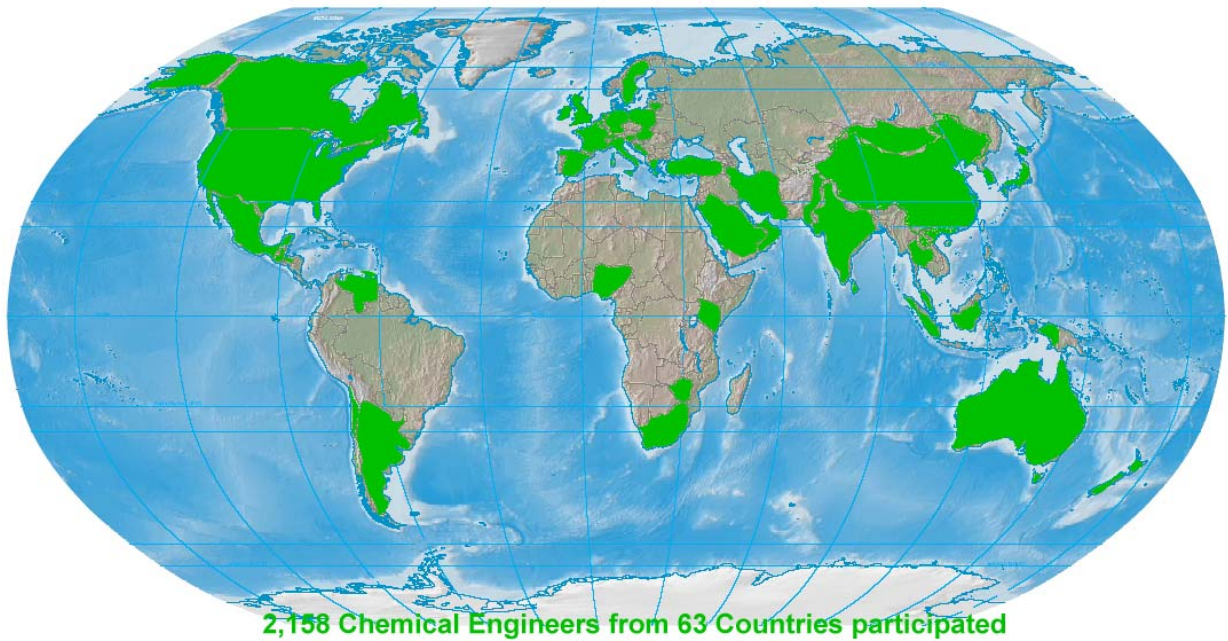


World Chemical Engineering Council WCEC

## Survey

# How Does Chemical Engineering Education Meet the Requirements of Employment ?



**September 2004**

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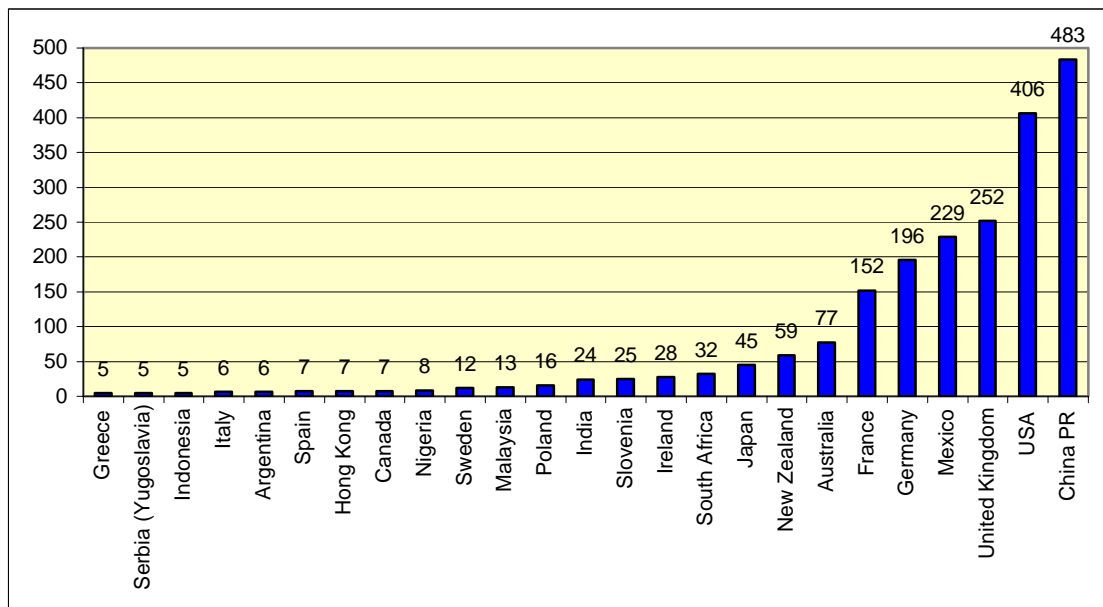
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## **Appendix**

## 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
<b>Participation</b>								
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
<b>Bachelor</b>								
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
<b>Master</b>								
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
<b>PhD</b>								
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
<b>Others</b>								
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)

