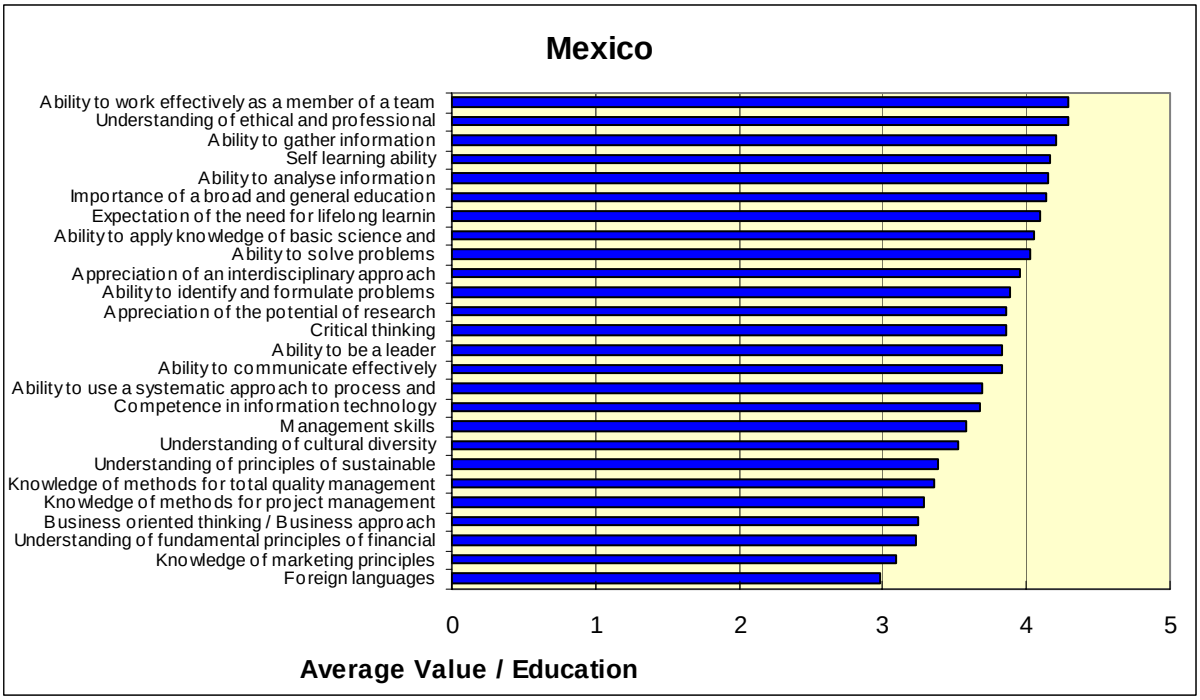


Fig. 10.5: Skills and Abilities Ranking for USA

1 – very low; 2 – low; 3 – medium; 4 – high; 5 – very high



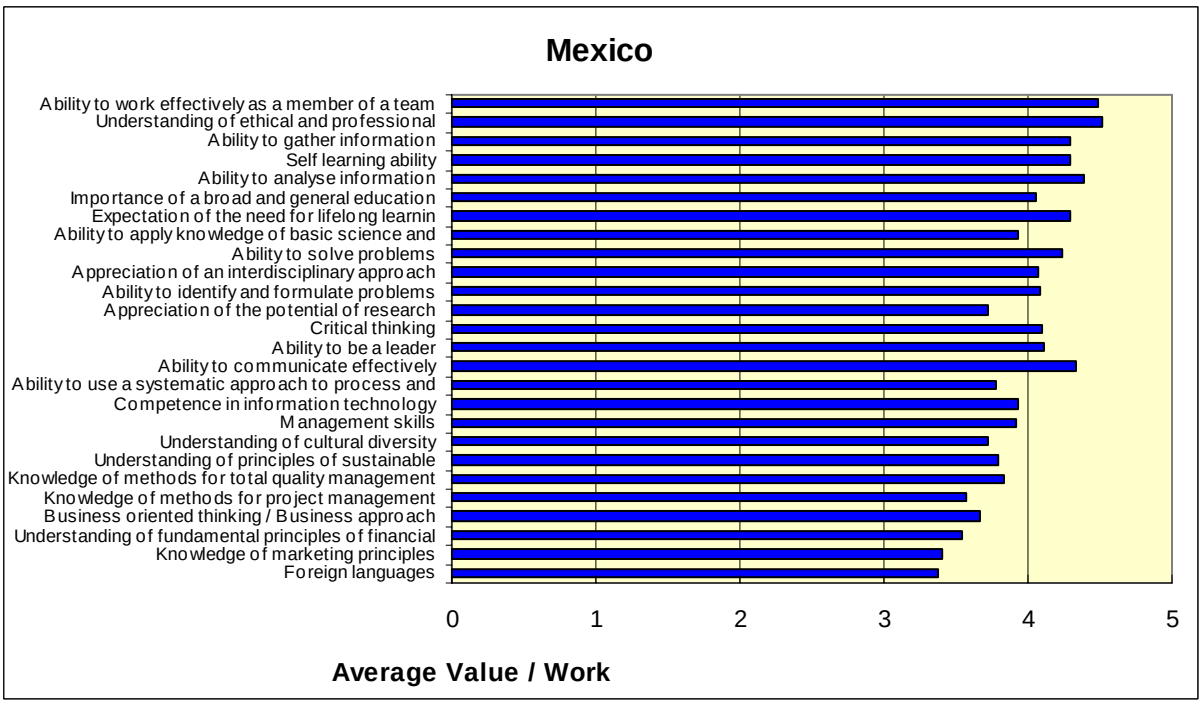
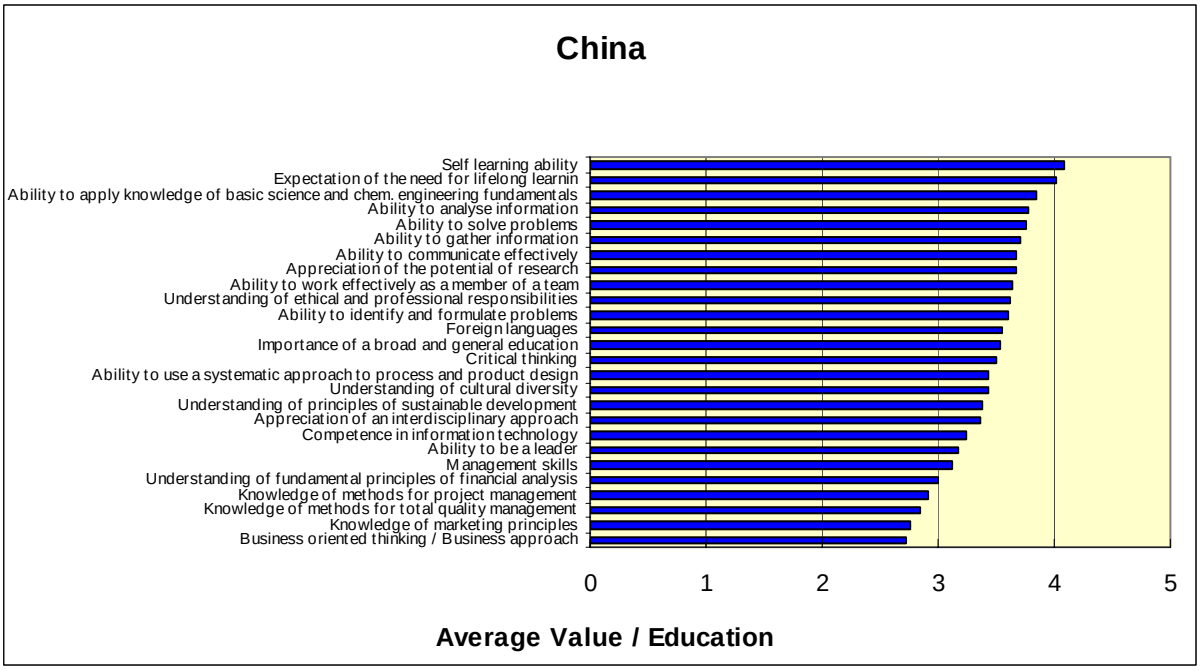


Fig. 10.6: Skills and Abilities Ranking for Mexico

1 – very low; 2 – low; 3 – medium; 4 – high; 5 – very high



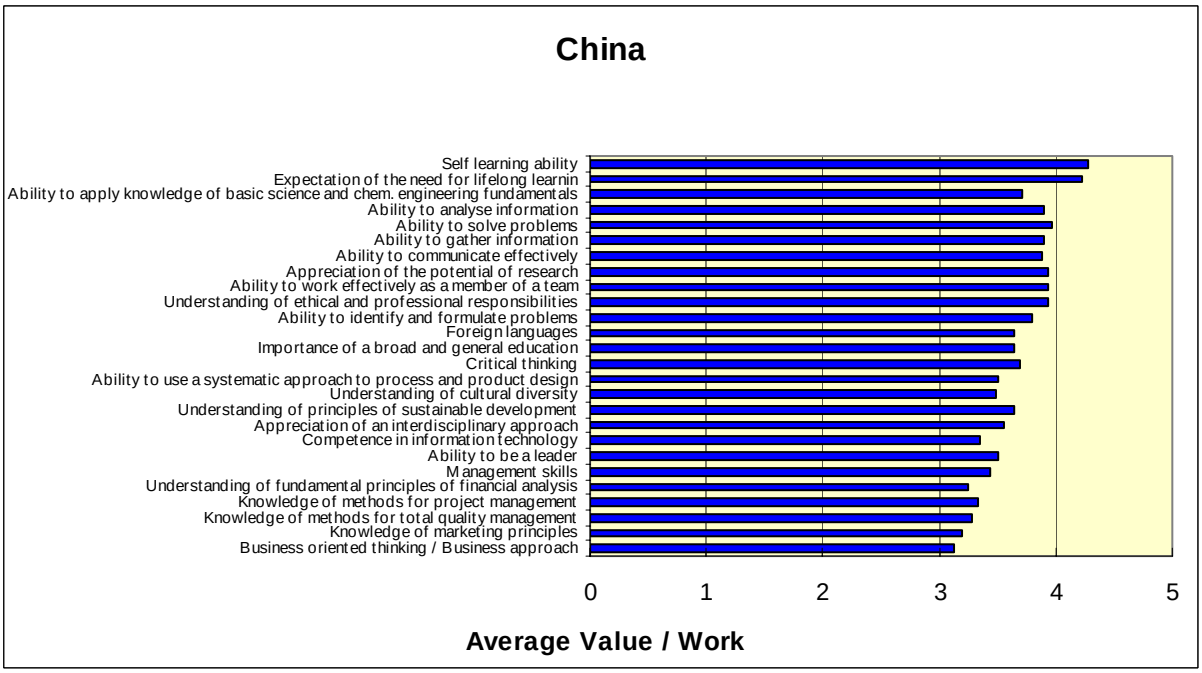
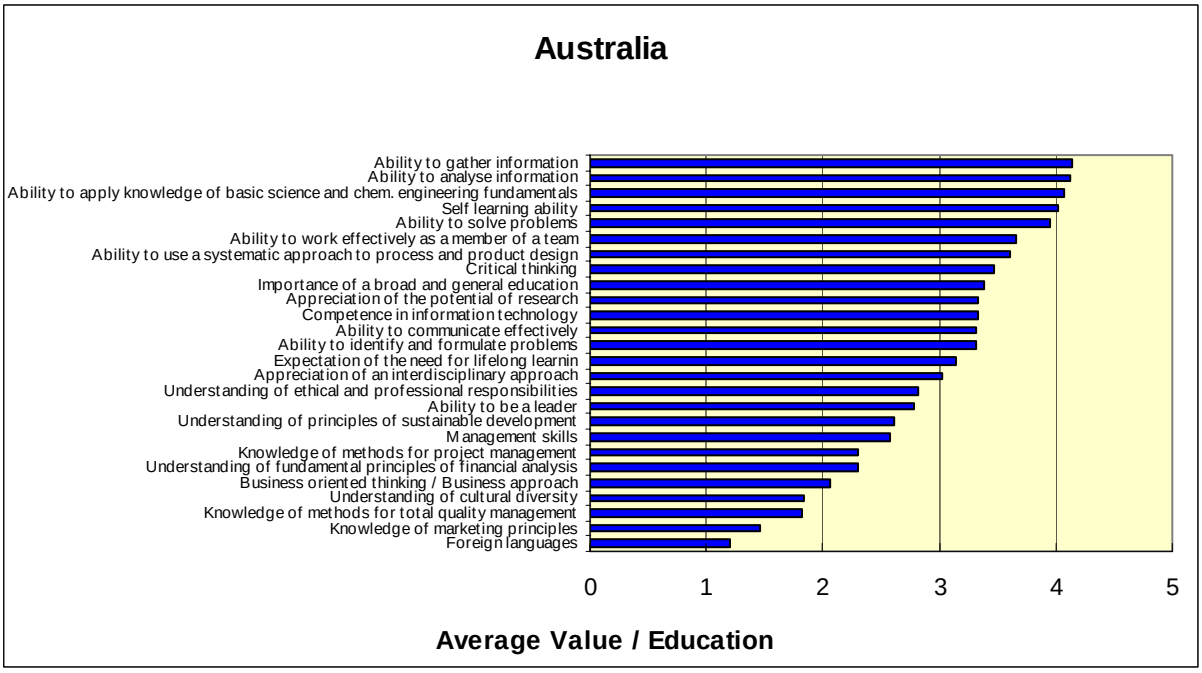


Fig. 10.7: Skills and Abilities Ranking for China

1 – very low; 2 – low; 3 – medium; 4 – high; 5 – very high



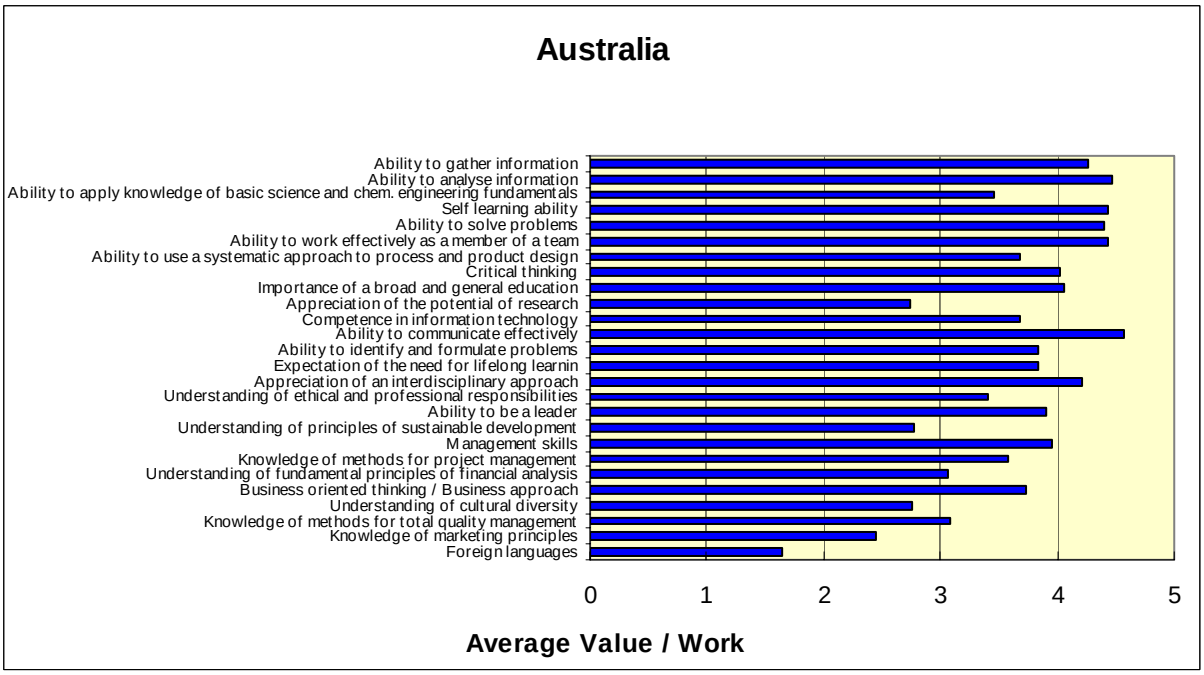


Fig. 10.8: Skills and Abilities Ranking for Australia

1 – very low; 2 – low; 3 – medium; 4 – high; 5 – very high

This task

Rank the listed skills/abilities with respect
to the quality of your education and its relevance to your work

provides answers to the question of how industry's needs and the quality of education fit together regarding the attributes listed. A characteristic value v is now calculated from the difference between the average ranking value for education and the average ranking value for work. This is performed for each attribute. If v equals zero, industry requirements and the attributes gained through education make a perfect fit. A value lower than zero shows a deficit, a value higher than zero an over-qualification. In the following figures these differences are shown for the different countries by the type of degree.

Some distributions (bachelor's degree Germany, PhD United Kingdom, PhD Mexico and master's degree and PhD Australia) were not calculated due to the lack of data points.

Fig. 10.9: Skills / Abilities versus **PhD Degree (total)**

Characteristic value v: v < 0 lack of qualification
v > 0 higher qualification than needed for professional job

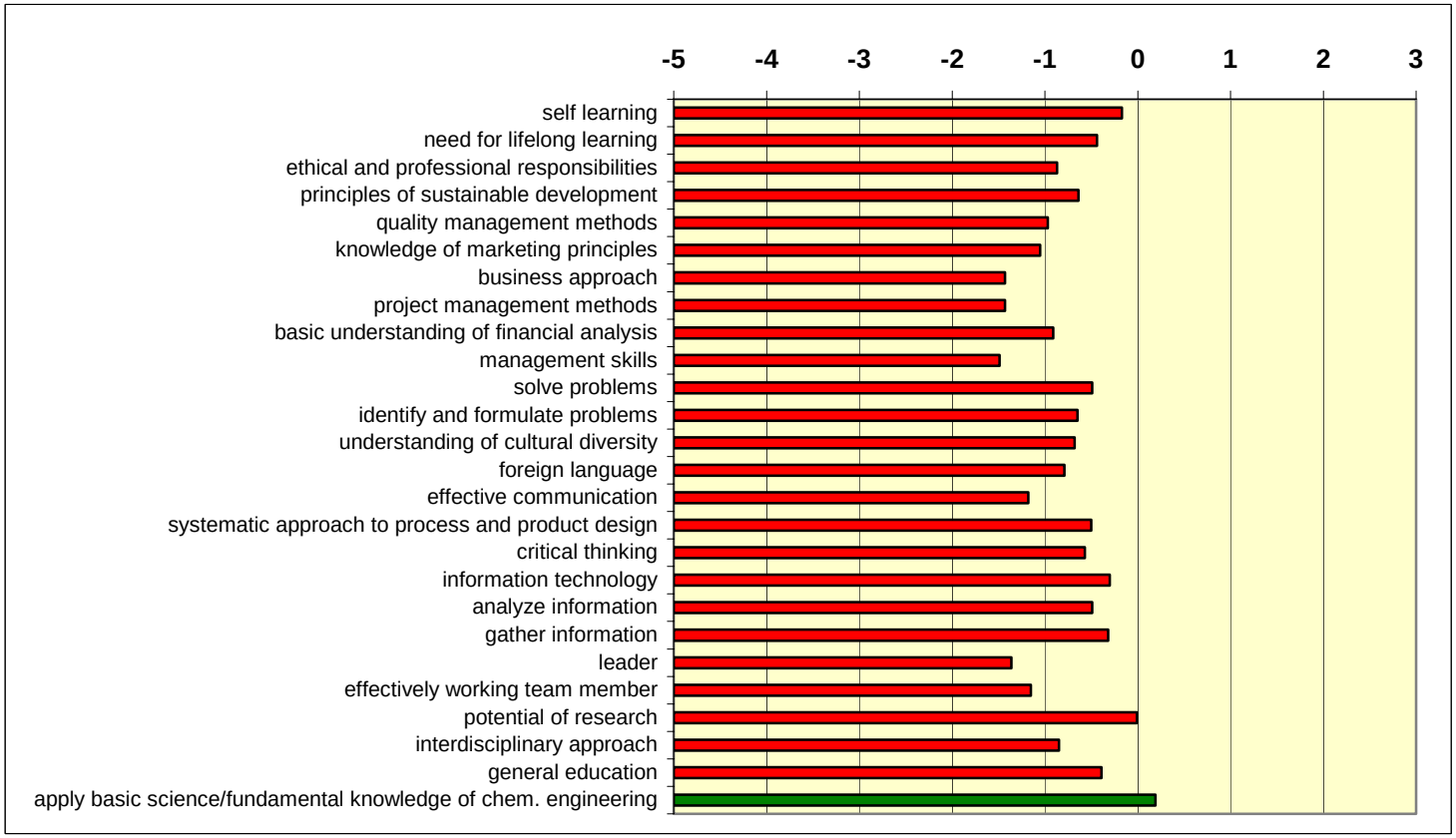


Fig. 10.9: Skills / Abilities versus **Master's Degree** (total, including British MEng., see chapter 3)

Characteristic value v: v < 0 lack of qualification
v > 0 higher qualification than needed for professional job

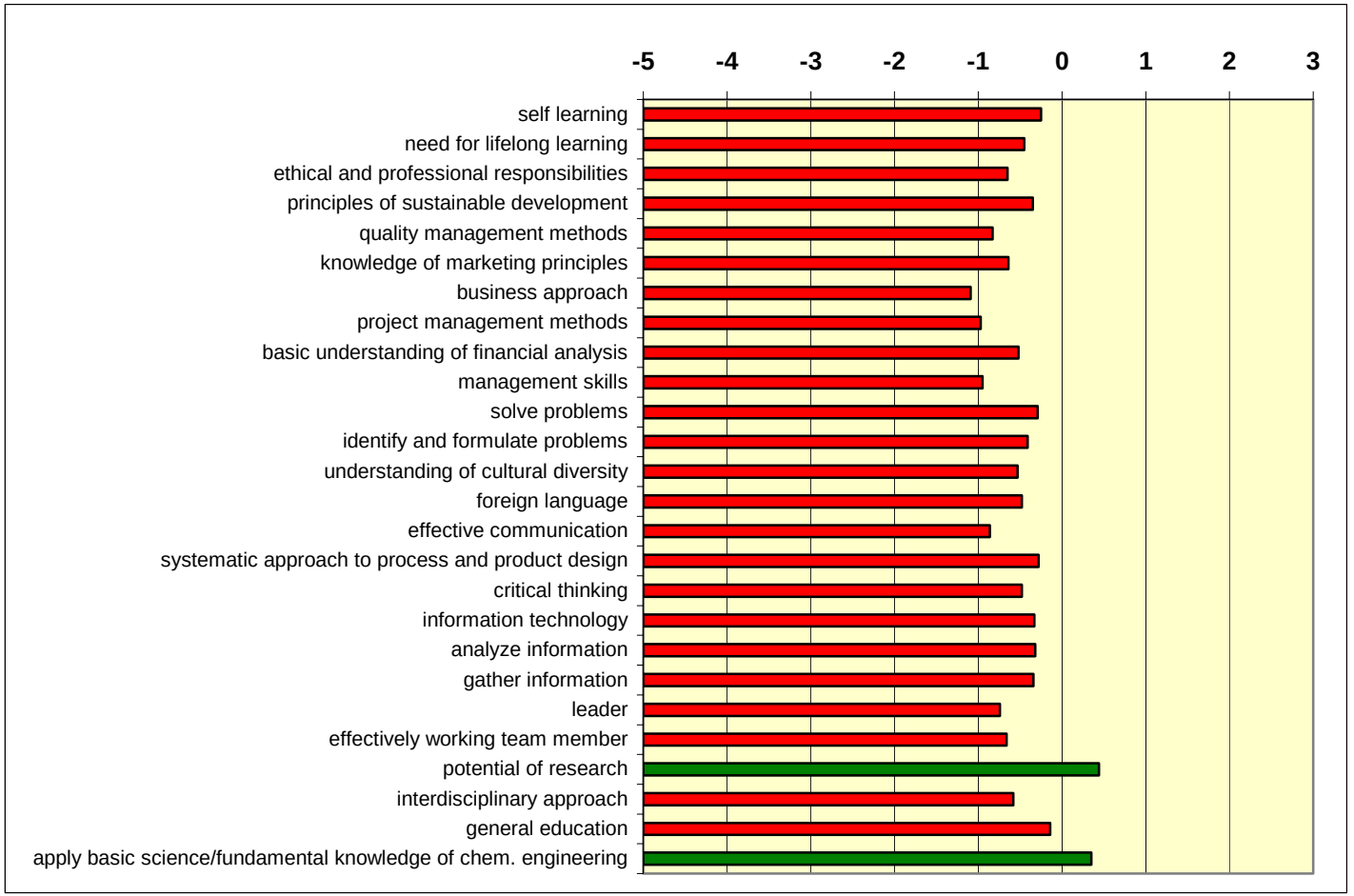


Fig. 10.10: Skills / Abilities versus **Bachelor's Degree (total)**

Characteristic value v: v < 0 lack of qualification

v > 0 higher qualification than needed for professional job

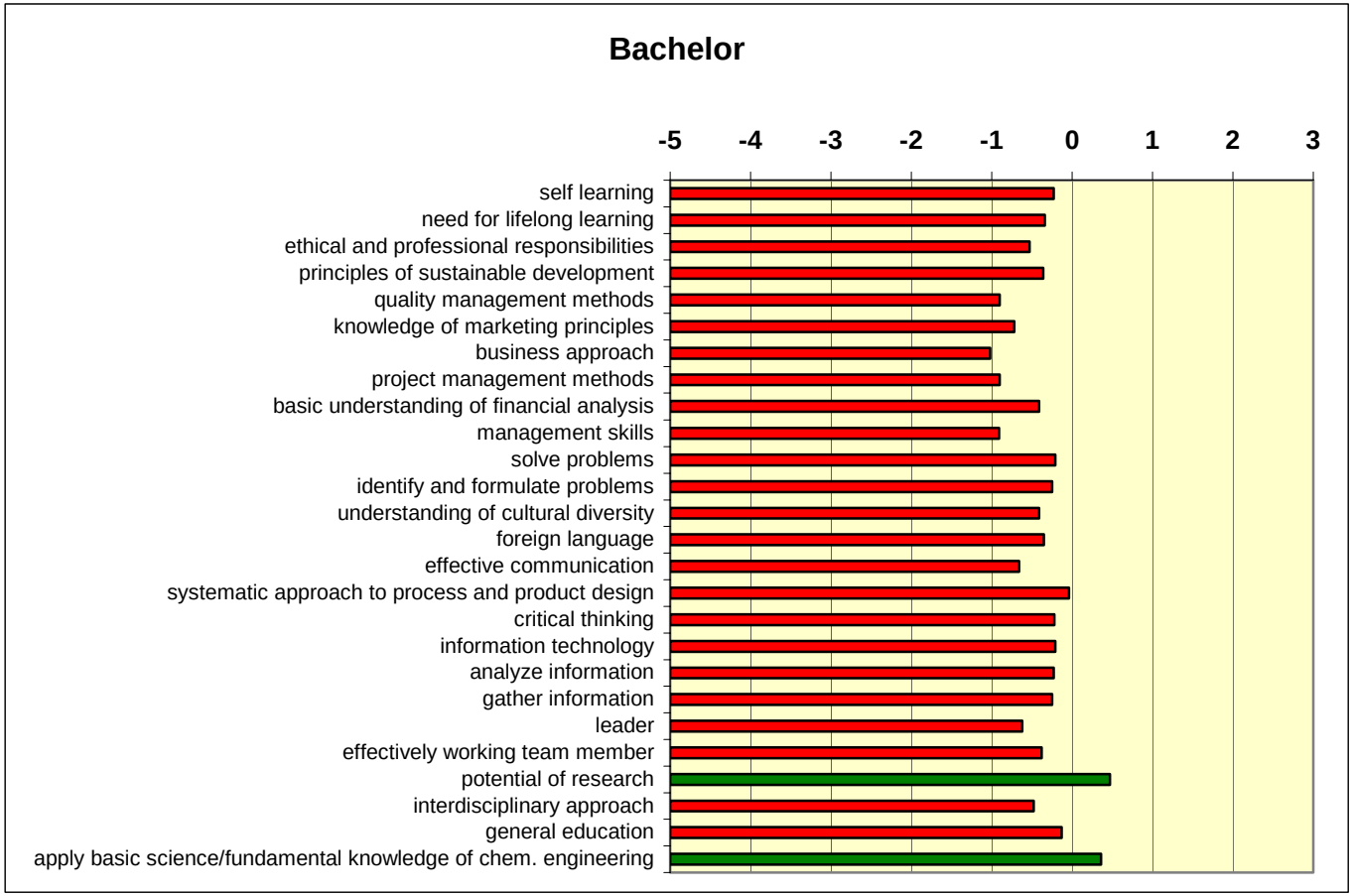


Fig. 10.11: Skills / Abilities versus **PhD Degree (Germany)**

Characteristic value v: v < 0 lack of qualification

v > 0 higher qualification than needed for professional job

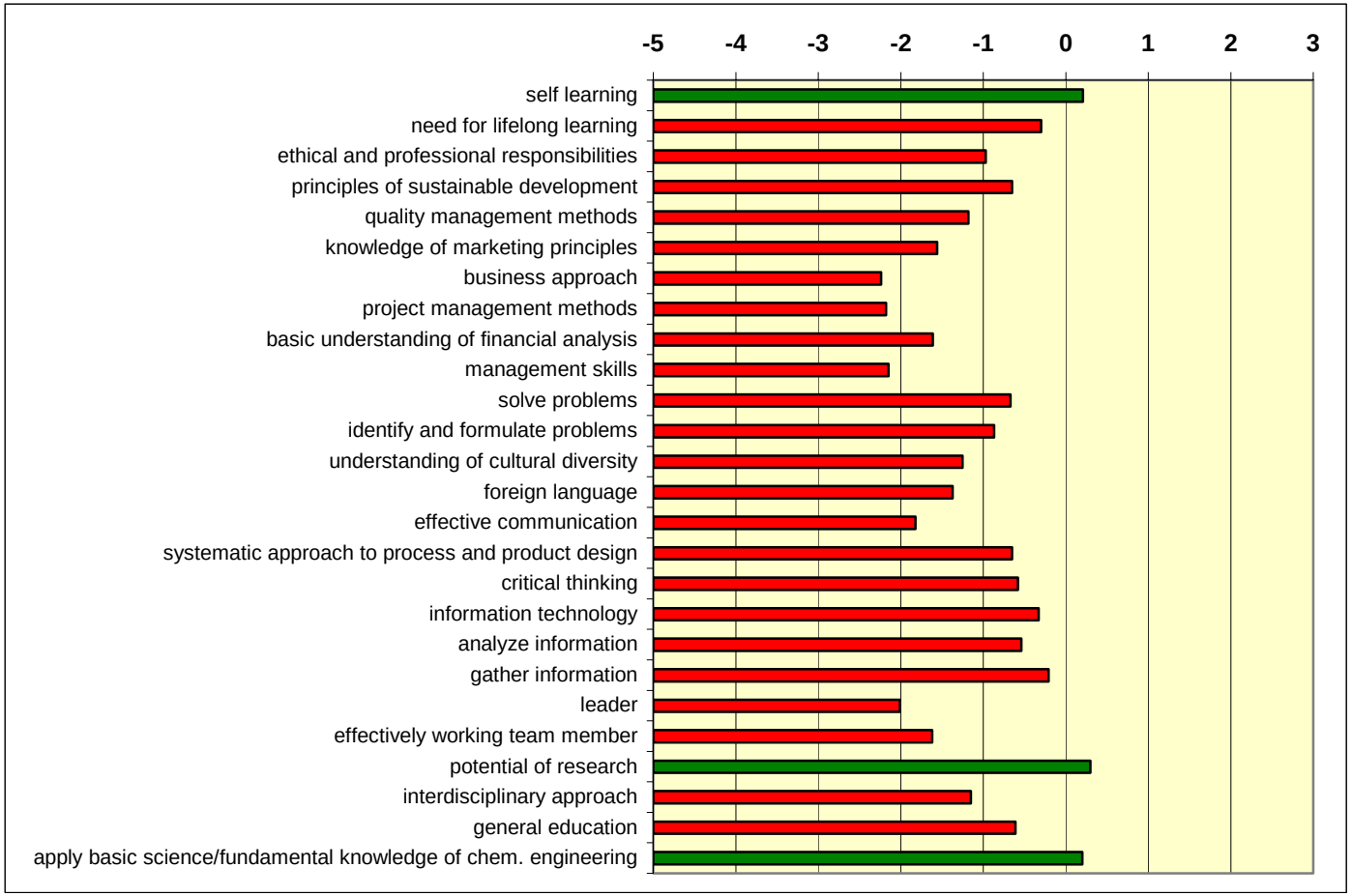


Fig. 10.12: Skills / Abilities versus **Master's Degree (Germany)**

Characteristic value v: v < 0 lack of qualification

v > 0 higher qualification than needed for professional job

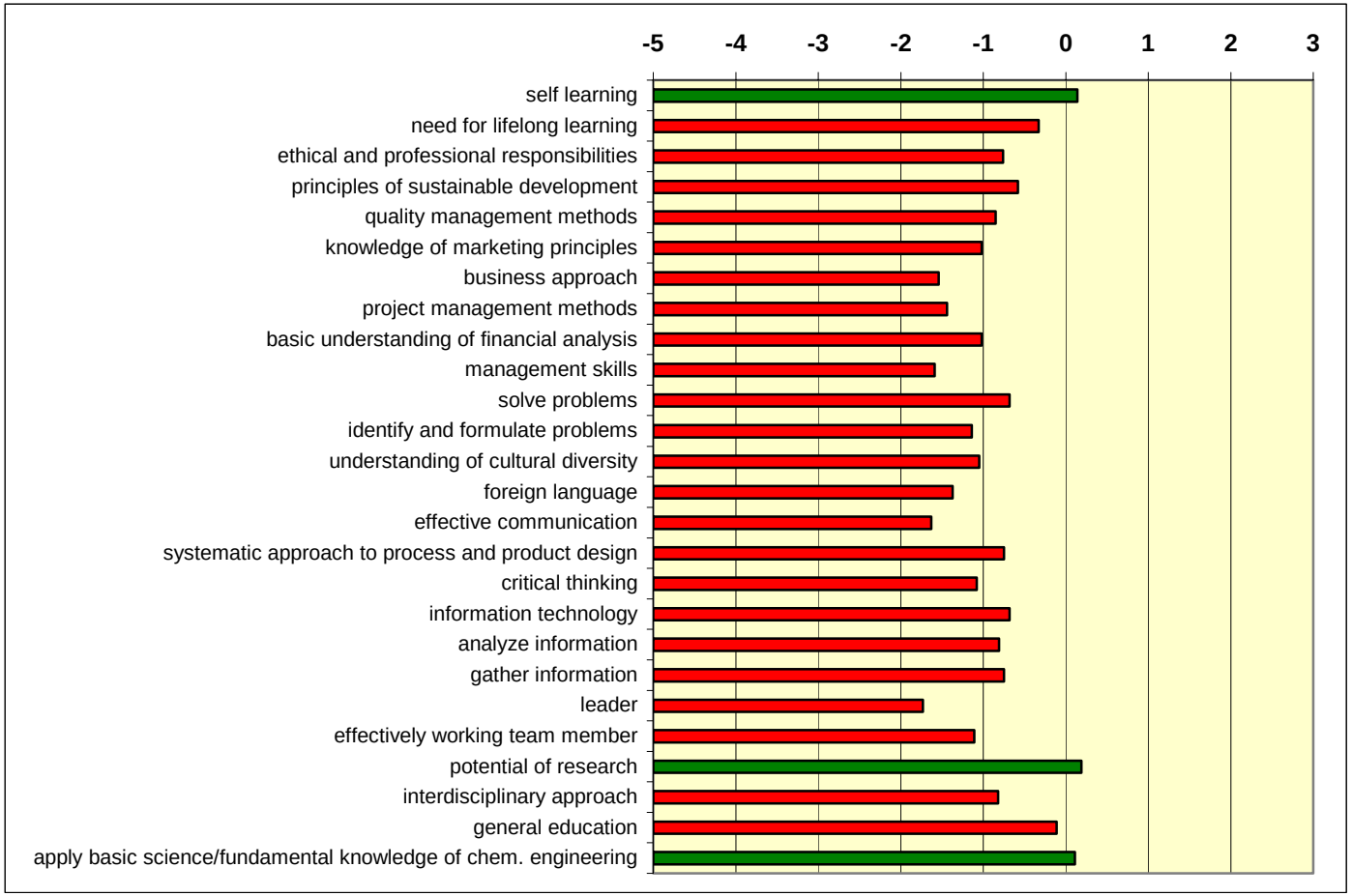


Fig. 10.13: Skills / Abilities versus **PhD Degree (France)**

Characteristic value v: v < 0 lack of qualification

v > 0 higher qualification than needed for professional job

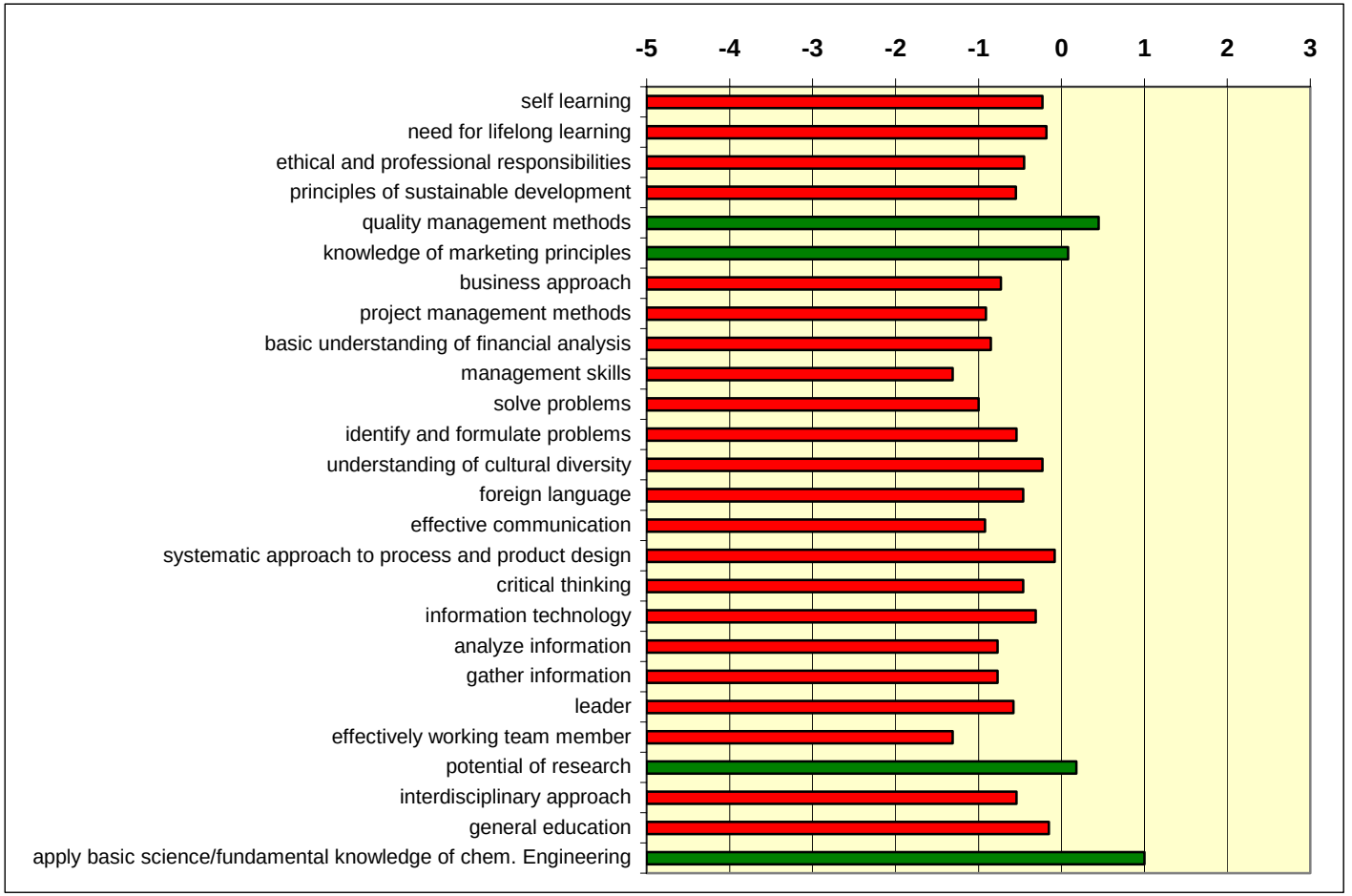


Fig. 10.14: Skills / Abilities versus **Master's Degree (France)**

Characteristic value v: v < 0 lack of qualification

v > 0 higher qualification than needed for professional job

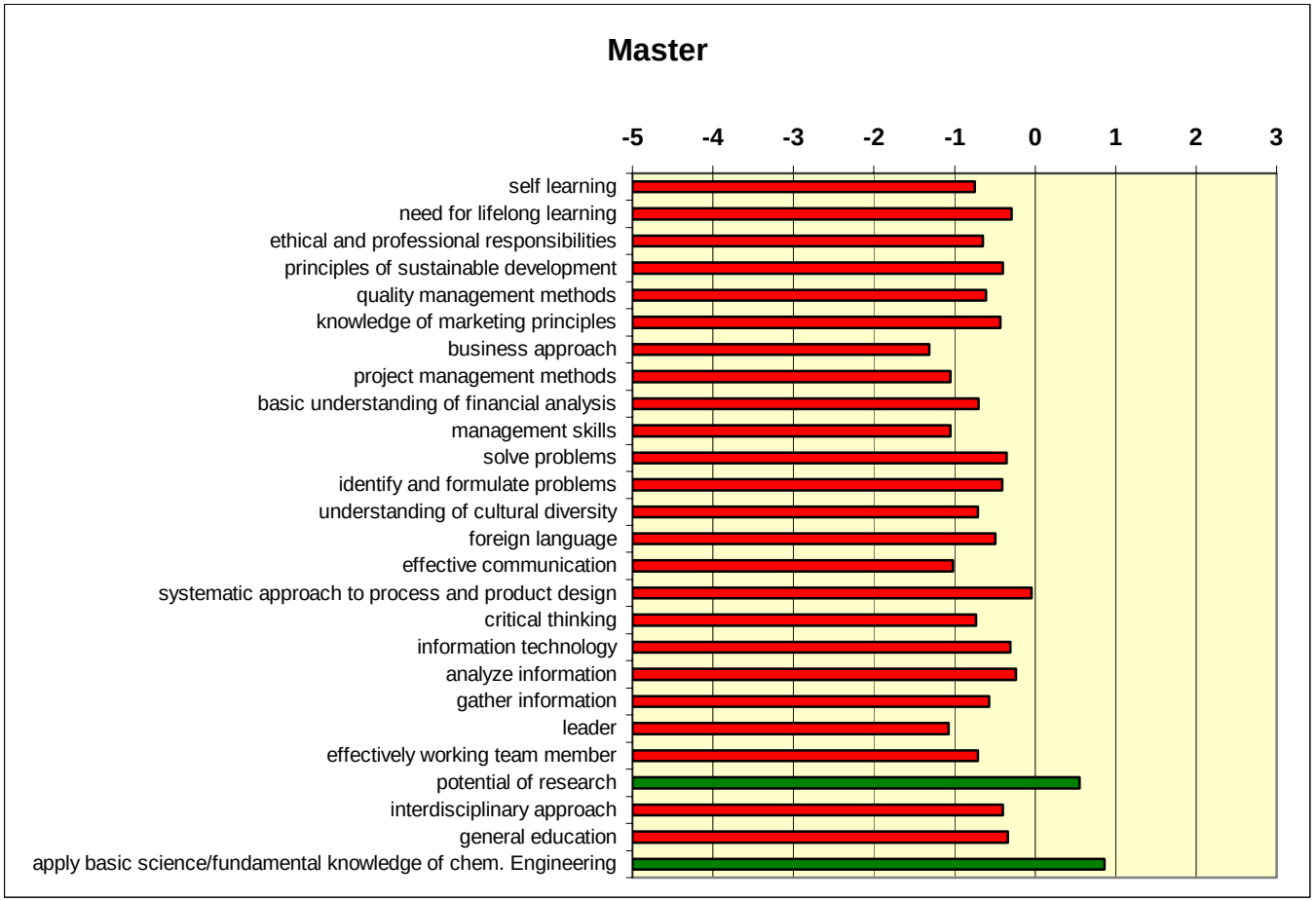


Fig. 10.15: Skills / Abilities versus **Bachelor's Degree (France)**
Characteristic value v: v < 0 lack of qualification

v > 0 higher qualification than needed for professional job

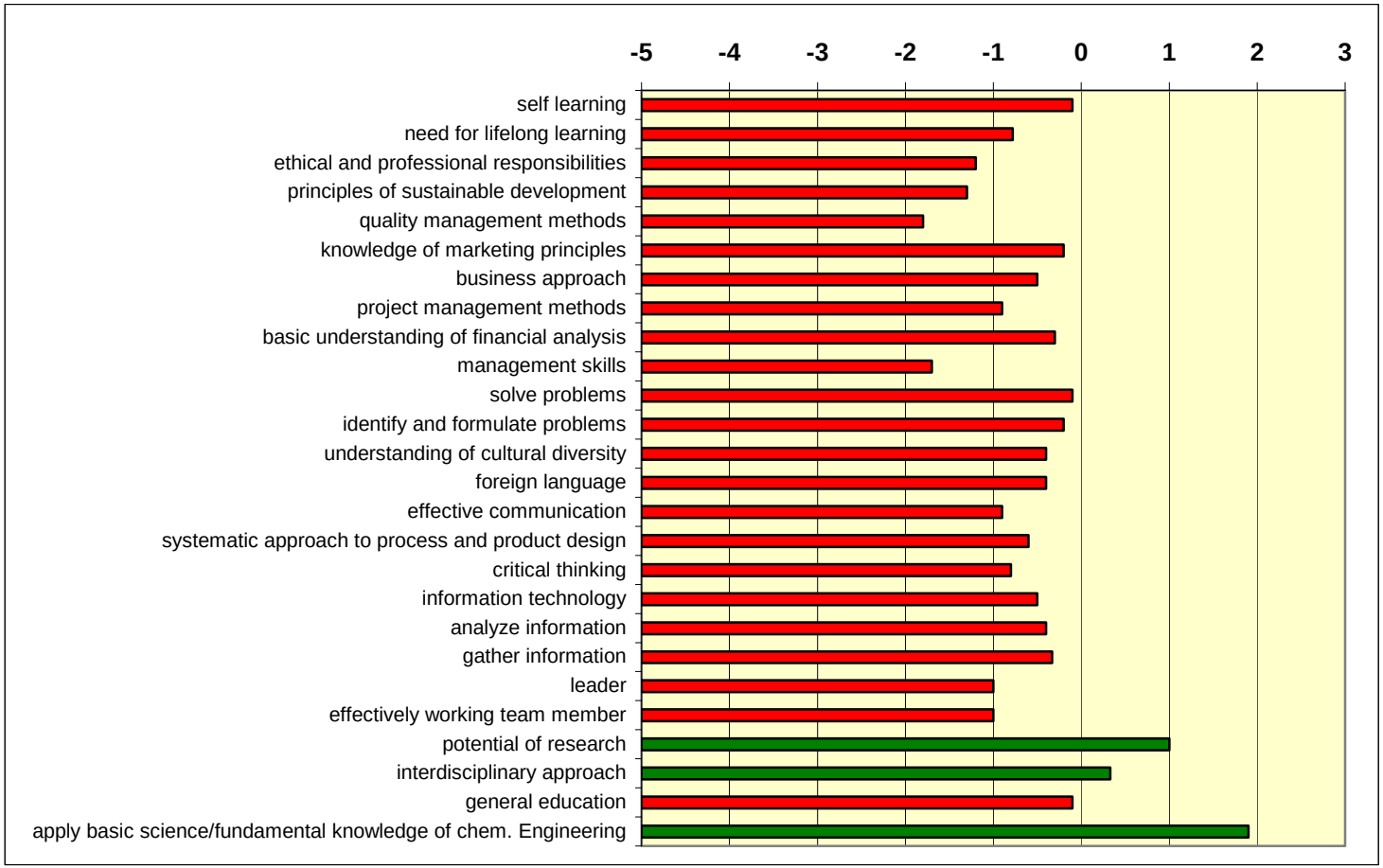


Fig. 10.16: Skills / Abilities versus Characteristic value v:

Master's Degree (United Kingdom, including British MEng., see chapter 3)

v < 0 lack of qualification

v > 0 higher qualification than needed for professional job

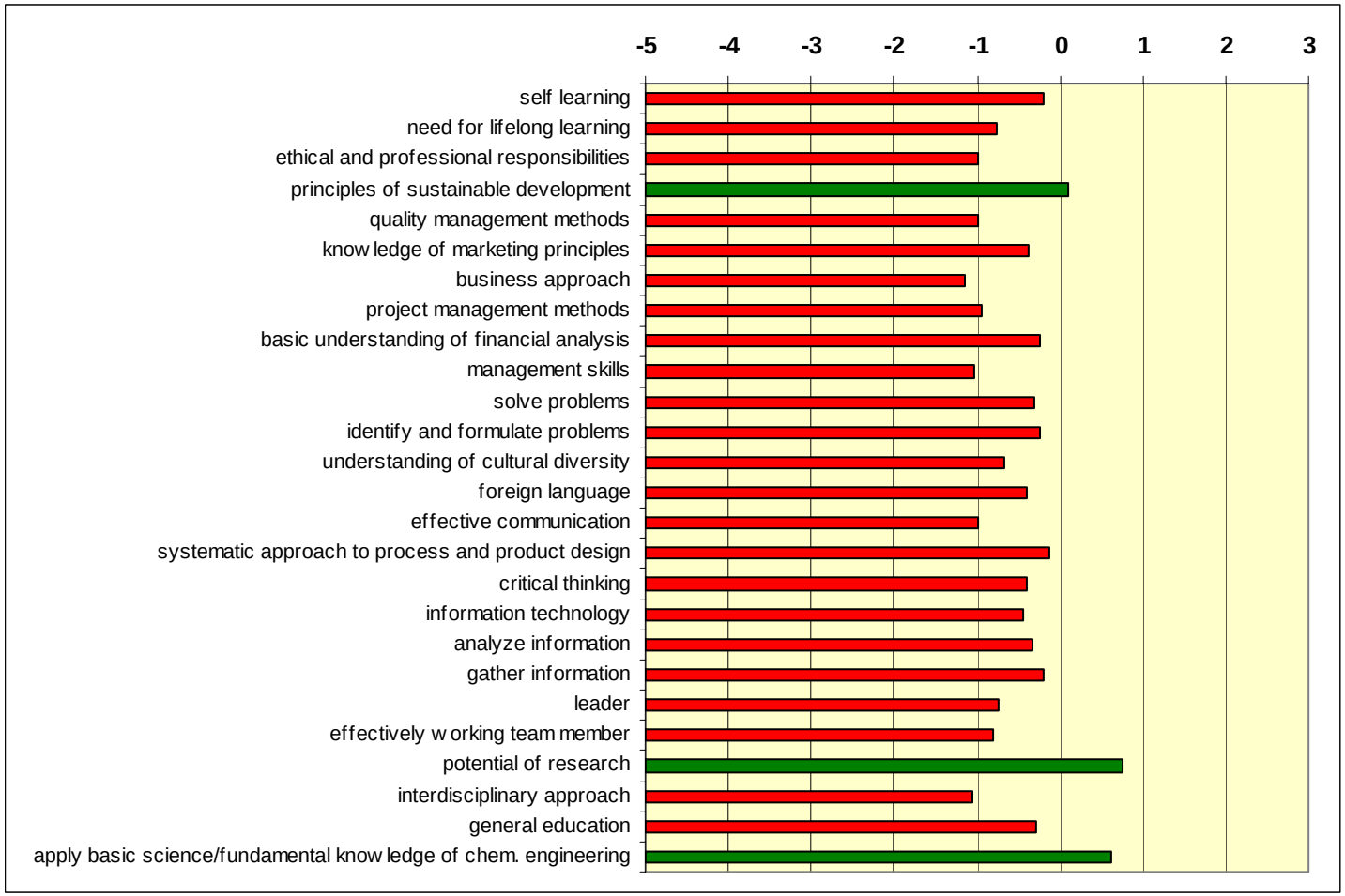


Fig. 10.17: Skills / Abilities versus **Bachelor's Degree (United Kingdom)**

Characteristic value v: v < 0 lack of qualification

v > 0 higher qualification than needed for professional job

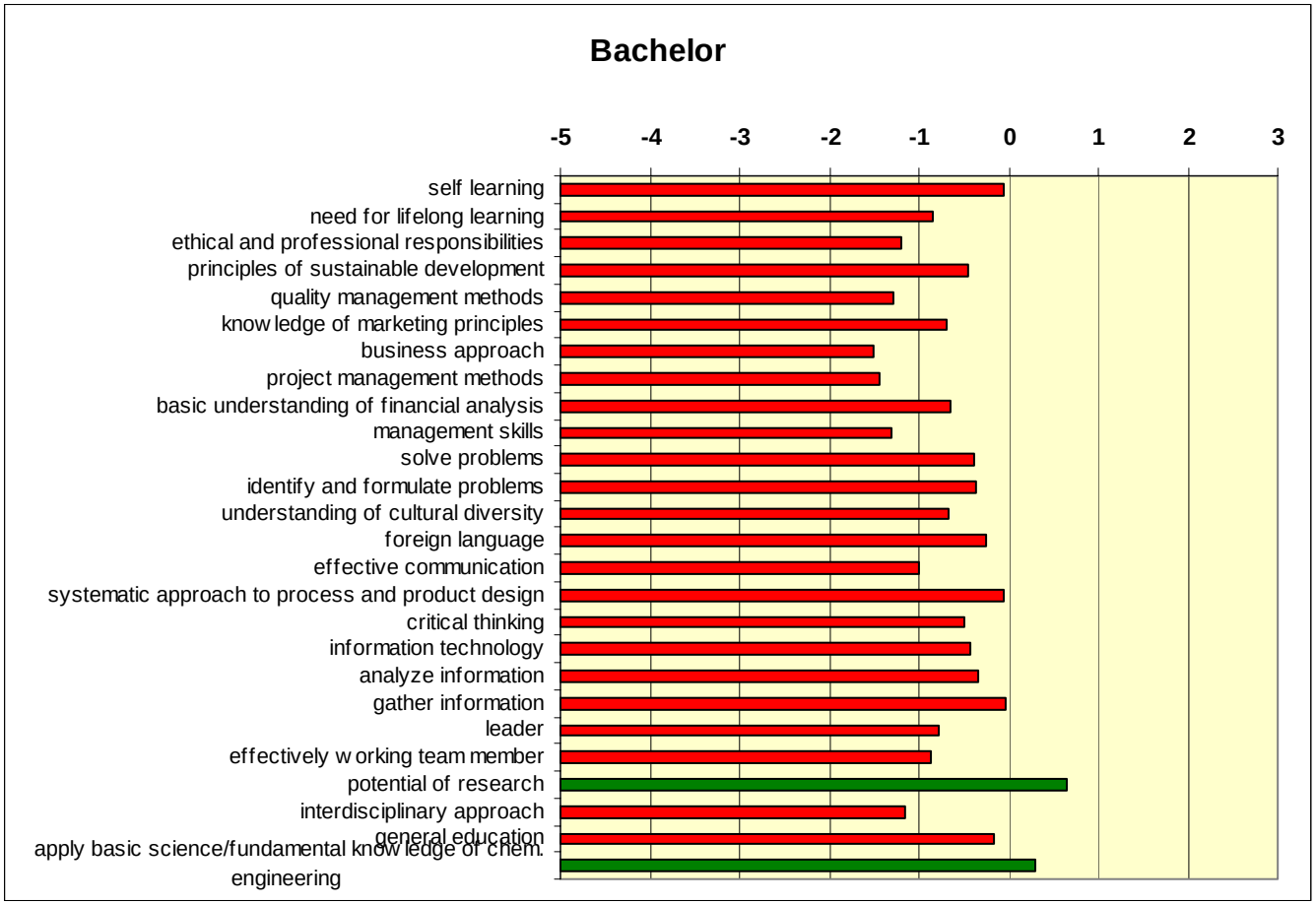


Fig. 10.18: Skills / Abilities versus **PhD (USA)**

Characteristic value v: v < 0 lack of qualification

v > 0 higher qualification than needed for professional job

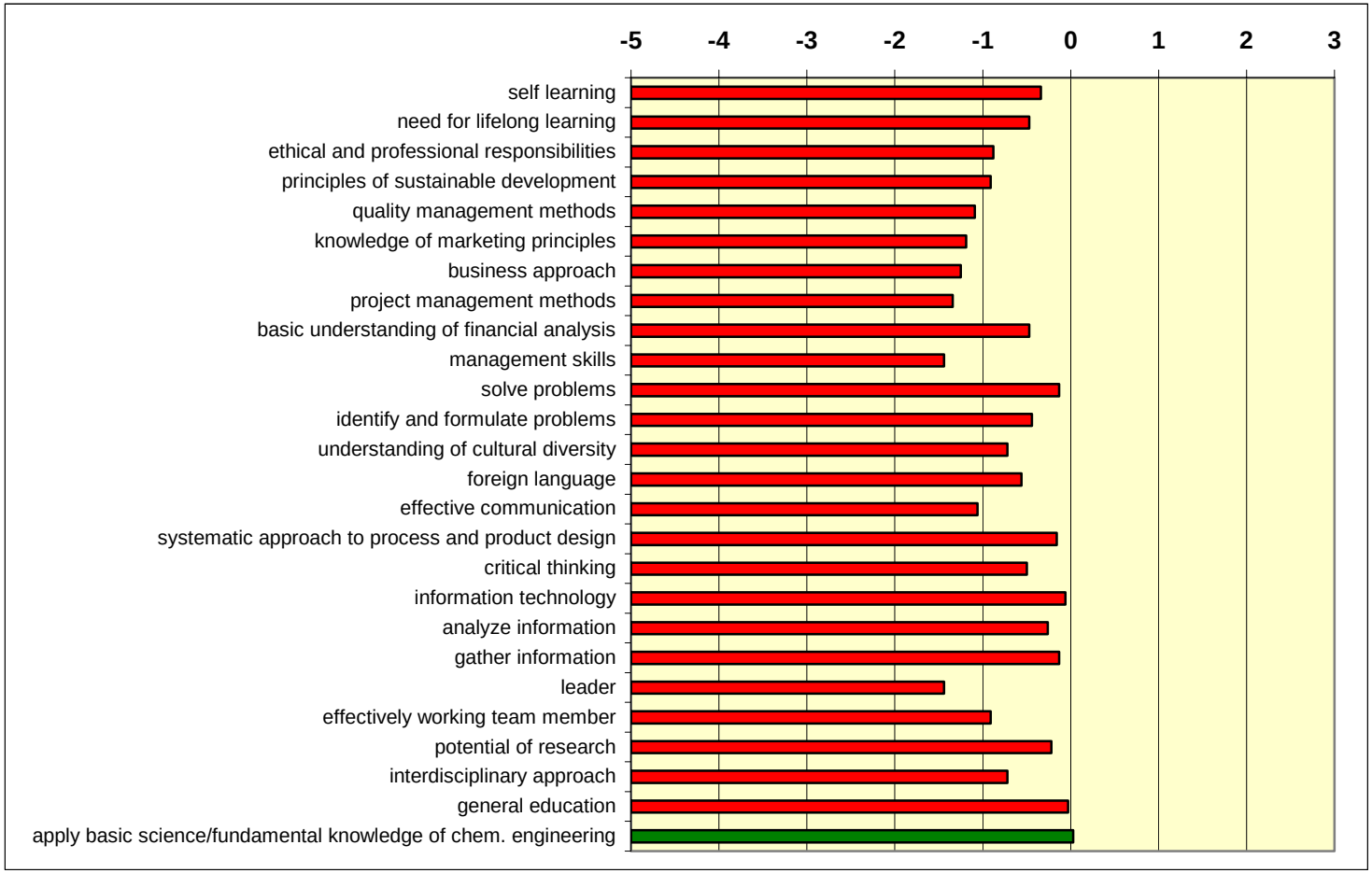


Fig. 10.18: Skills / Abilities versus **Master's Degree (USA)**

Characteristic value v: v < 0 lack of qualification

v > 0 higher qualification than needed for professional job

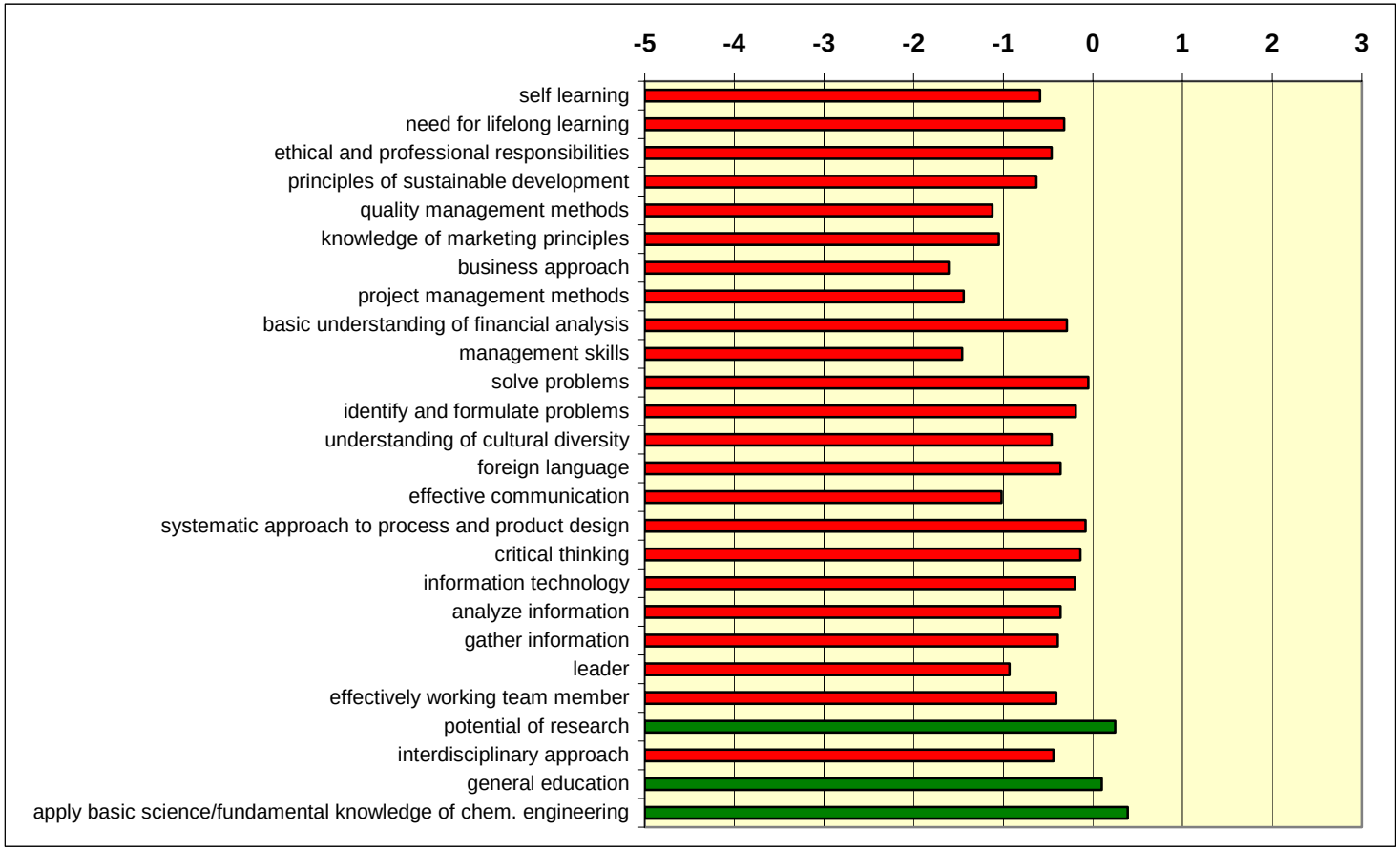


Fig. 10.19: Skills / Abilities versus **Bachelor's Degree (USA)**

Characteristic value v: v < 0 lack of qualification

v > 0 higher qualification than needed for professional job

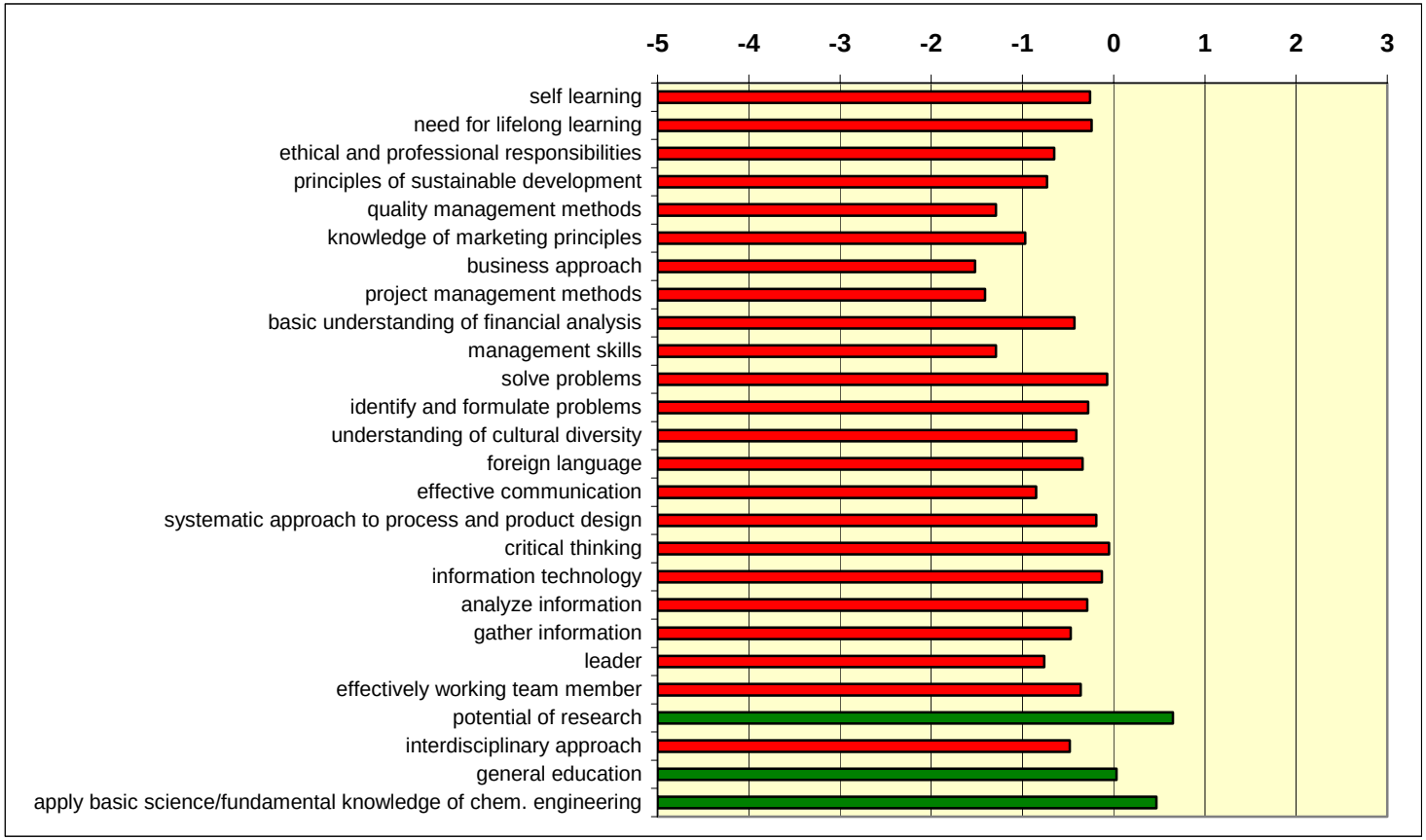


Fig. 10.19: Skills / Abilities versus **Master's Degree (Mexico)**

Characteristic value v: v < 0 lack of qualification

v > 0 higher qualification than needed for professional job

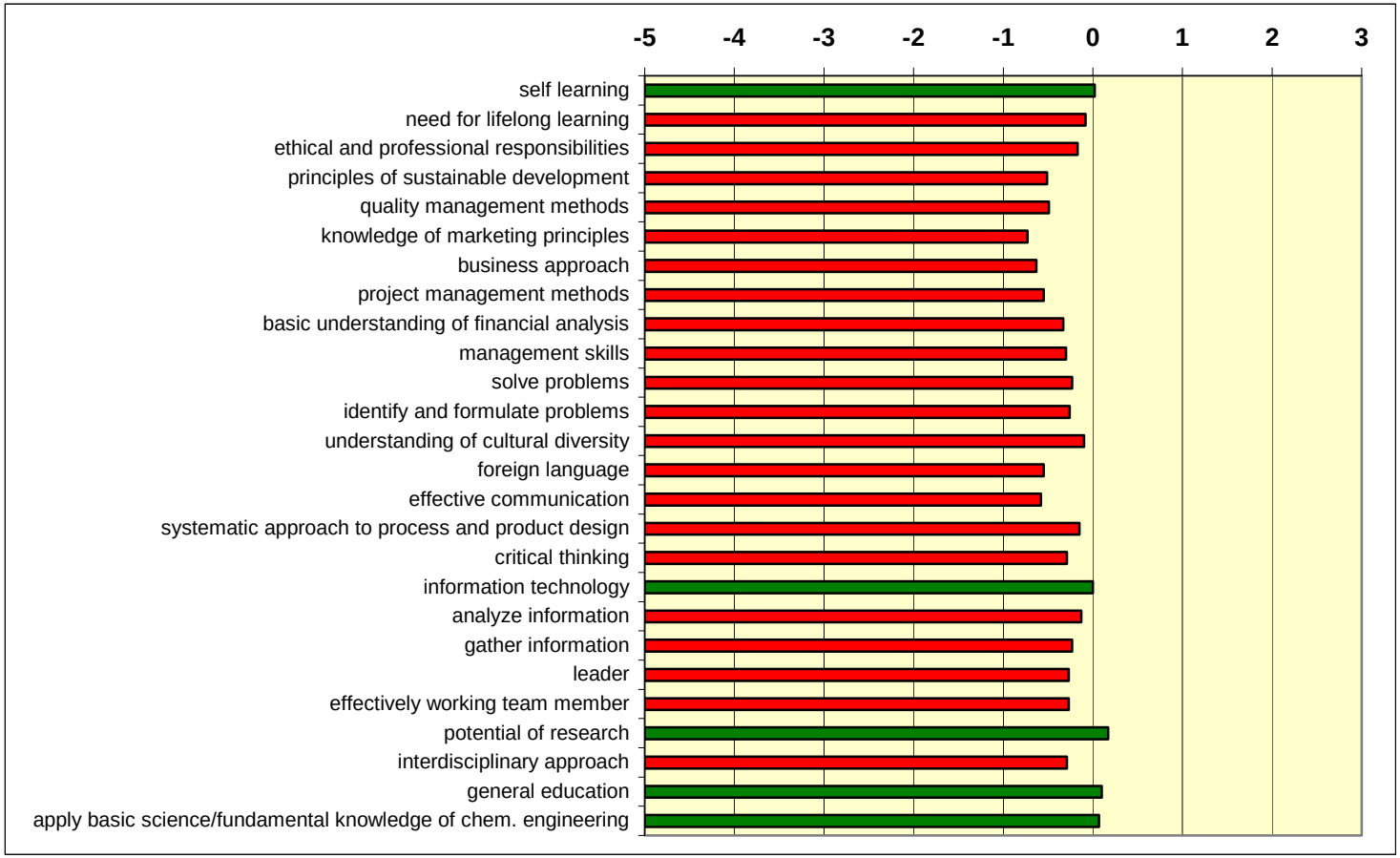


Fig. 10.20: Skills / Abilities versus **Bachelor's Degree (Mexico)**

Characteristic value v: v < 0 lack of qualification

v > 0 higher qualification than needed for professional job

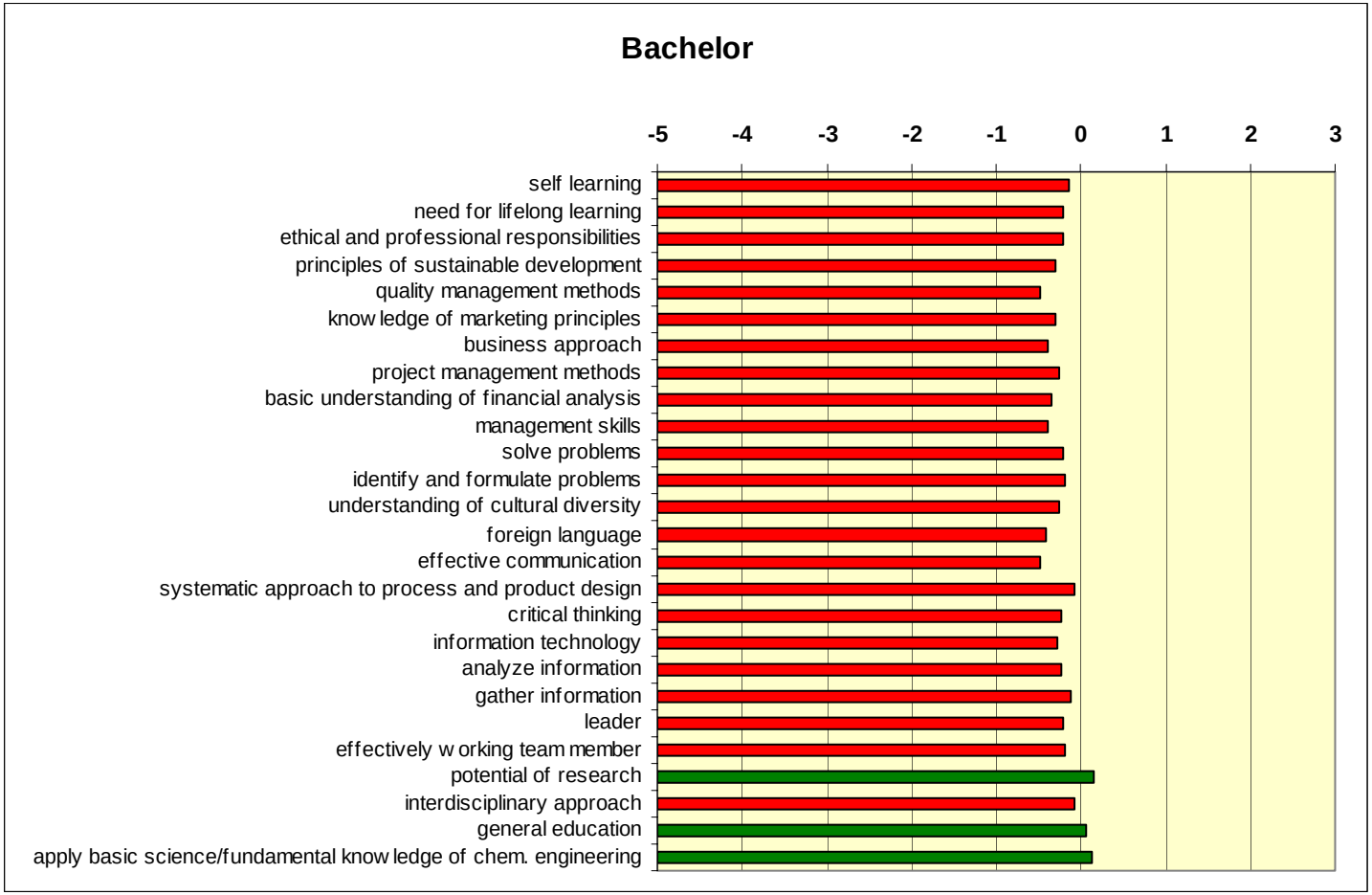


Fig. 10.21: Skills / Abilities versus **PhD Degree(China)**

Characteristic value v: v < 0 lack of qualification

v > 0 higher qualification than needed for professional job

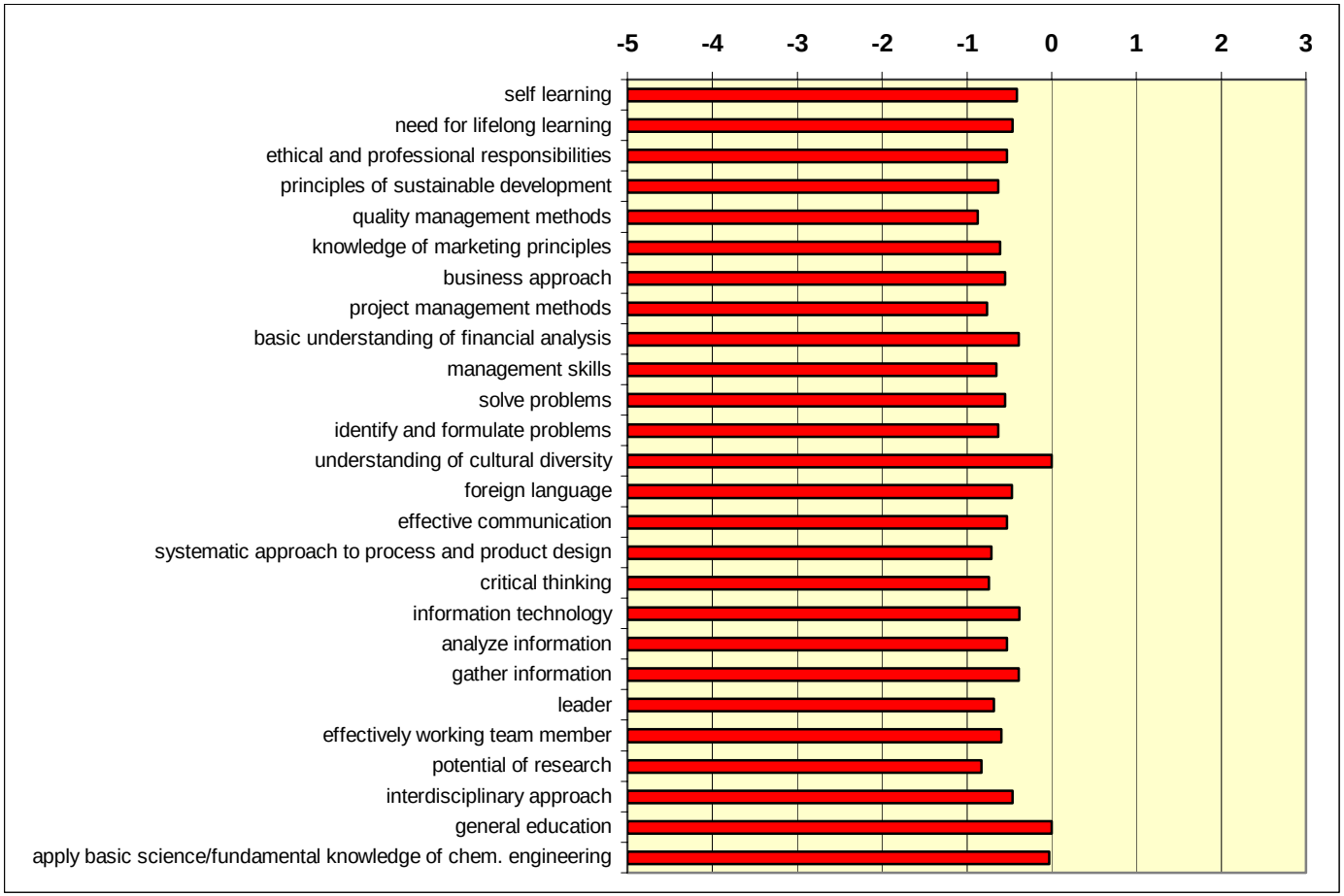


Fig. 10.22: Skills / Abilities versus **Master's Degree (China)**
Characteristic value v: v < 0 lack of qualification
v > 0 higher qualification than needed for professional job

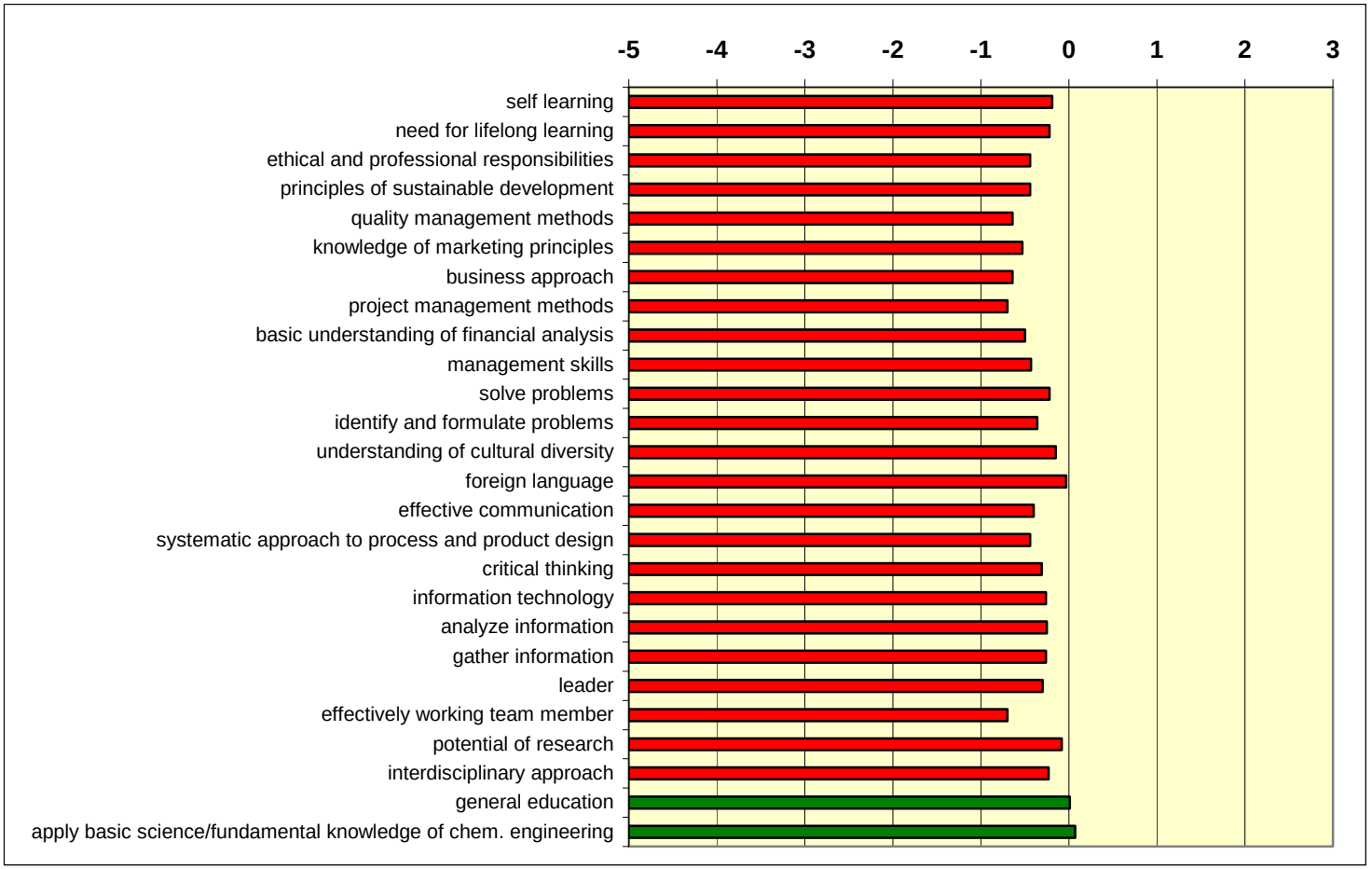


Fig. 10.23: Skills / Abilities versus **Bachelor's Degree (China)**
Characteristic value v: v < 0 lack of qualification

v > 0 higher qualification than needed for professional job

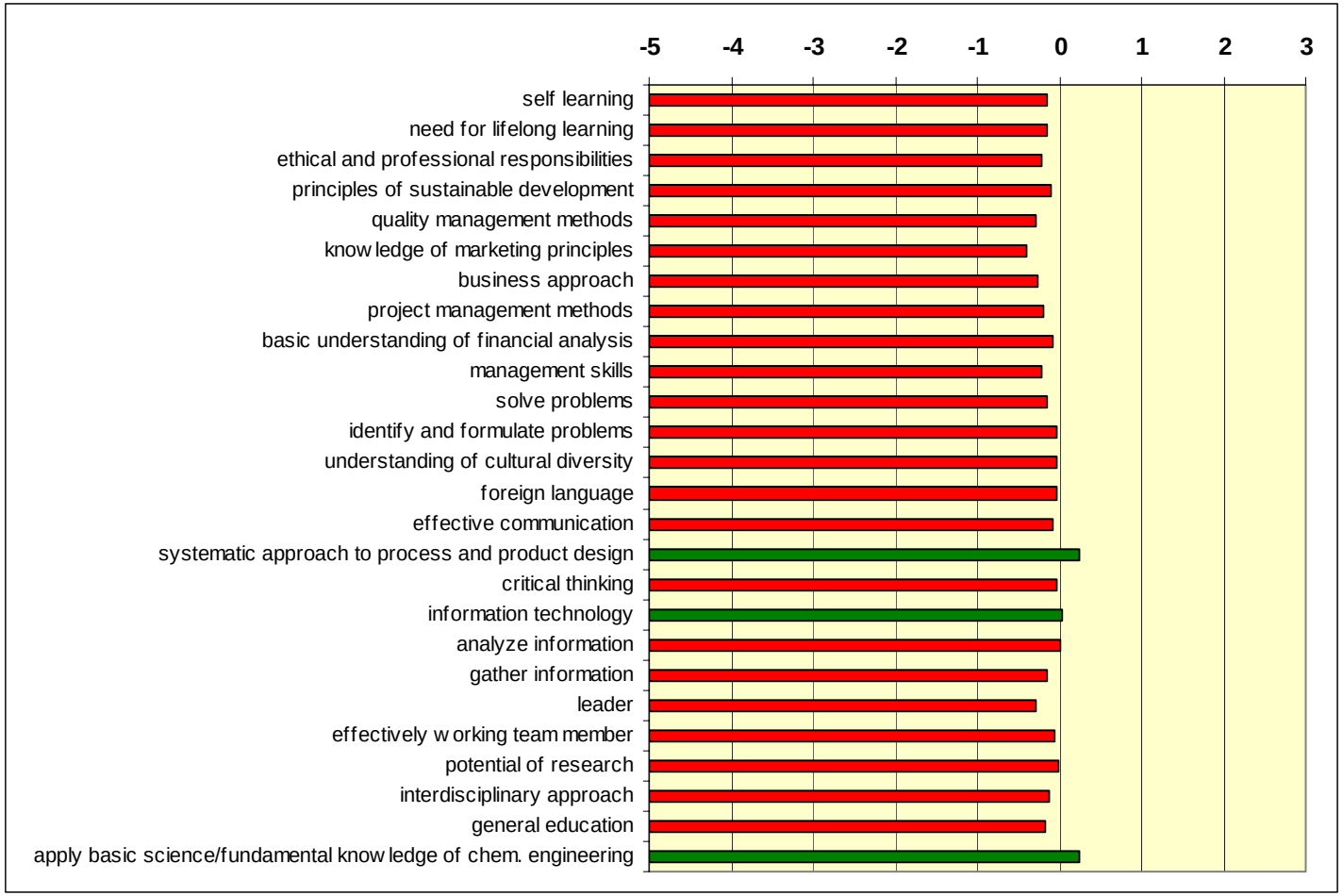
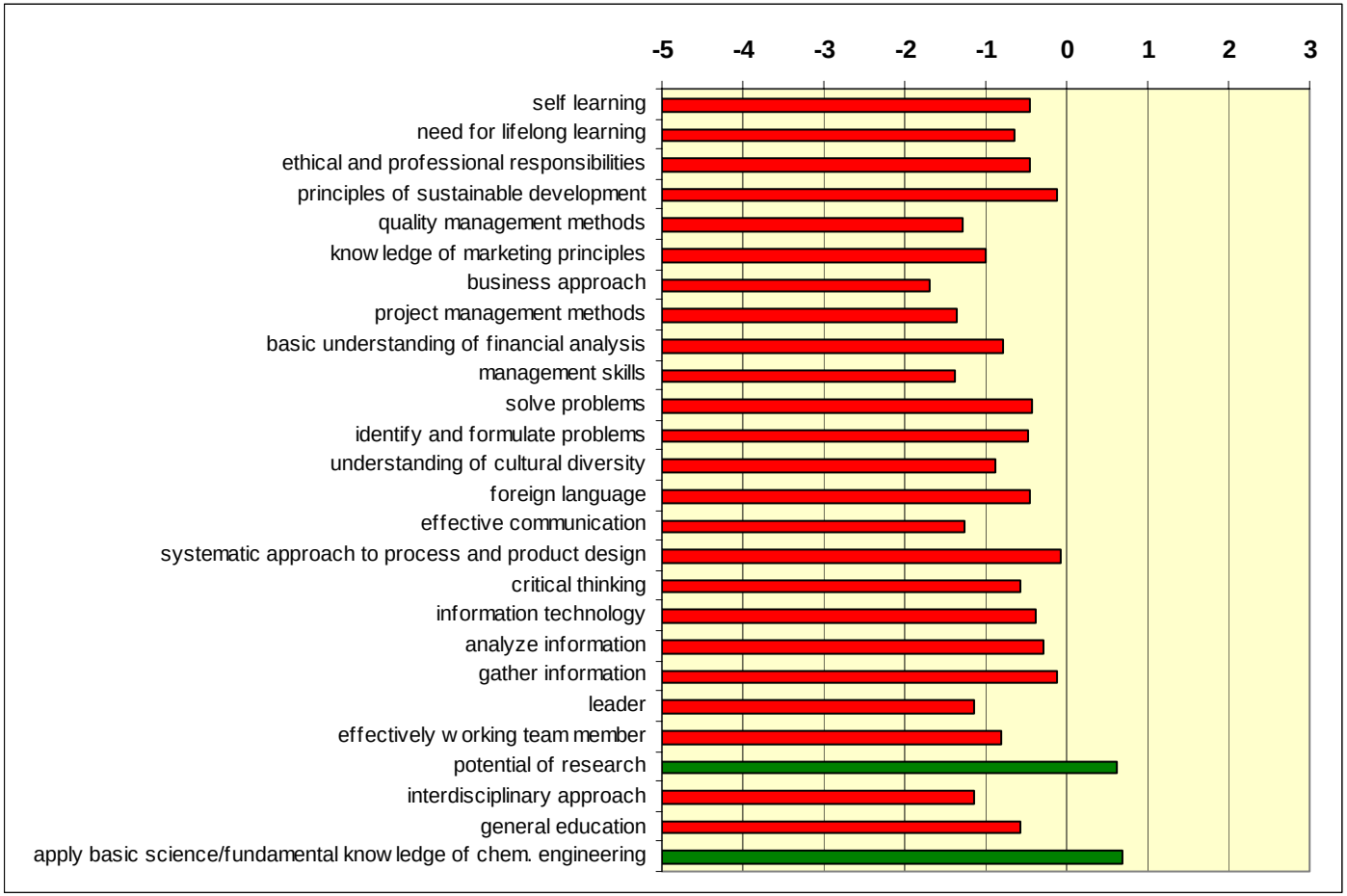


Fig. 10.24: Skills / Abilities versus **Bachelor's Degree (Australia)**
Characteristic value v: v < 0 lack of qualification

v > 0 higher qualification than needed for professional job



10.2 Interpretation of Results

Based on total data, education has evident shortcomings. With the exception of only two attributes, the difference in relevance of education minus work is always negative. **This means that almost all attributes are required to a greater extent at work than they are developed during education.** The two attributes which are rated as more important during education than for employment are

Appreciation of the potential of research and
Ability to apply knowledge of basic science.

These are, in fact, the traditional priorities of a classical university education. For work, their relevance ranks 21st and 14th respectively. A glance at the five most important attributes for employment shows that three of them also rank among the top five for education.

The 5 most important Generic Skills/Abilities at work	rank for education
Ability to work effectively as a member of a team	6
Ability to analyse information	2
Ability to communicate effectively	12
Ability to gather information	5
Self learning ability	4

Tab. 10. 1: Most Important Generic Skills/Abilities at Work

Teamwork moves from 6th place for education to 1st place for work. The ability to communicate effectively takes 12th place for education and 3rd place for work. The ranking differences between these two attributes, which are particularly important for employment, should not, in principle, be criticized since education must by definition attach particular importance to the achievement of the individual; thus communication with other students may be considered by some to be less important than required for the future.

The 5 generic attributes which are least fostered at university compared with the demands of employment, are collated in the following table.

The 5 Generic Skills/Abilities, which are least fostered at university compared with the demands of employment	**deviation**	**rank at work**
Ability to communicate effectively	-0.797	3
Knowledge of methods for total quality management	-0.877	24
Knowledge of methods for project management	-0.964	18
Management skills	-0.970	15
Business oriented thinking / Business approach	-1.057	20

Tab. 10.2: Attributes Which Are Least Fostered at University Compared With the Demands of Industry

If these data are viewed as a whole, the differences in degree of relevance to education and work of almost all these attributes are more or less valid for all academic degrees. As far as the 7 countries evaluated in detail are concerned, however, the picture is more complex.

Country	**Bachelor**	**Master**	**PhD**
PRC	3	2	0
USA	3	3	1
UK	2	3	-
MEX	3	5	-
D	-	3	3
F	3	2	4
AUS	2	-	-
mean value	2.67	3	2
total	2	2	1

Tab. 10.3: Number of Abilities With Positive Values of Education-Work (including British MEng., see chapter 3)

On average those with a master's degree consider themselves best prepared, those with a PhD, by contrast, least prepared for the demands of work. In all countries the generic attributes perceived to be required for employment yield greater scores than the same attributes when considered in terms of development during education. The

average shortfall in degree of relevance of these attributes for employment versus education is presented in the following table.

Country	Bachelor	Master	PhD
PRC	-0.11	-0.33	-0.51
USA	-0.47	-0.51	-0.64
UK	-0.6	-0.47	-
MEX	-0.51	-0.26	-
D	-	-0.86	-0.99
F	-0.47	-0.51	-0.45
AUS	-0.63	-	-
mean value	-0.47	-0.49	-0.65
total	-0.43	-0.48	-0.73

Tab. 10.4: Average shortfall in degree of relevance of generic abilities education – work, (including British MEng., see chapter 3)

Those with a PhD generally feel least equipped for the requirements of employment. The research orientation of this academic qualification is evidently less in demand than in the past. The graduates who feel least prepared for the demands of work are the Germans. Ratings by country of the successful acquisition of generic attributes at university are given in the following table; the mean value of all participants in the individual countries was selected as the indicator.

Country	Deviation educ-work
PRC	- 0.22
USA	- 0.49
UK	- 0.52
MEX	- 0.45
F	- 0.5
AUS	- 0.63
D	- 0.93

Tab. 10.5: Average shortfall in degree of relevance of generic abilities education – work for all participants in the individual countries

This rating should not be considered as an indicator of the performance of university education because it also covers the perceived requirements of employment. Thus it may well be that the demands made by employment in the emerging countries, China and Mexico, are less than those in the highly industrialized countries. Of the highly industrialized countries the USA has the lowest difference.

11. Evaluation of the Quality of Teaching at the University

This chapter provides information about the quality of university education. Five statements were given and the participants could make a similiar ranking to that described in chapter 10. The following subchapters summarize the answers for the different countries.

11.1 The Teaching Staff Motivated Me

1 – very low; 2 – low; 3 – medium; 4 – high; 5 – very high

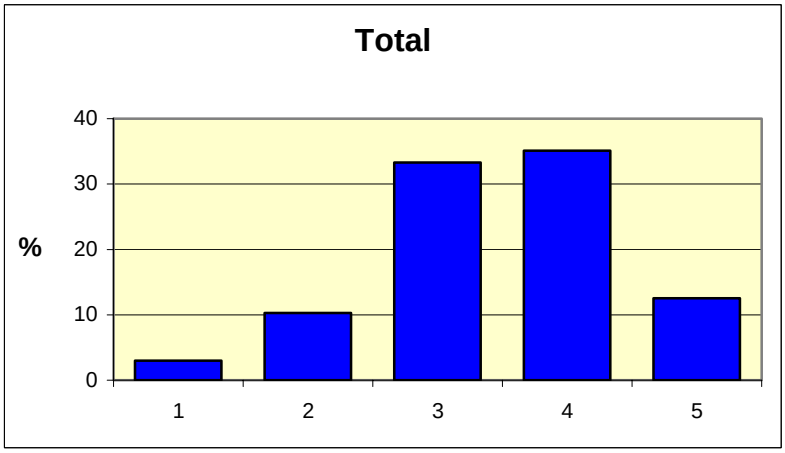


Fig. 11.1: Ranking of "The teaching staff motivated me" for All Participants

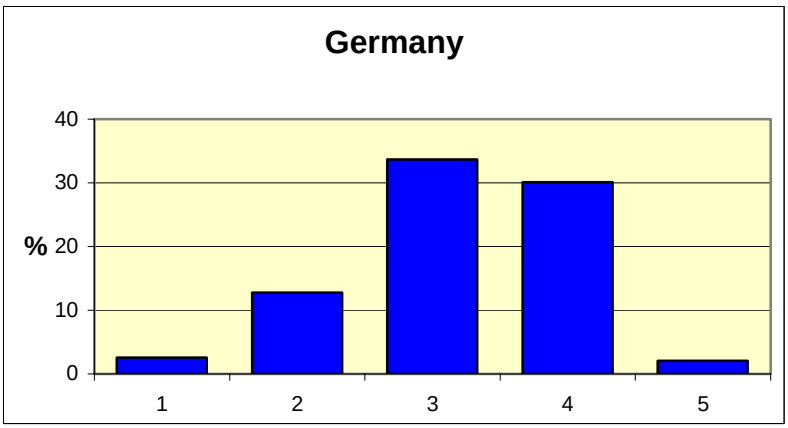


Fig. 11.2: Ranking of "The teaching staff motivated me" for Germany

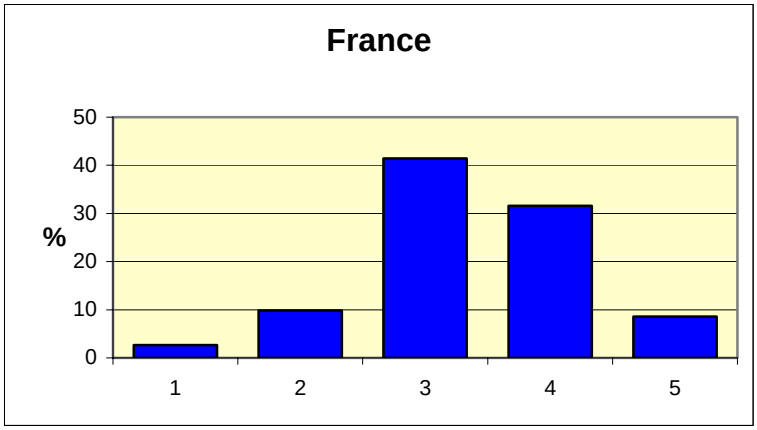


Fig. 11.3: Ranking of "The teaching staff motivated me" for France

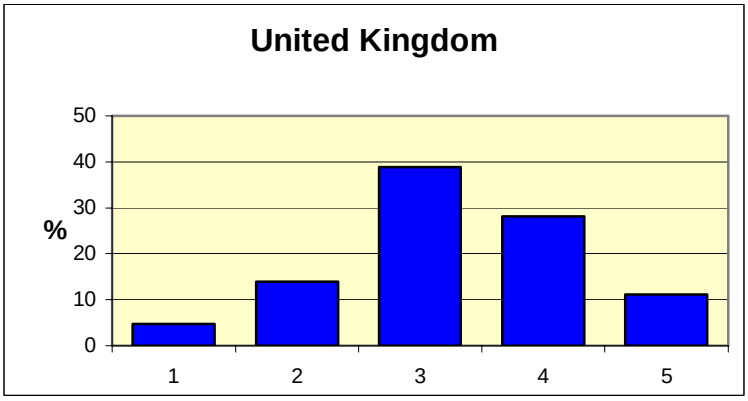


Fig. 11.4: Ranking of "The teaching staff motivated me" for United Kingdom

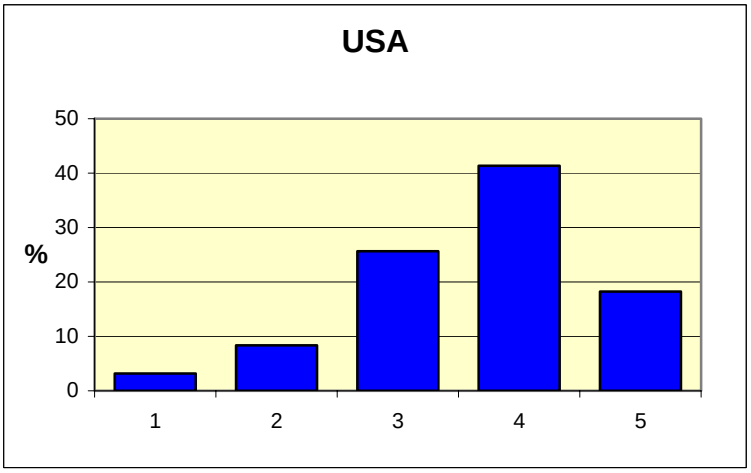


Fig. 11.5: Ranking of "The teaching staff motivated me" for USA

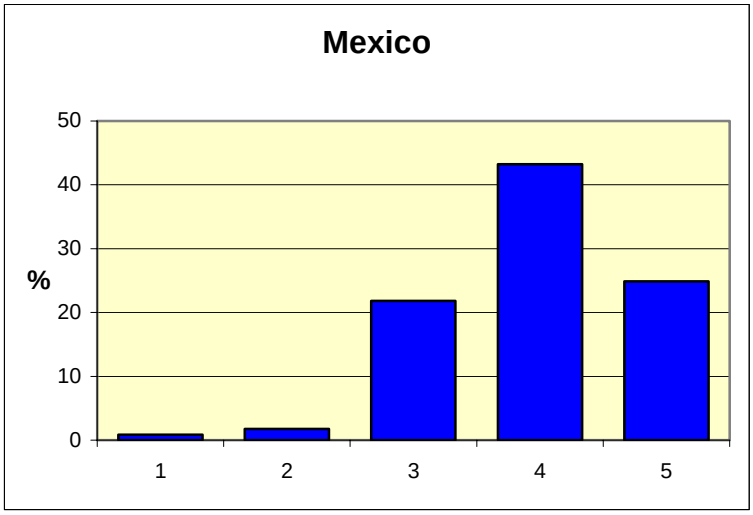


Fig. 11.6: Ranking of "The teaching staff motivated me" for Mexico

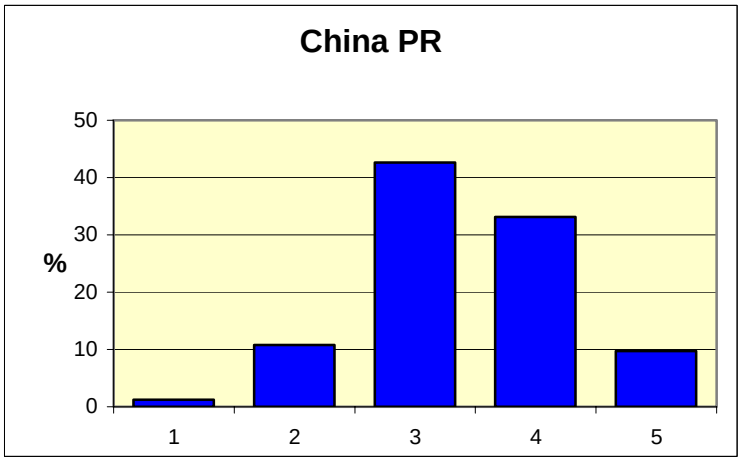


Fig. 11.7: Ranking of "The teaching staff motivated me" for China

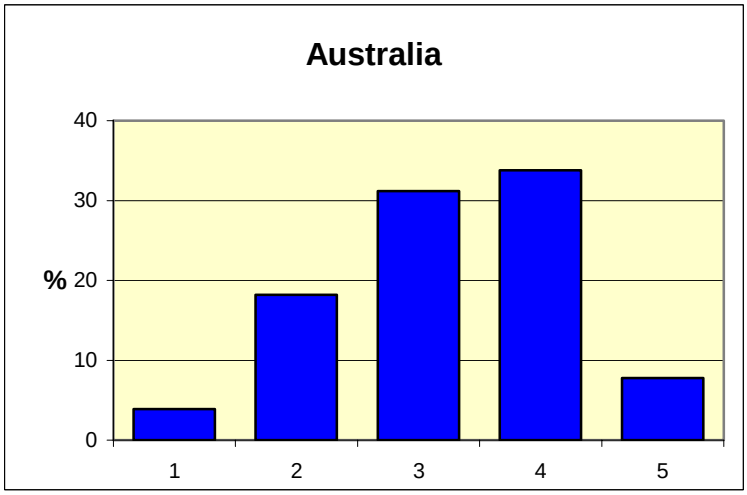


Fig. 11.8: Ranking of "The teaching staff motivated me" for Australia

11.2 The Teaching Staff Normally Gave Me Helpful Feedback

1 – very low; 2 – low; 3 – medium; 4 – high; 5 – very high

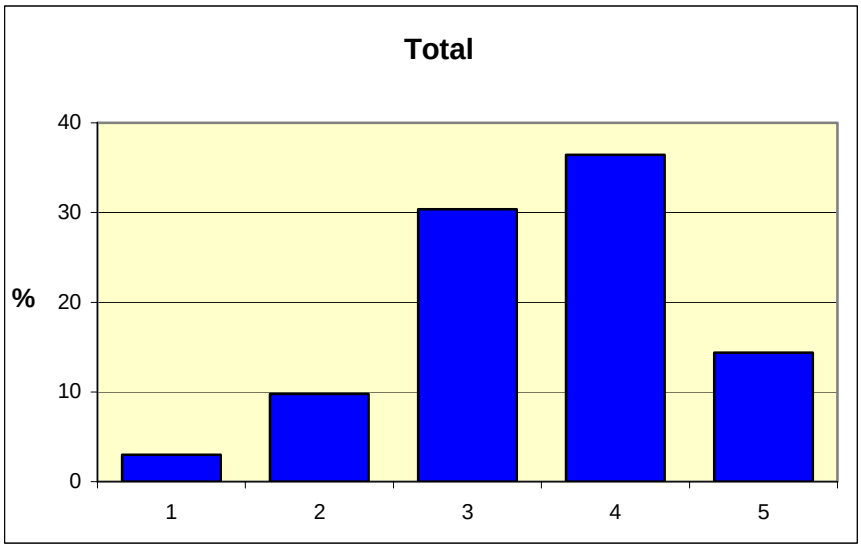


Fig. 11.9: Ranking of "The teaching staff normally gave me helpful feedback" for all participants

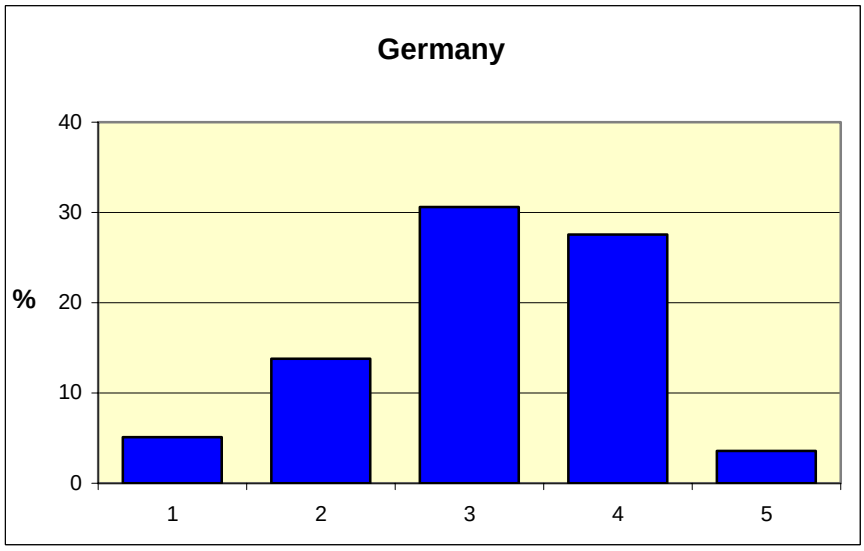


Fig. 11.10 Ranking of "The teaching staff normally gave me helpful feedback" for Germany

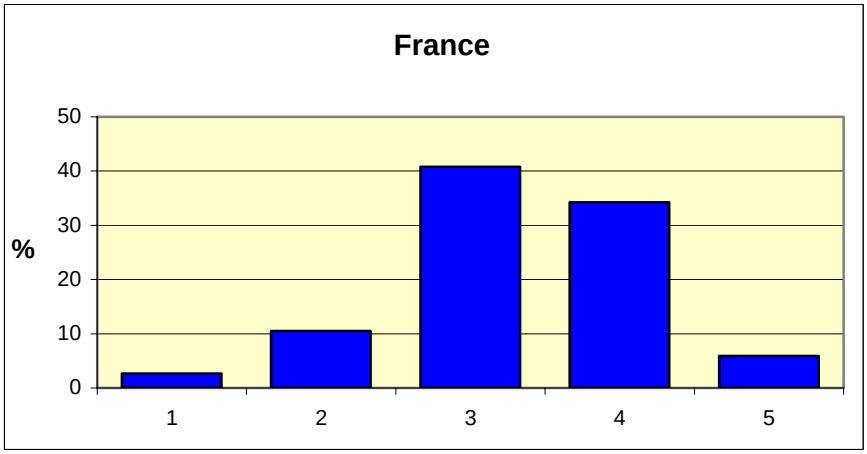


Fig. 11.11 Ranking of "The teaching staff normally gave me helpful feedback" for France

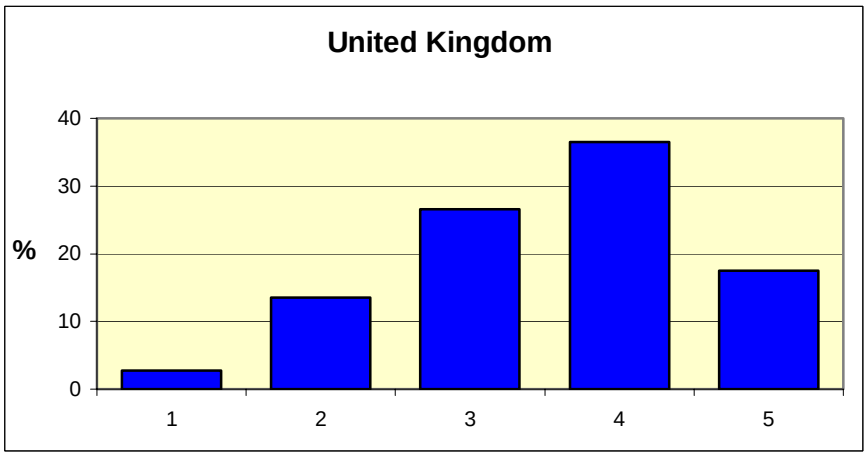


Fig. 11.12 Ranking of "The teaching staff normally gave me helpful feedback" for United Kingdom

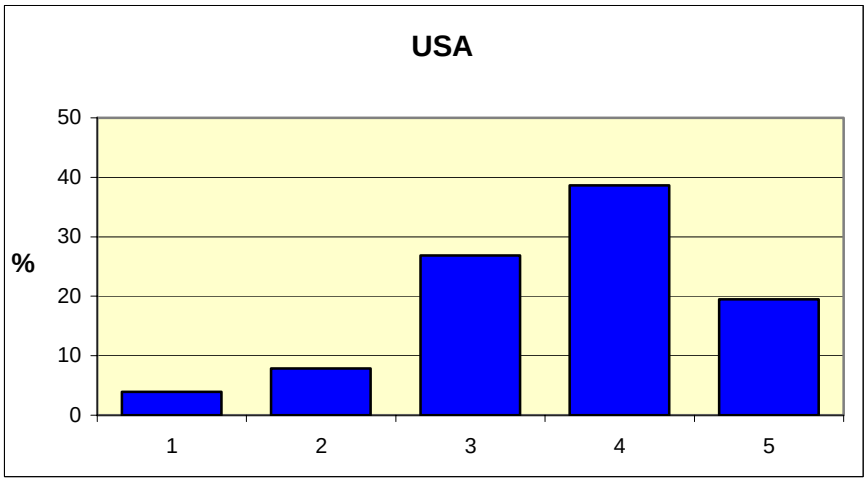


Fig. 11.13 Ranking of "The teaching staff normally gave me helpful feedback" for USA

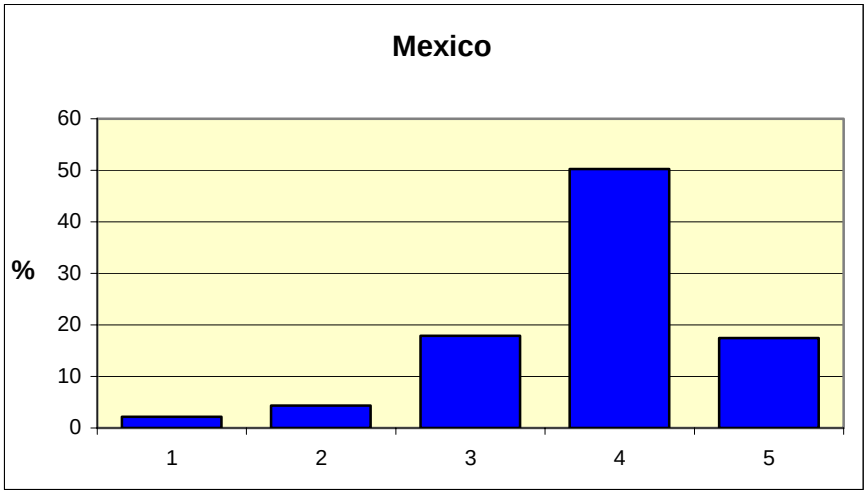


Fig. 11.14 Ranking of "The teaching staff normally gave me helpful feedback" for Mexico

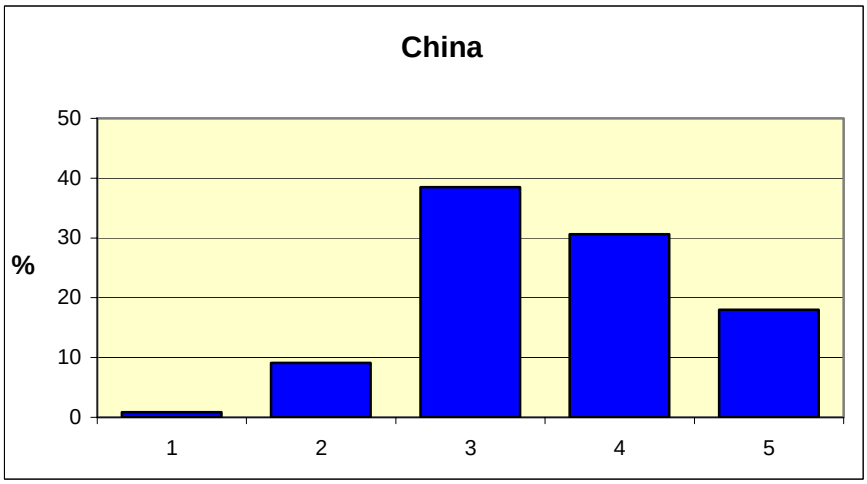


Fig. 11.15 Ranking of "The teaching staff normally gave me helpful feedback" for China

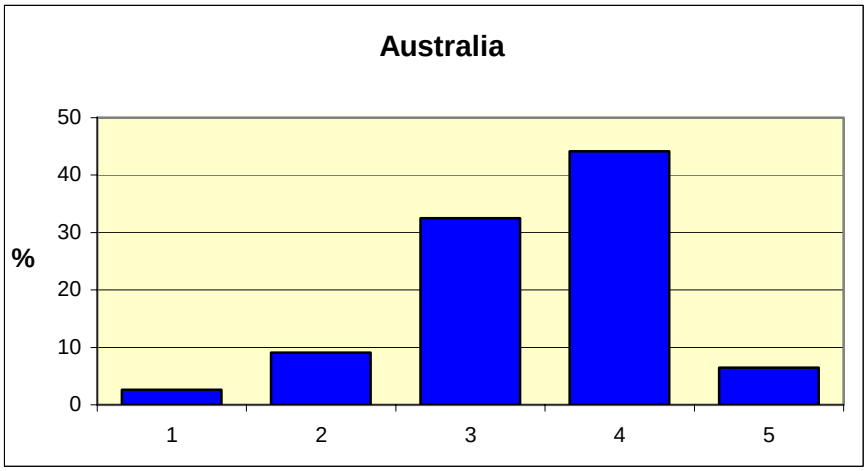


Fig. 11.16 Ranking of "The teaching staff normally gave me helpful feedback" for Australia

11.3 My Lectures Were Excellent and Inspiring

1 – very low; 2 – low; 3 – medium; 4 – high; 5 – very high

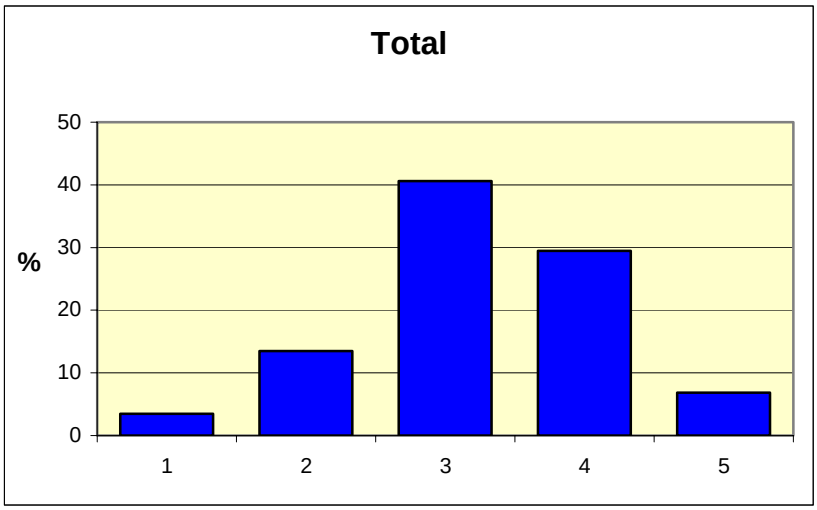


Fig. 11.17 Ranking of "My lectures were excellent and inspiring" for all participants

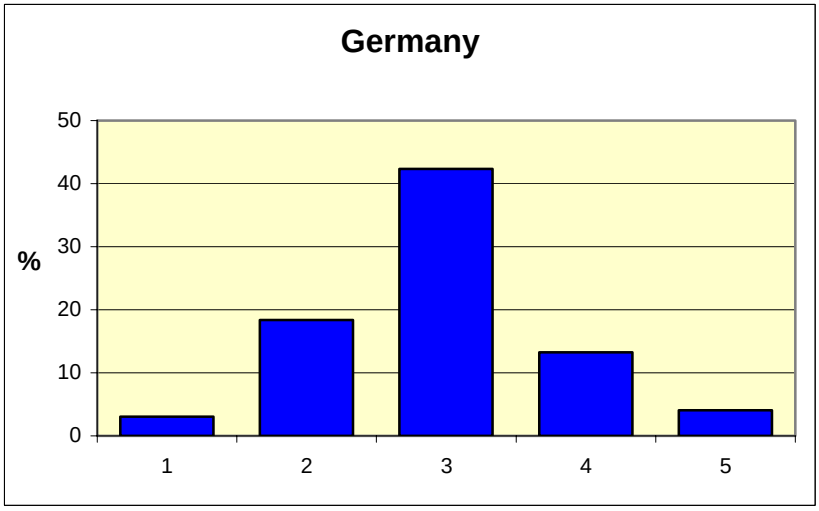


Fig. 11.18 Ranking of "My lectures were excellent and inspiring" for Germany

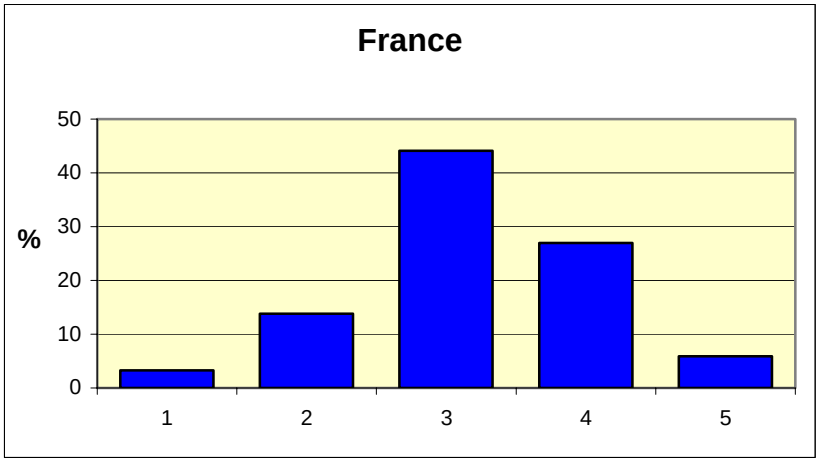


Fig. 11.19 Ranking of "My lectures were excellent and inspiring" for France

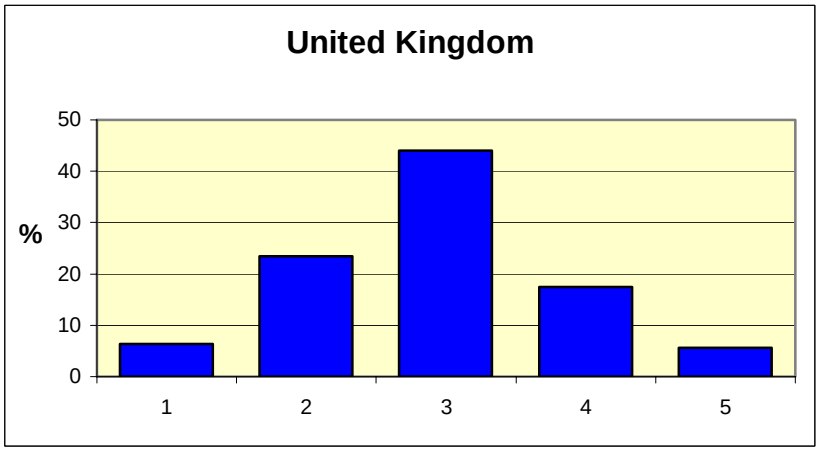


Fig. 11.20 Ranking of "My lectures were excellent and inspiring" for United Kingom

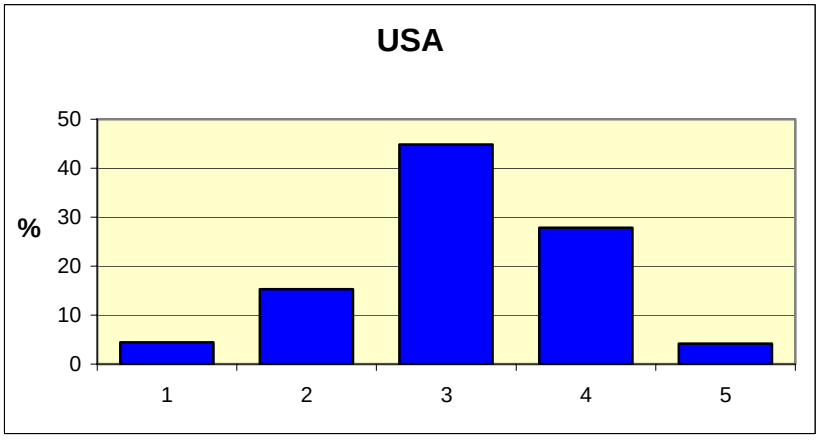


Fig. 11.21 Ranking of "My lectures were excellent and inspiring" for USA

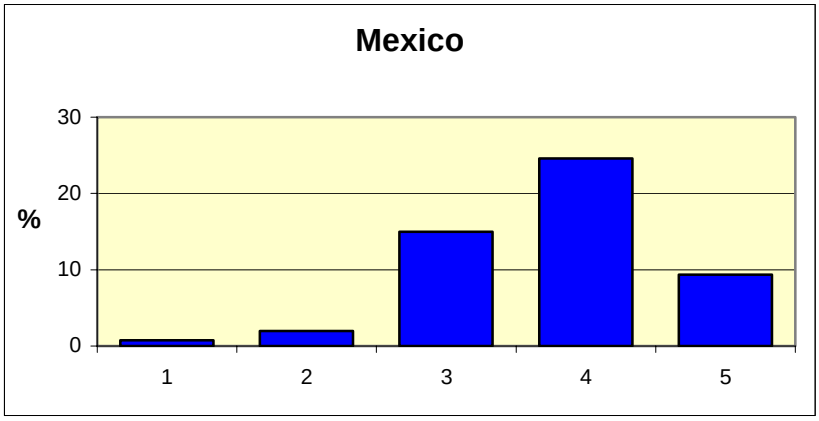


Fig. 11.22 Ranking of "My lectures were excellent and inspiring" for Mexico

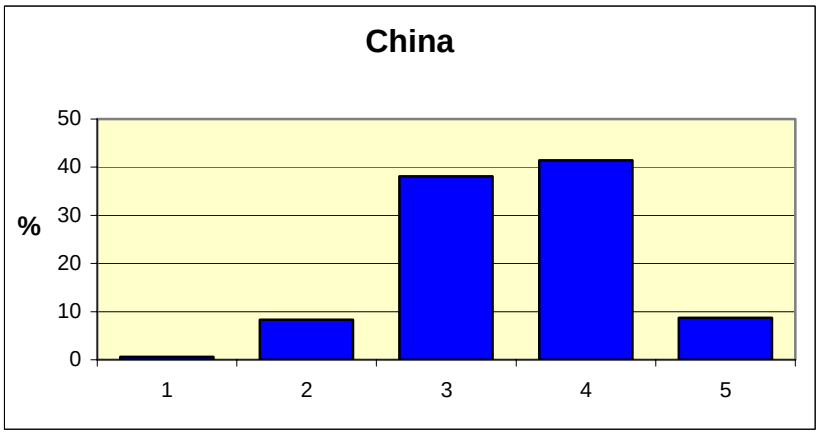


Fig. 11.23 Ranking of "My lectures were excellent and inspiring" for China

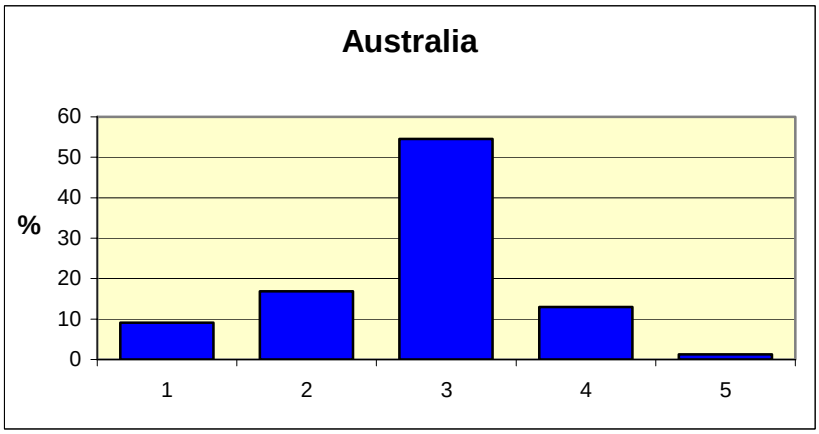


Fig. 11.24 Ranking of "My lectures were excellent and inspiring" for Australia

11.4 The Assessment Methods Employed Required an In-depth Understanding of the Course Content

1 – very low; 2 – low; 3 – medium; 4 – high; 5 – very high

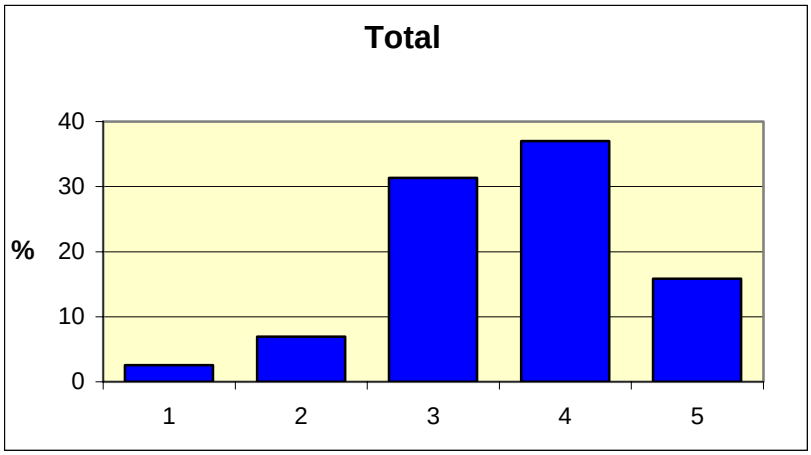


Fig. 11.25 Ranking of "The assessment methods employed required an in-depth understanding of the course content" for all participants

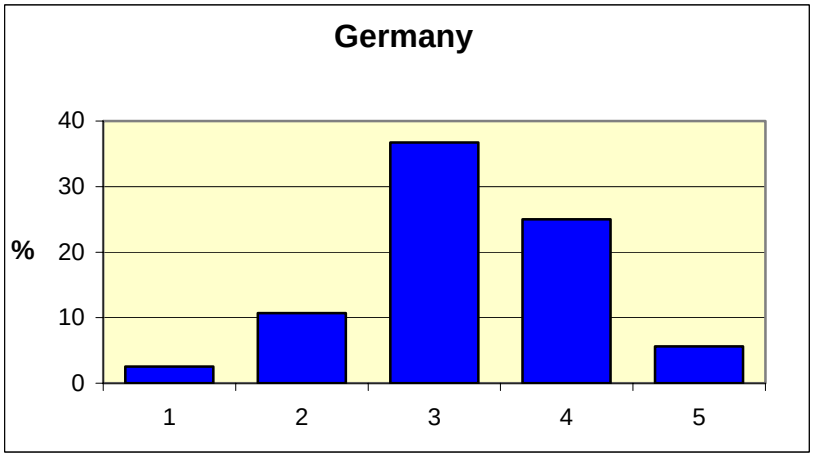


Fig. 11.26 Ranking of "The assessment methods employed required an in-depth understanding of the course content" for Germany

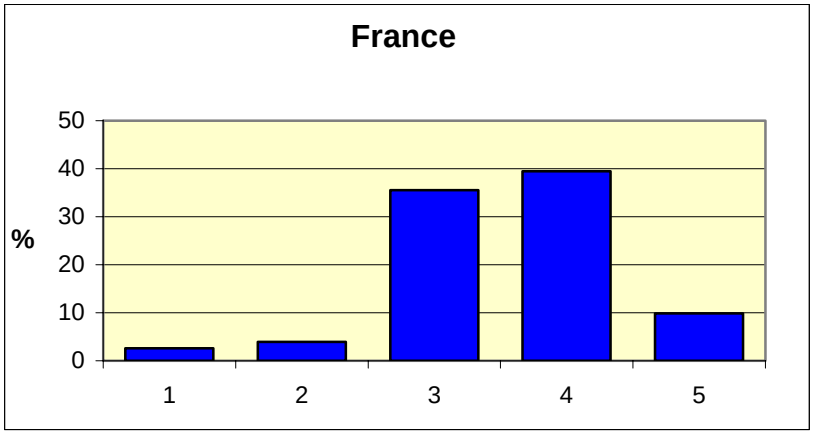


Fig. 11.27 Ranking of "The assessment methods employed required an in-depth understanding of the course content" for France

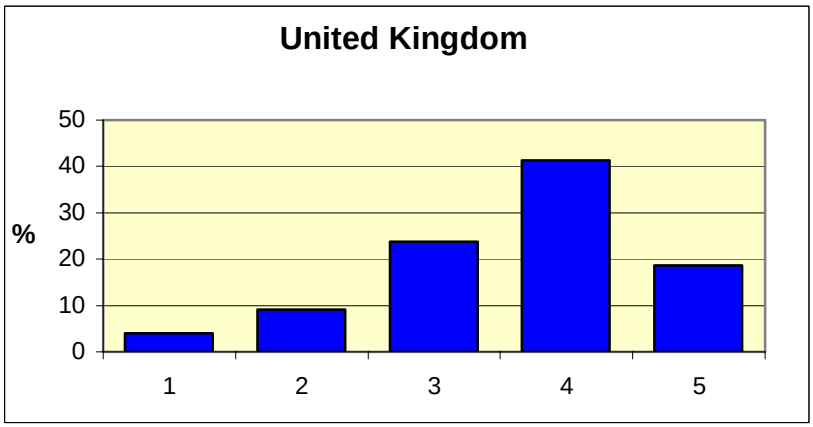


Fig. 11.28 Ranking of "The assessment methods employed required an in-depth understanding of the course content" for United Kingdom

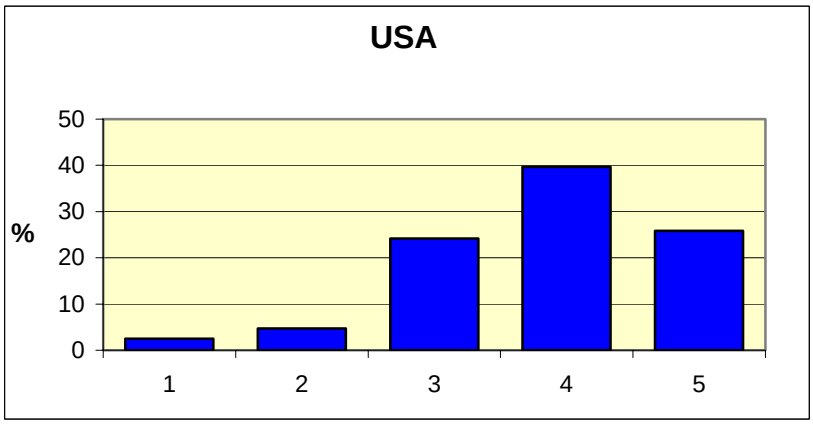


Fig. 11.29 Ranking of "The assessment methods employed required an in-depth understanding of the course content" for USA

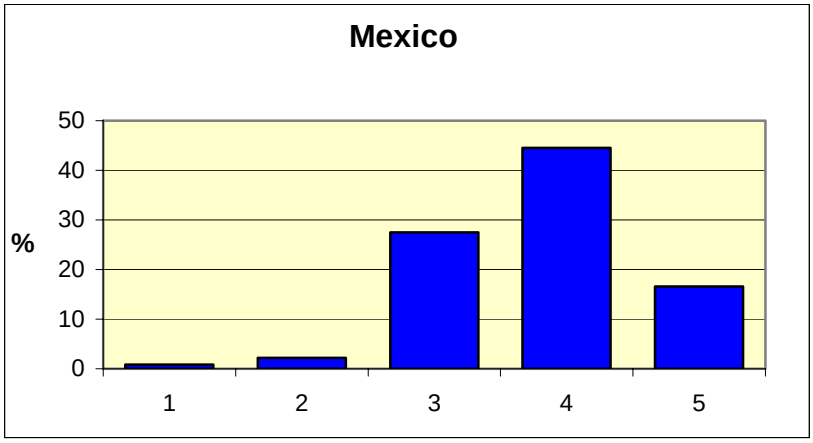


Fig. 11.30 Ranking of "The assessment methods employed required an in-depth understanding of the course content" for Mexico

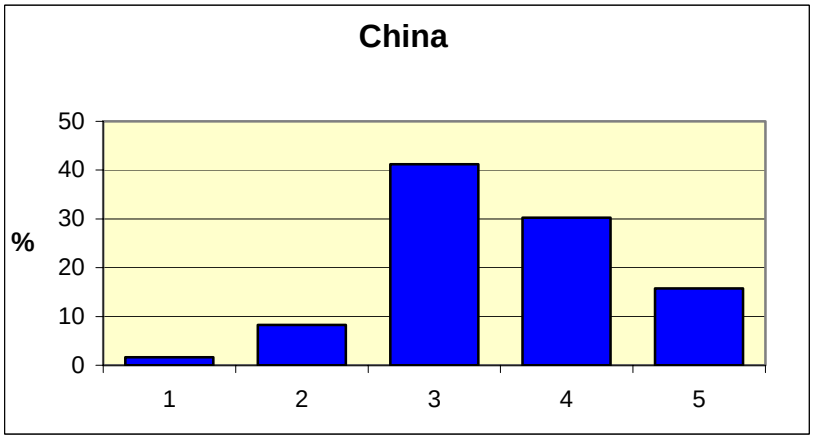


Fig. 11.31 Ranking of "The assessment methods employed required an in-depth understanding of the course content" for China

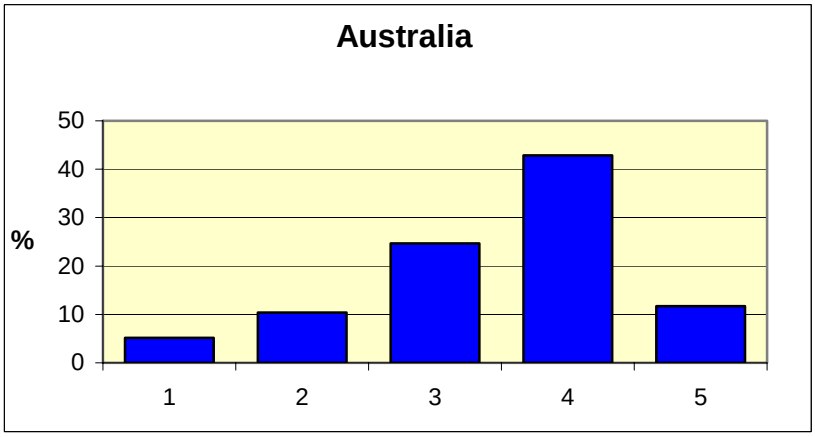


Fig. 11.32 Ranking of "The assessment methods employed required an in-depth understanding of the course content" for Australia

11.5 The Study Programme was Efficiently Organised

1 – very low; 2 – low; 3 – medium; 4 – high; 5 – very high

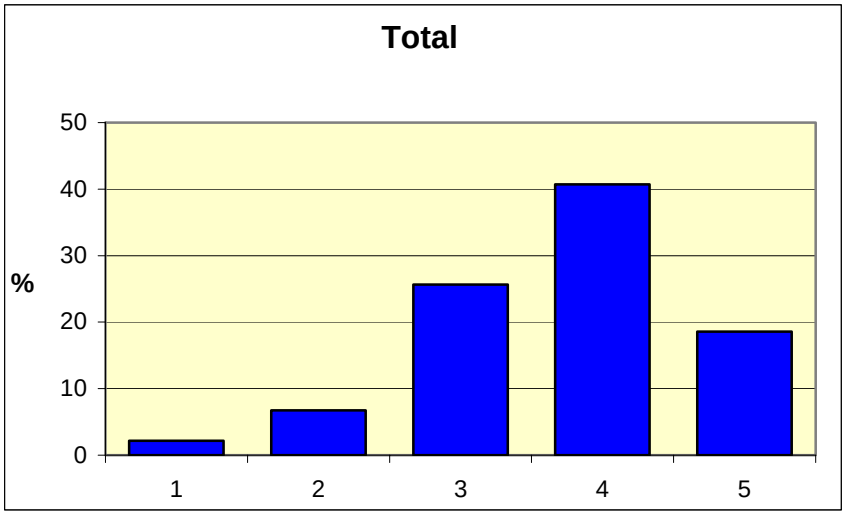


Fig. 11.33 Ranking of "The study programme was efficiently organised" for all participants

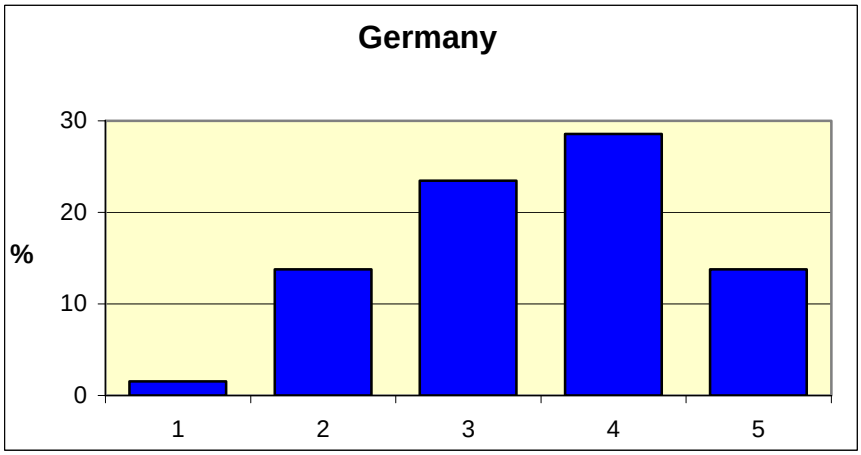


Fig. 11.34 Ranking of "The study programme was efficiently organised" for Germany

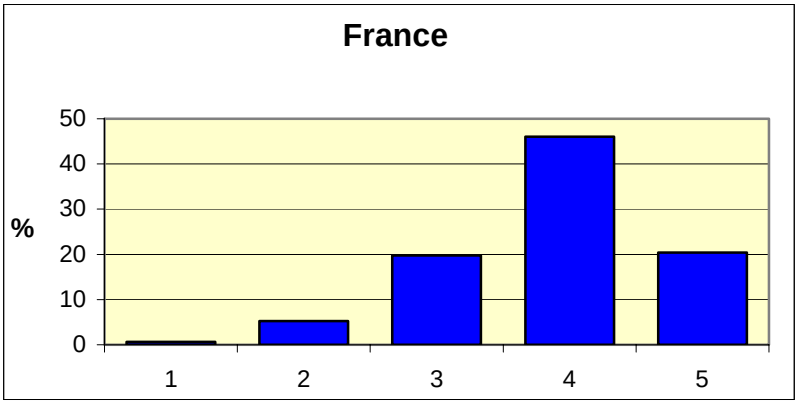


Fig. 11.35 Ranking of "The study programme was efficiently organised" for France

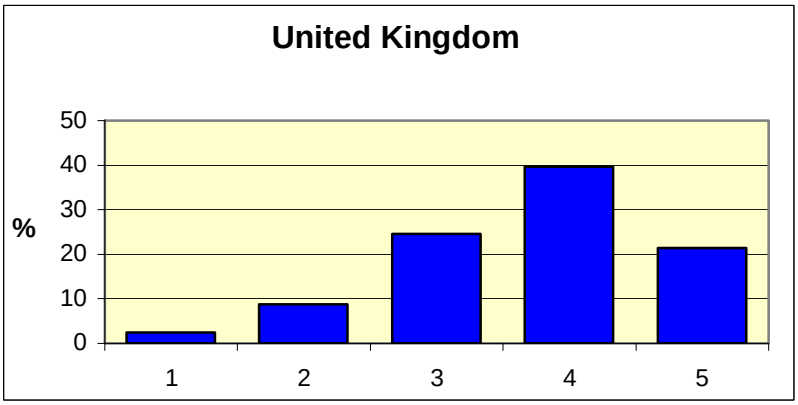


Fig. 11.36 Ranking of "The study programme was efficiently organised" for United Kingdom

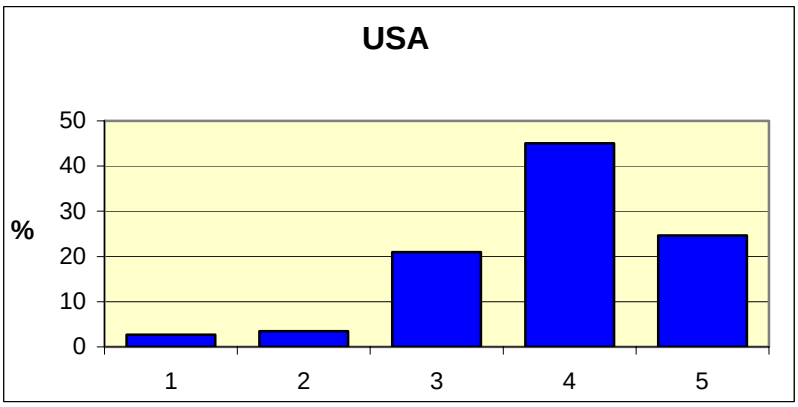


Fig. 11.37 Ranking of "The study programme was efficiently organised" for USA

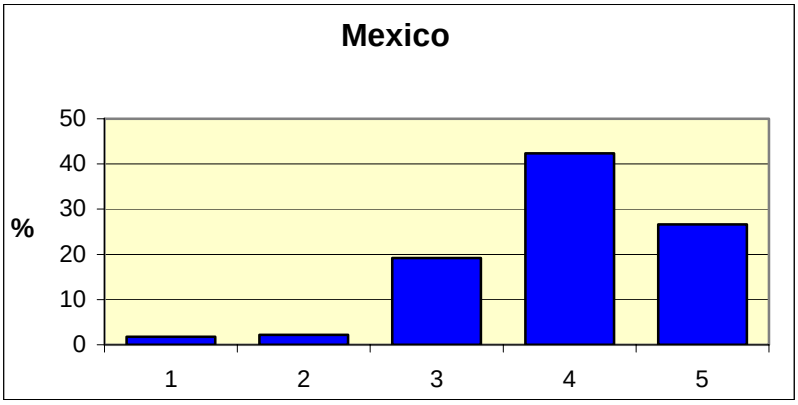


Fig. 11.38 Ranking of "The study programme was efficiently organised" for Mexico

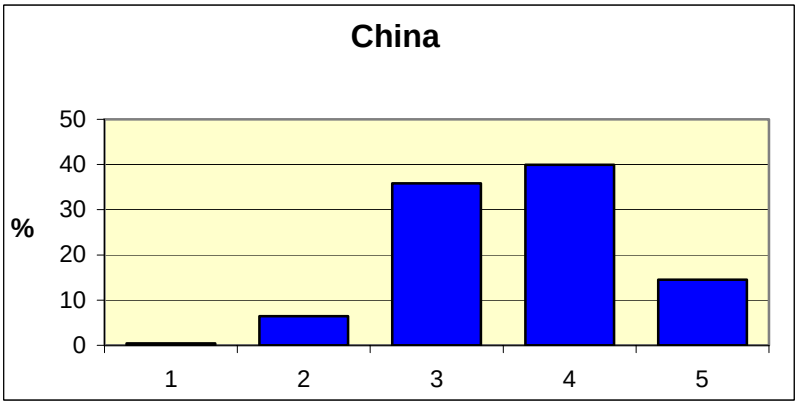


Fig. 11.39 Ranking of "The study programme was efficiently organised" for China

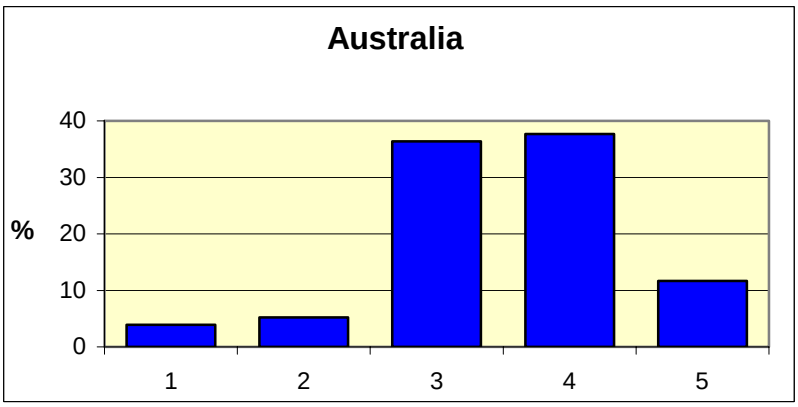


Fig. 11.40 Ranking of "The study programme was efficiently organised" for Australia

11.6 Evaluation of the Quality of the Teaching at the University by Gender

Calculations of average values were made for every criteria of the quality of the teaching at university for male and female participants separately. The results for the different countries are shown in the following figures (11.41 – 11.48)

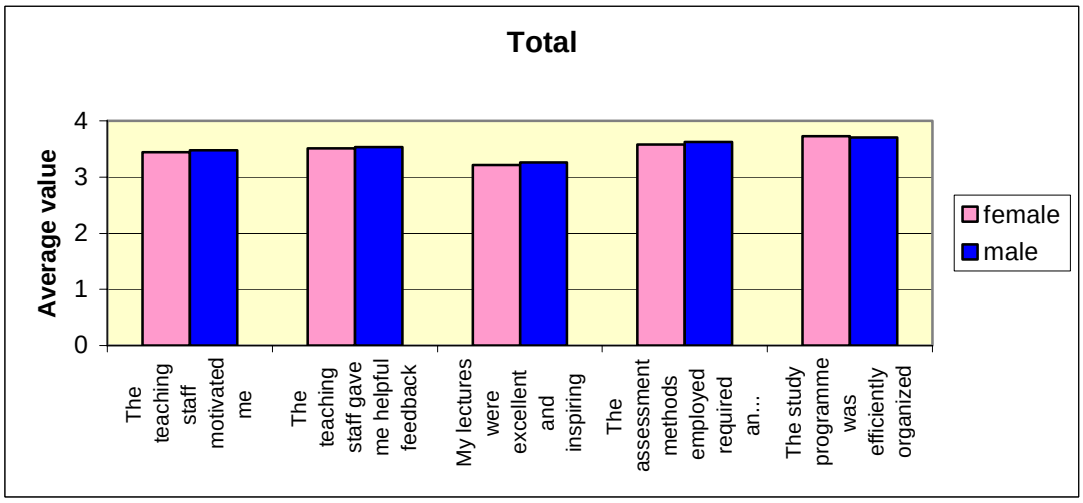


Fig. 11.41: Distribution of Average Values for All Participants

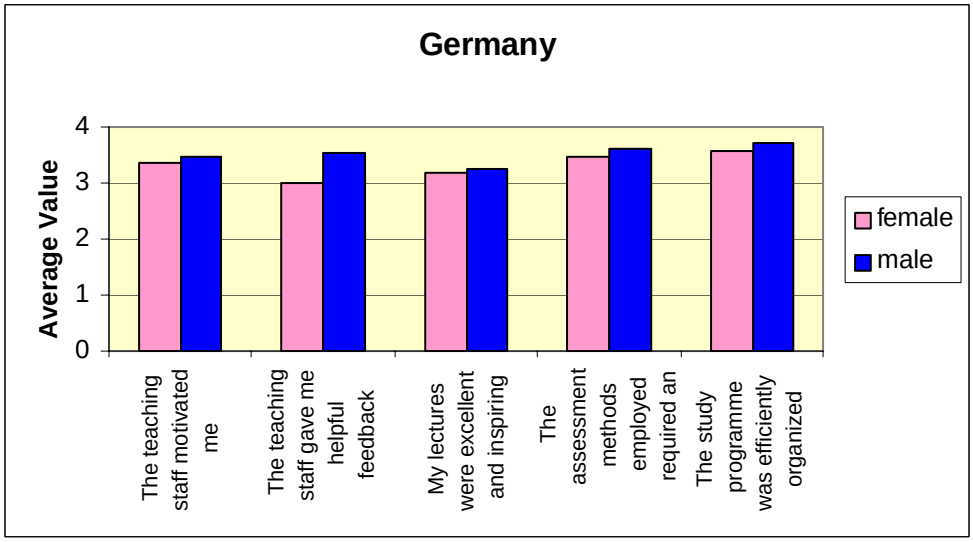


Fig. 11.42: Distribution of Average Values for Germany

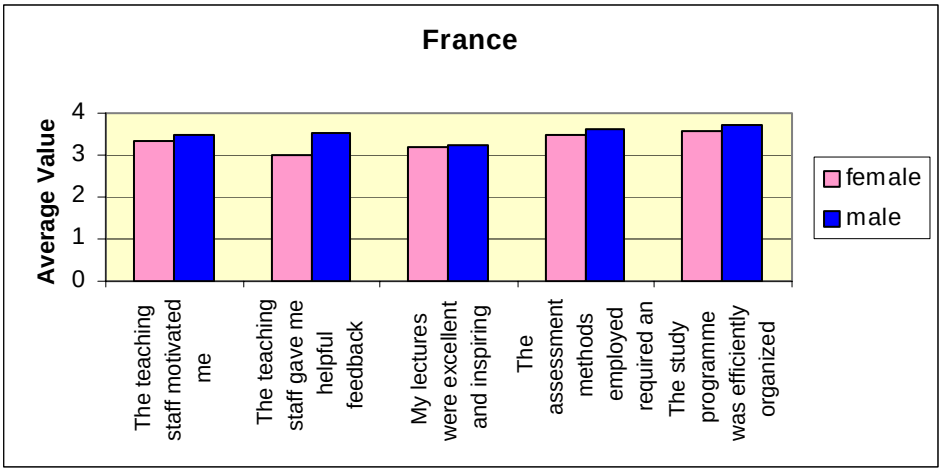


Fig. 11.43: Distribution of Average Values for France

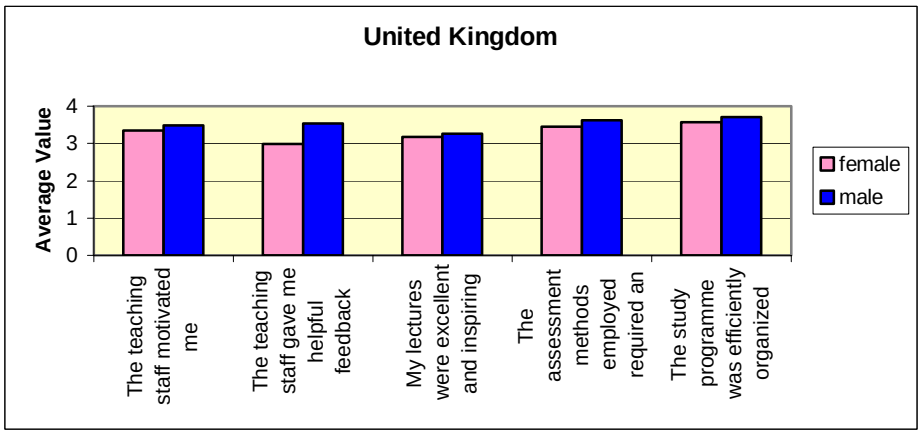


Fig. 11.44: Distribution of Average Values for United Kingdom

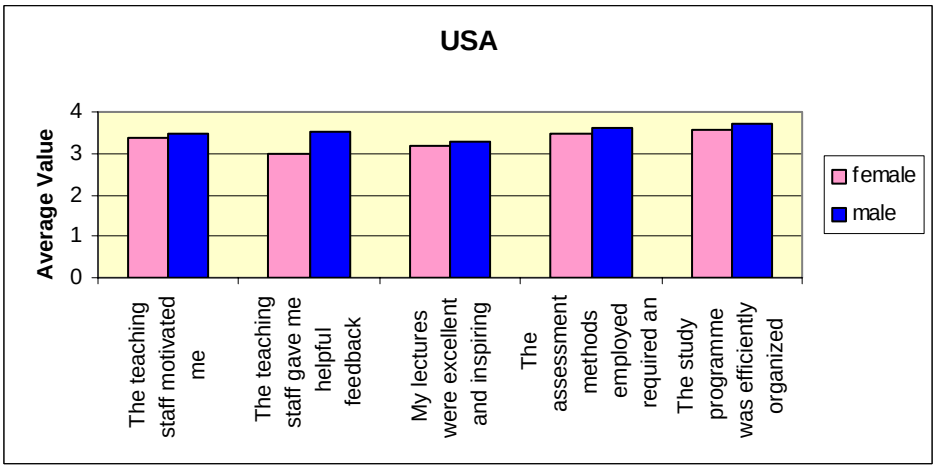


Fig. 11.45: Distribution of Average Values for USA

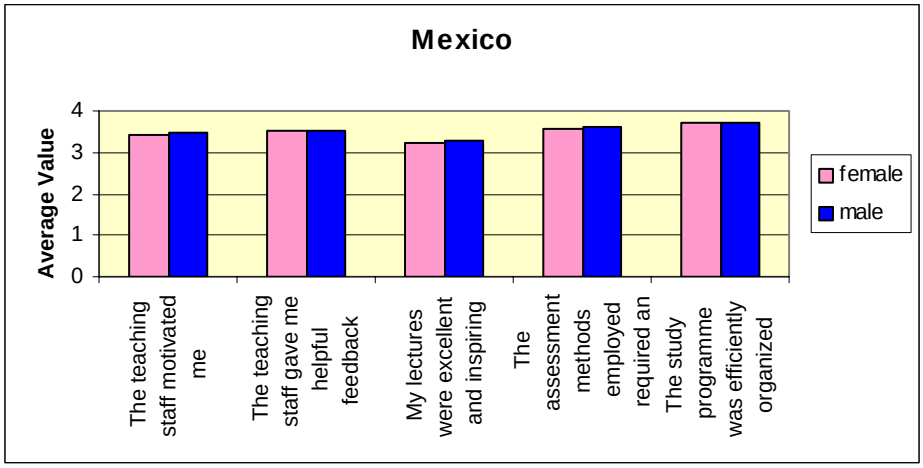


Fig. 11.46: Distribution of Average Values for Mexico

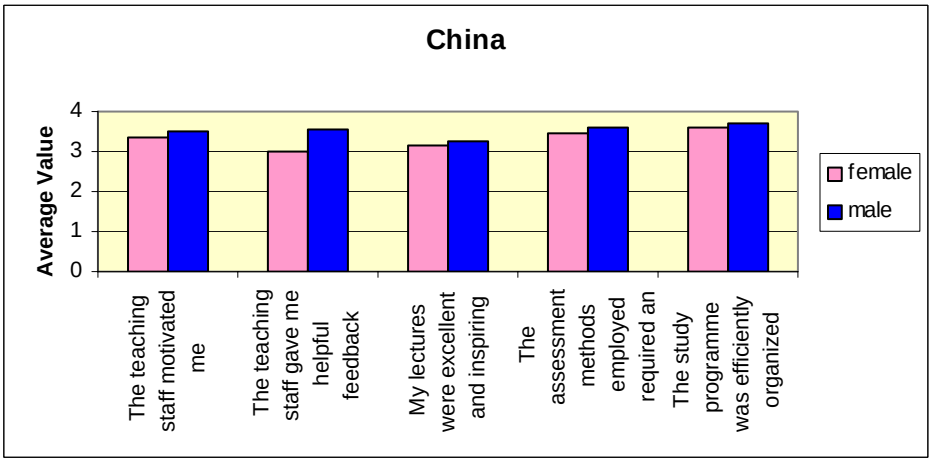


Fig. 11.47: Distribution of Average Values for China

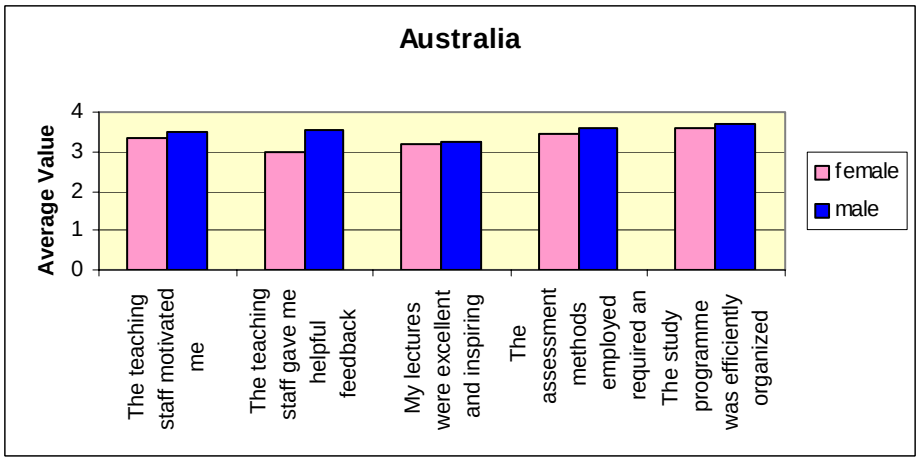


Fig. 11.48: Distribution of Average Values for Australia

12. Are you pleased to have studied Chemical Engineering?

This last question of the questionnaire could be regarded as an overall summary which reflects quality of education, chances in industry and personal welfare. The results are presented in figure 12.1.

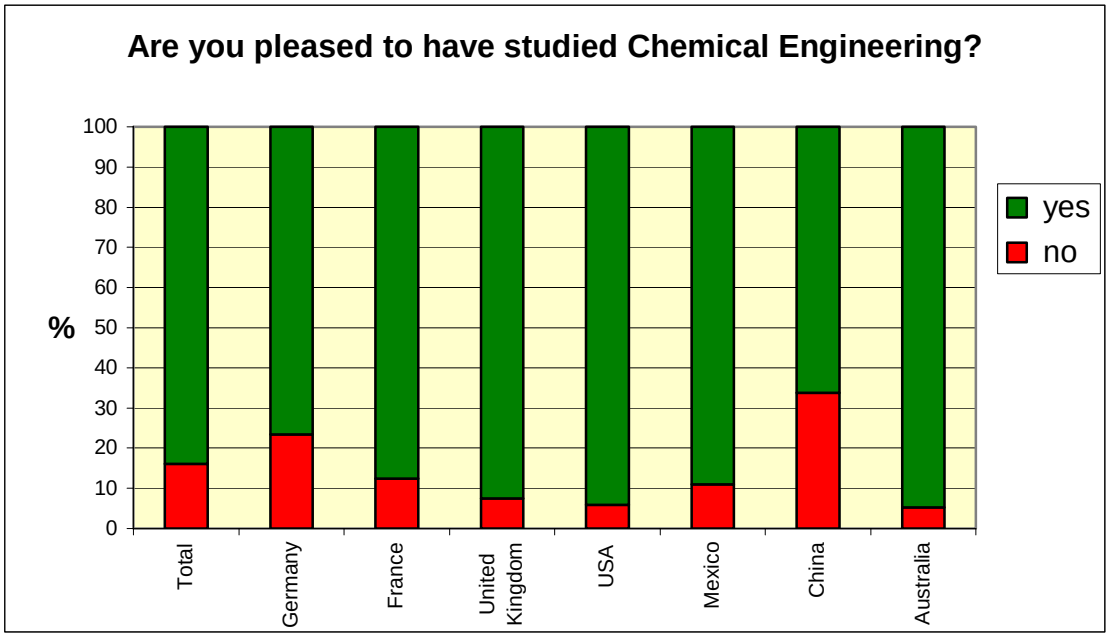


Fig. 12.1: "Are you pleased to have studied Chemical Engineering"? Results of the Yes – No Scheme

The high green columns show that most of the participants are pleased to have studied chemical engineering. Only in China did more than 30% answer this question with "no". More detailed calculations were made and the following diagrams show the results for how different groups answered this question.

In figure 12.2 the answers to this question are presented for the different degrees.

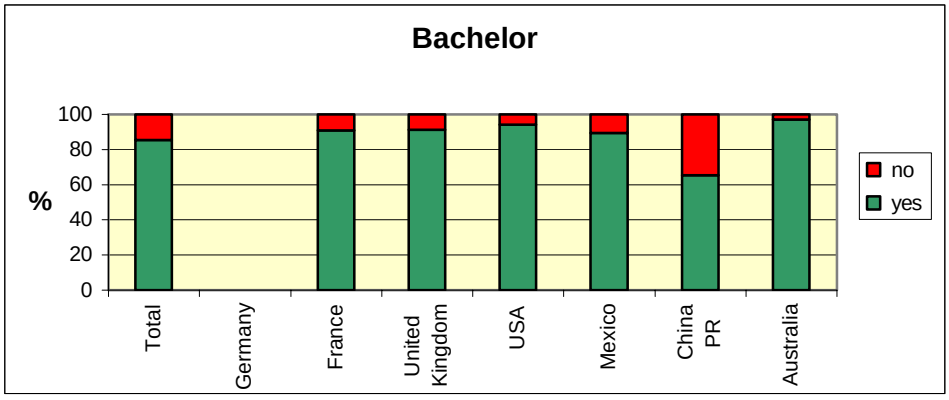


Fig. 12.2: "Are you pleased to have studied Chemical Engineering"? Results of the Yes – No Scheme for Bachelor's Degree (only seven answers from Germany)

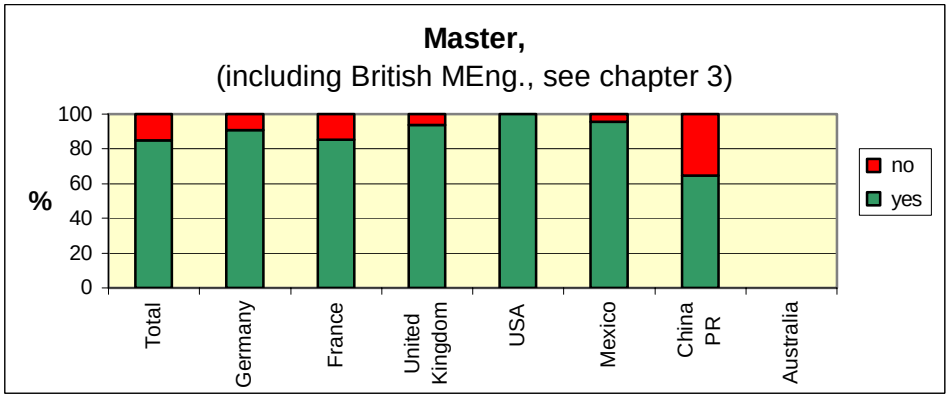


Fig. 12.3: "Are you pleased to have studied Chemical Engineering"? Results of the Yes – No Scheme Master's Degree (only one answer from Australia)

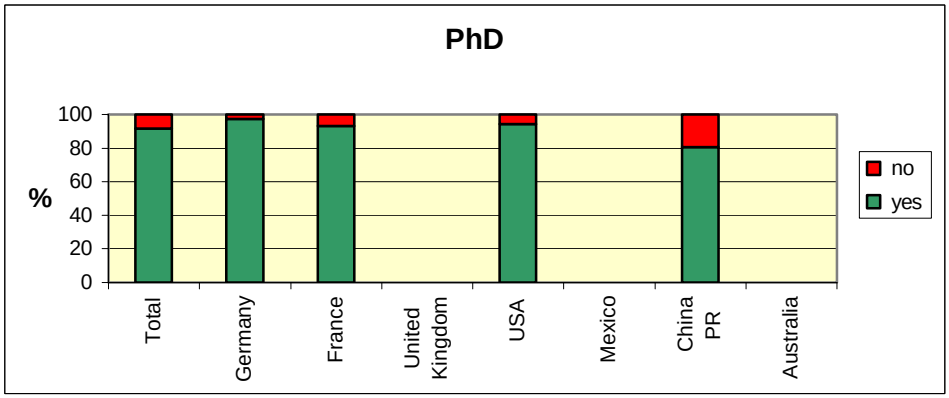


Fig. 12.4: "Are you pleased to have studied Chemical Engineering"? Results of the Yes – No Scheme PhD Degree (only two answers from United Kingdom, only three answers from Mexico, only four answers from Australia)

It is also interesting to compare the answers of males and females to this question. Their answers are presented in figures 12.5 and 12.6.

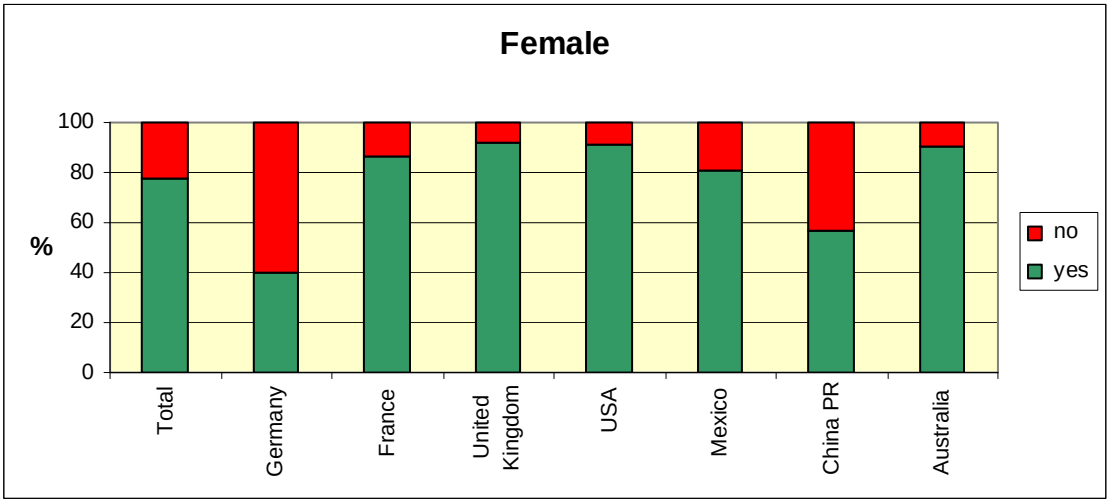


Fig. 12.5: "Are you pleased to have studied Chemical Engineering"? Results of the Yes – No Scheme, Females

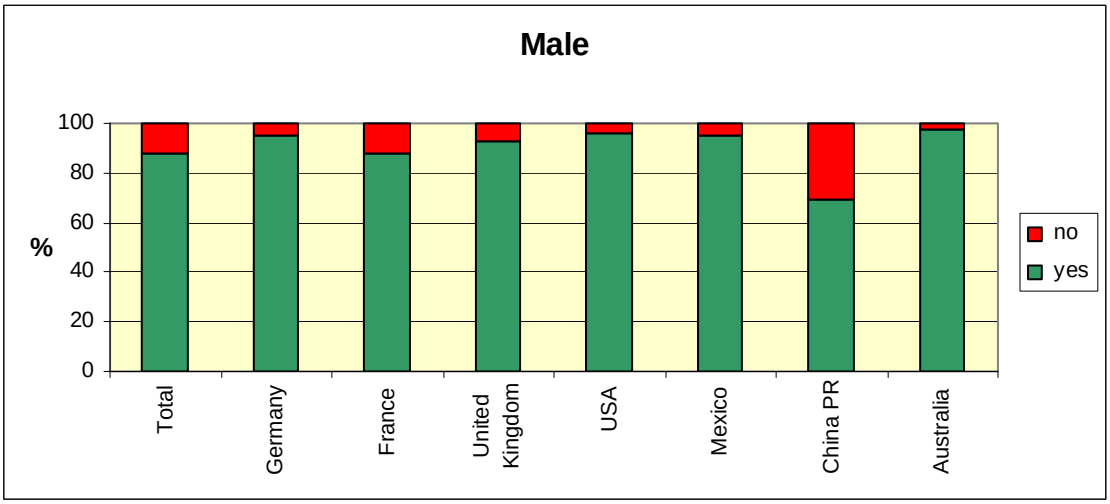


Fig. 12.6: "Are you pleased to have studied Chemical Engineering"? Results of the Yes – No Scheme, Males

It may also be significant if participants had to pay fees for their studies. In figs. 12.7 and 12.8 the corresponding results are presented.

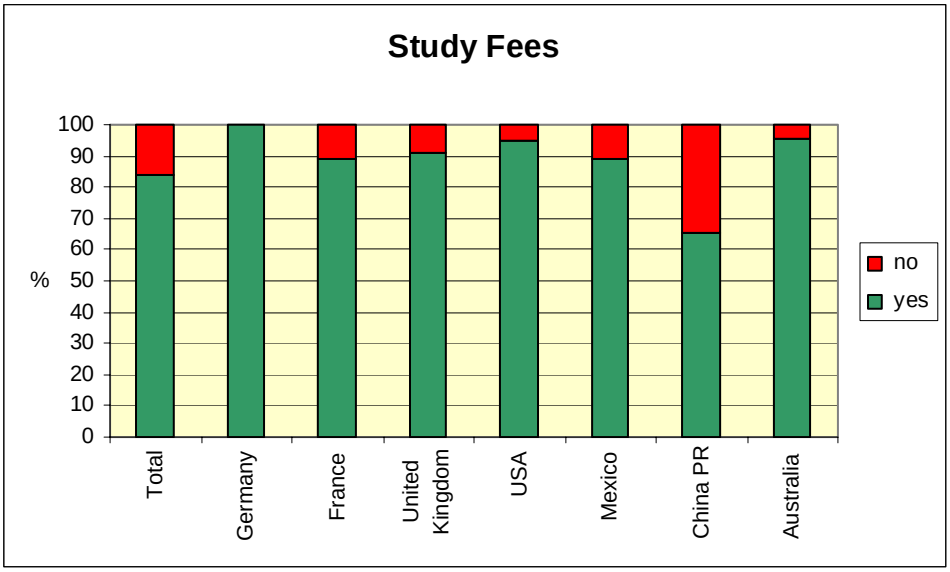


Fig. 12.7: "Are you pleased to have studied Chemical Engineering"?
Results of the Yes – No Scheme, Participants who had to pay fees

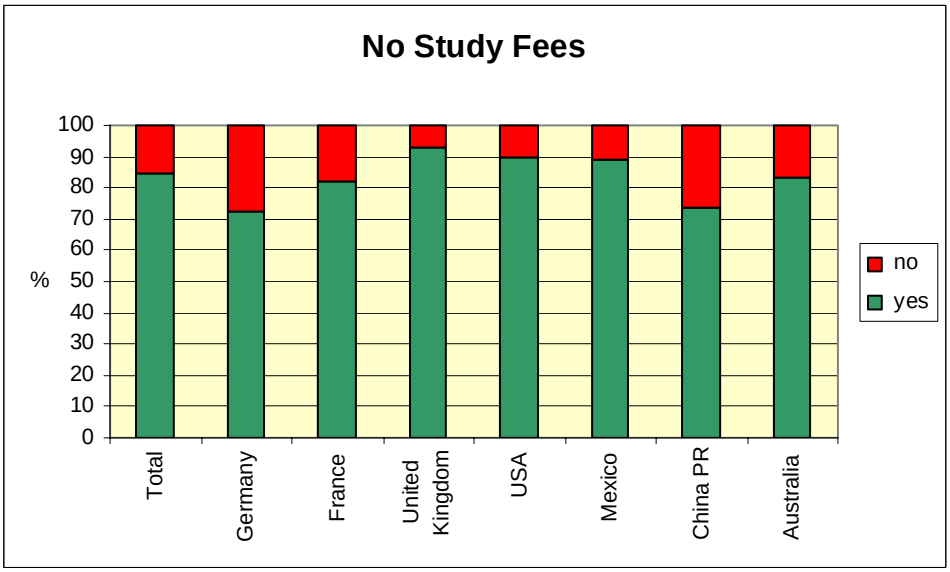


Fig. 12.8: "Are you pleased to have studied Chemical Engineering"?
Results of the Yes – No Scheme, Participants who had to pay no fees

Annex:

Annex 1: **List of Countries and Number of Responses**

Annex 2: **List of Universities and Instituts**

Annex 3: **List of Societies and Institutions**

Annex 4: **Questionnaire**

Annex 1

WCEC Study
„How Does Chemical Engineering Education Meet the Requirements of Employment“

List of Countries and Number of Responses

Country	Number of Responses
China PR	483
United States of America	406
United Kingdom	252
Mexico	229
Germany	196
France	152
Australia	77
New Zealand	59
Japan	45
South Africa	32
Ireland	28
Slovenia	25
India	24
Poland	16
Malaysia	13
Sweden	12
Nigeria	8
Canada	7
Hong Kong	7
Spain	7
Argentina	6
Italy	6
Greece	5
Indonesia	5
Serbia (Yugoslavia)	5
Chile	4
Pakistan	4
Venezuela	3
Belgium	2
Guatemala	2
Iran	2
Kenya	2
Korea, South	2
Switzerland	2
United Arab Emirates	2
Zimbabwe	2

Country	Number of Responses
Guinea	1
Honduras	1
Hungary	1
Kuwait	1
Latvia	1
Macao	1
Mongolia	1
Netherlands	1
Oman	1
Saudi Arabia	1
Singapore	1
Sri Lanka	1
Thailand	1
Trinidad and Tobago	1
Turkey	1

Total Number of Countries: **63**

Total Number of Participants: **2,158**

Annex 2

WCEC Study
"How Does Chemical Engineering Education Meet the Requirements of Employment?"

List of Universities and Institutes

Argentina:
Instituto Tecnologico de Buenos Aires

Australia:
Adelaide University
Curtin University of Technology, Perth, Western Australia
James Cook University
Melbourne University
Monash University (Clayton)
Newcastle University
Queensland University
Swinburne University of Technology
Sydney University
New South Wales University

Bahrain
University of Bahrain

Barbados, Trinidad & Tobago
University of the West Indies, St. Augustine Campus, Trinidad

Brazil
Federal University of Santa Catarina

Bulgaria
HTMU

Canada
Ecole Polytechnique de Montreal
McGill University
McMaster University
Michigan State University
University of Alberta
University of Waterloo, Ontario, Canada

Chile
Universidad Metropolitana

China
Azuhui University
Beijing Chemical College
Beijing Industry University
Beijing Institute of Petrochemical Technology
Beijing Research Institute of Chemical Industry
Beijing University of Chemical Engineering
Beijing University of Chemical Technolgy

Central South University
Chemical and Metallurgy, Chinese Academy of Sciences
China Agriculture University
China University of Mining and technology
China University of Science and Technology
Chong Qing University
Da Qing Petroleum Institute
Dajing University
Dalian University of Technology and Science HUST
Dong Hua University
East University of Science and Technology
Fu Shun Petrochemical University
Fudan University
Fushun Petrochemical University
Giuling Institute of Technology
Harbin Industry and Technology University
Heibei Industrial University
Henan University
Hu Nan University
Huaina Mining Institute
Human University
Ji Lin University
Jian Jin University
Jian Su Institute of Petrochemical Technology
Jianjin Polytechnic University
Kunming University of Science and Technology
Lalian Light Industry Institute
Lanzhou University
Liao Ning University of Petrochemical Technology
Monjing University of Technology
Nahua University
Nakai University
Nan Jing University of Technology
Nanchang University
NingXin University
North China University of Science and Technology
North West University
Qingdao University of Science and Technology
Research Institute of Petroleum Processing
Shan Dang University
Shan Dong Construction Materials University
Shan Yang Chemical Institution
Shandong University of Technology
Shanghai University
ShanHai Jiao Tong University
Shanxi Normal College
Sheng Yang Institute of Chemical Technology
Si Chuan Union University
Southern Yangtze University
Taiyuan University of Technology
The Jian Su Petrochemical College
Tian Jin University
Tith Jing University
Tong Ji University
Tsinhua University

West China University Medical Science
Wuhan Institute Of Chemical Industry
Wurlan Institute of Chemical Technology
Xi `An Jiaotong University
Yantai University
Zhe Jian University of Technology
Zhengzhou Institute of Technology

Croatia
University of Zagreb

Ecuador
Escuela Politecnica Nacional

France
Bordeaux University
CPE Lyon
Ecole Nationale Supérieure des Industries Chimiques de Nancy
Ecole Nationale Supérieure de Chimie de Rennes
Ecole Nationale Supérieure en Arts Chimiques et Technologiques (ENSIACET) in Toulouse, France.
Ecole Nationale Superieure en Genie des Technologies Industrielles
Ecole Supérieure de Chimie Organique et Minérale
Ecole Supérieure d'Ingenieurs de Poitiers
INSA de Lyon
INSA Rouen
Institute of Technology in Chemistry, Lyon
IUT Génie chimique
IUT GTE Lorient
Pierre et Marie Curie (Paris 6)
Tours University of Tours
Université de St Jérome Marseille France
University of Pierre and Marie Curie-CPE Lyon

Germany
Aachen RWTH
Anhalt Fachhochschule
Bingen Fachhochschule
Berlin Freie Universität
Berlin Technische Universität
Mosbach Berufsakademie
Bielefeld Universität
Bochum Ruhr-Universität
Braunschweig Technische Universität
Bremen Universität
Brunswick Fachhochschule
Clausthal Technische Universität
Clausthal-Zellerfeld Technische Universität
Darmstadt Fachhochschule
Darmstadt Technische Universität
Dortmund, Universität
Dresden Technische Universität
Duisburg Gerhard-Mercator-University
Erlangen Nürnberg Fachhochschule
Erlangen-Nürnberg Friedrich Alexander Universität

Giessen Fachhochschule
Goettingen Gerog-August-Universitaet
Hamburg Harburg Technische Universität
Hamburg University of Technology
Hannover Universität
Heidelberg, Universität
Heilbronn, Fachhochschule
HTW Mittweida
Kaiserslautern Fachhochschule
Karlsruhe Technische Hochschule
Konstanz Fachhochschule
Konstanz Universtät
Magdeburg Universität
Mannheim Fachhochschule
Merseburg TH
München TU
Münster Fachhochschule
Offenburg Fachhochschule
Oldenburg Universität
Oldenburg/Ostfriesland/Wilhelmshafen Fachhochschule
Osnabrück Fachhochschule
Paderborn Universität
Regensburg Fachhochschule
Regensburg Universität
Reutlingen Fachhochschule für Technik und Wirtschaft
Saarbruecken, Universität
Stuttgart Universität
Trier Fachhochschule
Wildau Fachhochschule
Zittau/Görlitz Fachhochschule für Technik, Wirtschaft und Sozialwesen

Greece
Athens National Technical University

Guinea
University of Conakry

Hong Kong
Hong Kong University of Science and Technology

Hungary
Budapest Technical University

India
Bangalore University
Bombay University
Chidambaram Annamalai University
Delhi Indian Institute of Technology
Gujarat University Ahmedabad
Hyderabad Jawaharlal Nehru Technological University
Jadavpur University
Kolkata Jadavpur University
Madras University
Mumbai University
Pilani, Birla Institute of Technology and Science

Sarvajanik College of Engg., & Tech.
Tamilnadu Annamalai University,
University of Bombay, Texas A&M University, Kingsville
University of Pune

Indonesia
Institut Teknologi Bandung (ITB)
University of Indonesia

Iran
Shiraz University

Ireland
Cork Institute of Technology
Dublin University College
Limerick University of

Italy
Milano Politecnico di
Naples University of "Federico II"
Torino Politecnico di

Japan
Hiroshima University
Kagoshima University
Kanazawa Univ.
Kobe University
Kumamoto University
Kyoto University
Kyushu University
Muroran Institute of Technology
Nagoya University
Osaka Prefecture University
Tokushiama University
Tokyo University
Toyohashi University of Technology

Malaysia
University of Malaya, Kuala Lumpur

Mexico
Baja California Universidad Autonoma de
Campeche, Universidad Autonoma del Carmen
Celaya, Instituto Tecnologico de
Cuitlahuac Universidad Tecnologica de Mexico
Durango Instituto Tecnologico de
Facultad de Química, Universidad Nacional Autónoma de México Mexico City
Guadalajara Universidad de
Guanajuato, Universidad de
Iberoamericana Universidad
Instituto Politécnico Nacional.
Chihuahua, Intituto Tecnologico de
Madero, Instituto Tecnologico de Ciudad.
Matamoros Instituto Tecnologico de
Monterrey, Instituto Tecnológico y de Estudios Superiores de

National Autonomous University of Mexico
Nueva Leon Universidad Autonoma de
Oriza, Instituto Tecnologico de
Pachuca, Instituto Tecnologico de
Puebla, Benemérita Universidad Autónoma de (BUAP)
Regiomontana Universidad
San Luis Potosi Universidad Autonoma de
San Nicolás Hidalgo, Universidad Michoacana de
Tabasco, Universidad Juarez Autonoma de
Tamaulipas Universidad Autonoma de
Universidad Autónoma Metropolitana Azcapotzalco de México D.F:
Universidad Juarez Autonoma de Mexico
Universidad Nacional Autonoma de Mexico (UNAM)
Valle de Mexico Universidad del
Veracruz, Universidad Veraceuzana

The Netherlands
Delft University of Technology
Technical High School The Hague

New Zealand
Auckland University
Canterbury University
Waikato University

Nigeria
Bida, Niger State Nigeria. The Federal Polytechnic
Lagos, University
Minna Niger State Nigeria, The Federal University of Technology
Obafemi Awolowo University, Ile-ife.
Ogbomoso, Ladoke Akintola University of Technology
Owerri Imo State Nigeria, Federal University of Technology

Pakistan
Lahore, University of Punjab

Poland
Bydgoszcz, University of Technology and Agriculture
Cracow University of Technology,
Rzeszow University of Technology
Silesian University
Szczecin, Technical University
University of Opole
Wroclaw University
WSI Radom

Serbia (Yugoslavia)
Belgrade University
Novi Sad

Slovenia
Ljubljana, University

South Africa
Cape Town University

Durban University of Natal
Potchefstroom University
Pretoria, University
Stellenbosch University
Witwatersrand University of the

Spain
Barcelona Universitat de
Castilla-La Mancha Universidad de
University of Oviedo, Oviedo (Spain)
Valladolid University of

Sri Lanka
Moratuwa, University of

Sweden
Stockholm, Royal Institude of Technology

United Kingdom
Bath University
Belfast Queens University
Birmingham Aston University
Bradford University
Cambridge University
Edinburgh Heriot-Watt University
Glasgow Strathclyde University
Leeds University
London Imperial College
London University College
Loughborough University
Manchester UMIST
Middlesborough, Cleveland University of Teesside
Newcastle-Upon-Tyne University
Nottingham University
Paisley University
Sheffield University
Surrey University
Swansea University of Wales
Warwick University

USA
Akron University of
Alabama University of
Allan Hancock College
Arizona University
Arkansas University
Auburn University, Auburn, Alabama
Austin, University of Texas
Berkeley UC
Boise State University
Brigham Young University
Brown University
Bucknell University
Buffalo, University of (State University of New York at Buffalo)
CA University of , San Diego

California Institute of Technology
California State Polytechnic University, Pomona
California State University - San Jose
Carnegie Mellon University
Case Western Reserve University
Christian Brothers University, Memphis, TN
Cincinnati University
Clarkson University
Clemson University
Cleveland State University
Colorado at Boulder, University
Colorado School of Mines
Colorado State University
Cornell University
Davis UC
Dayton, University
Delaware University
Detroit Mercy University of
Drexel University
Florida A&M University
Florida Institute of Technology
Georgia Institute of Technology
Harvey Mudd College
Idaho University
Illinois Institute of Technology
Illinois, Chicago University
Iowa State University
Johns Hopkins University
Kansas State University
LA Tech University (Ruston, LA)
Lamar University - Beaumont, TX
Lehigh University
llinois at Urbana-Champaign University
Louisiana State University - Baton Rouge
Louisiana State University at Alexandria
Louisiana Tech University
Louisiana-Lafayette University
Louisville University
Lowell Umass
Maine University
Manhattan College
Maryland University of
Massachusetts Institute of Technology
Massachusetts, Amherst University
McNeese State University, Lake Charles, Louisiana
Michigan - Ann Arbor University
Michigan State University
Minnesota - Twin Cities University
Minnesota Duluth University
Mississippi State University
Missouri - Columbia University
Missouri - Rolla University
Montana State University
Nebraska - Lincoln University
Nevada, Reno University

New Hampshire University
New Jersey Institute of Technology
New Mexico State University
North Carolina State University
North Dakota University of
Northeastern University
Ohio State University
Oklahoma State University
Oregon State University
Pennsylvania State University
Pittsburgh University
Princeton University
Purdue University - West Lafayette, Indiana
Rensselaer Polytechnic Institute
Rice University
Riverside University of California
Roanoke College
Rose-Hulman Institute of Technology
Rutgers, The State University of NJ
San Antonio, Trinity University
South Carolina University
South Dakota School of Mines & Technology
South Florida University
Southern California University
Spelman College
Stanford University
State University of New York at Buffalo
Stevens Institute of Technology
SUNY at Buffalo
Syracuse University
Tennessee Technological University
Texas A & M University Kingsville
The Cooper Union
The Johns Hopkins University
Tulsa University
Tuskegee University
Utah University
Vanderbilt University
Villanova University
Virginia Polytechnic Institute
Virginia University
Washington State Universitity
West Virginia University
Widener University
Wisconsin University
Worcester Polytechnic Institute
Wyoming University

Venezuela
Universidad Simon Bolivar

Zimbabwe
National University of Science and Technology

Annex 3

WCEC Study
"How Does Chemical Engineering Education Meet the Requirements of Employment?"

List of Societies and Institutions

Argentina
AGITBA (Asociación de Graduados del ITBA)
Asosiacion Quimica Argentina
Repsol

Australia
AIChemE
American Institute of Chemical Engineers
APESMA
Australian Institute of Mining and Metallurgy
Institution of Engineers Australia (IEAust)
Golden Key National Honour Society
IChemE Australia
International Water Association
Society of Petroleum Engineers

Bahrain
Bahrain Soc. of Engineers

Barbados
Barbados Association of Professional Engineers

Canada
APEGGA
Ordre des ingenieurs du Quebec
Professional Engineers Ontario

China
Analytical Society in SPC
Anti-corrosion society of china
Beijing Research Institute of Chemical Industry
Chemical Industry and Engineering Society of China
Chemical Ministry
Chemical Society of China
Chengda Chemical Engineering Corporation of China
China Petroleum Society
China Quality Management Societies
Chinese Petroleum Society
China Chemical Engineering Society
National Defence Society of Ecust
Shanghai Chemistry and Chemical Engineering Society
Shanghai Society of Chemistry and Chemical Indust.

Ecuador
Sociedad de Ingenieros Quimicos de Pichincha

France
Ingenieur Professionel de France
SFGP: Société Française du Génie des Procédés
Society of Cosmetic Chemistry

Germany
DECHEMA
DGM Deutsche Gesellschaft für Materialkunde e.V.
DVS Deutscher Verband für Schweißen und verwandte Verfahren e.V.
Gesellschaft Deutscher Chemiker
VAA - Verein Angestellter Akademiker
VDE Verband der Elektrotechnik Elektronik Informationstechnik e.V.
VDI Society of German Engineers

Greece
Hellenic Technical Chamber
Greek Technical Chamber

Hongkong
Hong Kong Institution of Engineers (HKIE)
Society of Women Engineers

India
Indian Institute of Chemical Engineers

Ireland
Institution of Engineers of Ireland (IEI)

Italy
PPG INDUSTRIES ITALIA
The Milan Order of Engineers

Japan
Society of Chemical Engineers, Japan

Kuwait
Kuwait Engineer's Society

Malaysia
Institute of Engineers, IEM

Mexico
Academia de catalisis (ACAT)
ASOCIACION DE INGENIEROS PETROLEROS DE MEXICO
ASOCIACION NACIONAL DE PERFORADORES DE MEXICO
Association of Petroleum Engineers of Mexico
COLEGIO DE INGENIEROS QUIMICOS PETROLEROS
COLEGIO DE QUIMICOS BATERIOLOGOS Y PARASITOLOGOS
Colegio Nacional de Químicos e Ingenieros Químicos
IMIQ (Instituto Mexicano de Ingenieros Químicos)
Ingenieros Quimicos Petroleros
INSTITUTO MEXICANO DEL PETROLEO
Instrumentation, Systems, and Automation Society
Ninguna

New Zealand
Dairy Industry Association of New Zealand
Institute of Professional Engineers of New Zealand
Society of Chemical Engineers of New Zealand
The Minerals, Metals and Materials Society

Nigeria
Nigeria Society of Chemical Engineers

Serbia
Serbian Chemical Society

Slovenia
Engineering Chamber of Slovenia
Slovene Chemical Society
Society of Rheology

South Africa
South African Institute of Chemical Engineers
Engineering Council of South Africa

Spain
Asociación Castellano-Manchega de Ingenieros Químicos

Sweden
Amersham Biosciences
Svenska Kemistsamfundet
The Swedish Association of Pulp and Paper Engineers

Switzerland
Swiss Society for Chemical Engineering

United Kingdom
Chartered Institute of Management Accountants
ESACT
ICAEW, UK
IChemE
Institute of Petroleum
Royal Statistical Society
Society of Petroleum Engineers

USA
American Chemical Society
American Institute of Chemical Engineers
American Physical Society
American Society of Quality
Association of Cert. Hazardous Materials Managers
International Society of Pharmaceutical Engineers
National Society of Black Engineers
National Society of Professional Engineers
Society of Automotive Engineers
Society of Petroleum Engineers
Society of Plastics Engineers
Society of Women Engineers

Venezuela
Colegio Ingenieros de Venezuela

Zimbabwe
Zimbabwe Institute of Engineers

Annex 4

How Does Chemical Engineering Education Meet the Requirements of Employment?

Questionnaire

1. Where and how long did you study Chemical Engineering?	
My home country	Germany
Country(ies) of my studies	
Universities	
Study time (years)	

2. Did you pay fees for your studies?	
☐ yes ☐ no	
if 'yes' how much. appr. in US $	

3. What are your university degrees? - Year degree awarded?		
	Year degree awarded:	Discipline
☐ Bachelor		
☐ Master		
☐ Ph.D.		
☐ Others, (please identify):		

4. Date of birth			
Date of birth			

Annex 4

5. To which professional societies do you belong?	
Name of Society	Country
	-- please select --
	-- please select --
	-- please select --
	-- please select --
	-- please select --

6. Gender	
☐ Female	☐ Male

7. Employment Status	
☐ Full-time permanent	☐ Full-time temporary
☐ Part-time permanent	☐ Part-time temporary
☐ Postdoc	☐ Self-employed
☐ Career break	☐ Unemployed/seeking work

8. How long did you take to find your first professional job?	months:
Where did you find your first job?	☐ in the country of my studies ☐ in my home country ☐ elsewhere
How long have you been employed (disregard job changes)?	months:
How many employers have you had?	
Current position (job title)?	

9. Branch/Area of your present/most recent occupation?	
☐ Chemical process industry	☐ Petrochemical industry
☐ Oil and Gas	☐ Mining and Metallurgy
☐ Processes Plant Contracting and Design	☐ Process equipment manufacturing
☐ Pharmaceutical industry	☐ Cosmetics
☐ Food and Drink industry	☐ Pulp and Paper
☐ Biotechnology	☐ Information technology

Annex 4

☐ Electronic industry	☐ Materials incl. Polymers
☐ Construction Materials	☐ Government
☐ University	☐ Research Institute
☐ Consulting	☐ Finance/Banking/Insurance
☐ Water	☐ Safety and Environment
☐ Energy	☐ Others, please identify:

10. Rank the following skills/abilities with respect to the quality of your education and its relevance to your work

1- very low, 2 - low, 3 - medium, 4 - high, 5 - very high

	education	work
Ability to apply knowledge of basic science and chemical engineering fundamentals		
Importance of a broad and general education		
Appreciation of an interdisciplinary approach		
Appreciation of the potential of research		
Ability to work effectively as a member of a team		
Ability to be a leader		
Ability to gather information		
Ability to analyse information		
Competence in information technology		
Critical thinking		
Ability to use a systematic approach to process and product design		
Ability to communicate effectively		
Foreign languages		
Understanding of cultural diversity		
Ability to identify and formulate problems		
Ability to solve problems		
Management skills		
Understanding of fundamental principles of financial analysis		

Knowledge of methods for project management		
Business oriented thinking / Business approach		
Knowledge of marketing principles		
Knowledge of methods for total quality management		
Understanding of principles of sustainable development		
Understanding of ethical and professional responsibilities		
Expectation of the need for lifelong learning		
Self learning ability		

11. Evaluation of the Quality of the Teaching at the University	
1- very low, 2 - low, 3 - medium, 4 - high, 5 - very high	
	score
The teaching staff motivated me	
The teaching staff normally gave me helpful feedback	
My lectures were excellent and inspiring	
The assessment methods employed required an indepth understanding of the course content	
The study programme was efficiently organized	

12. Are you pleased to have studied Chemical Engineering?
☐ yes ☐ no

Non-obligatory Part

Your present annual salary (in US $)	
Country of your employment	-- please select --

SEND CLEAR