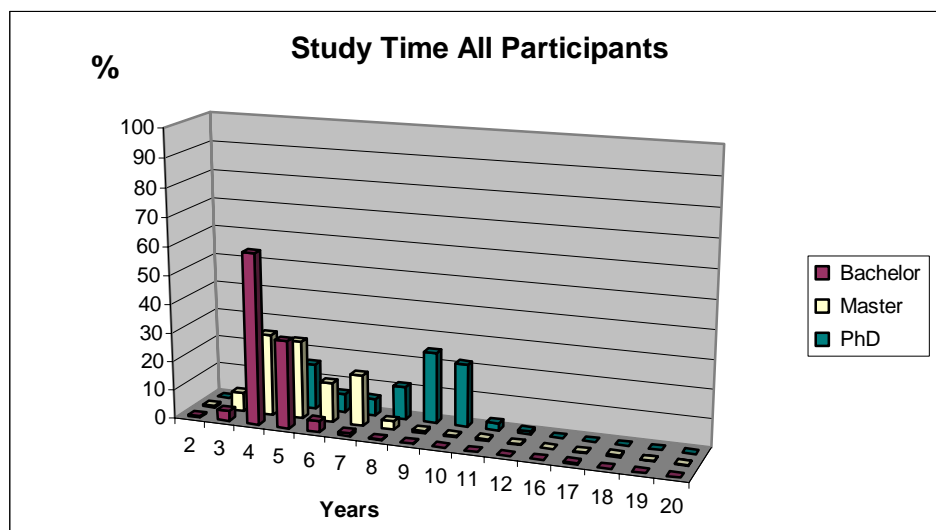
## 1. Study Time

### 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)

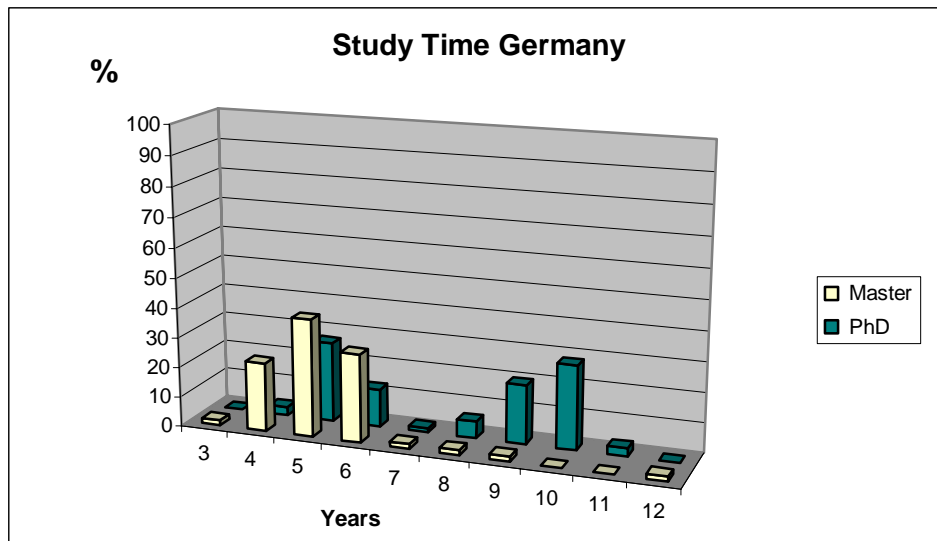


Fig 1.2: Study Time for Germany

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.

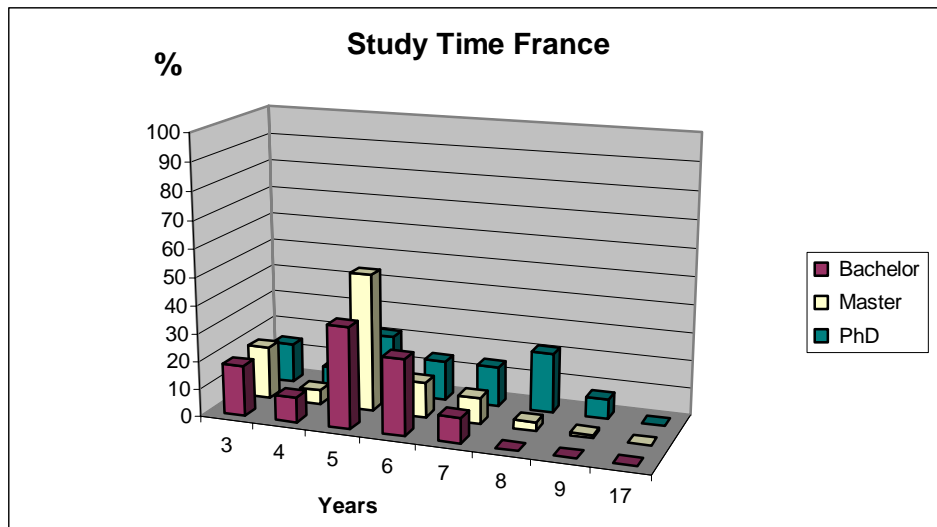


Fig. 1.3: Study Time in France

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 Kingdom, 5.2 % in Canada.

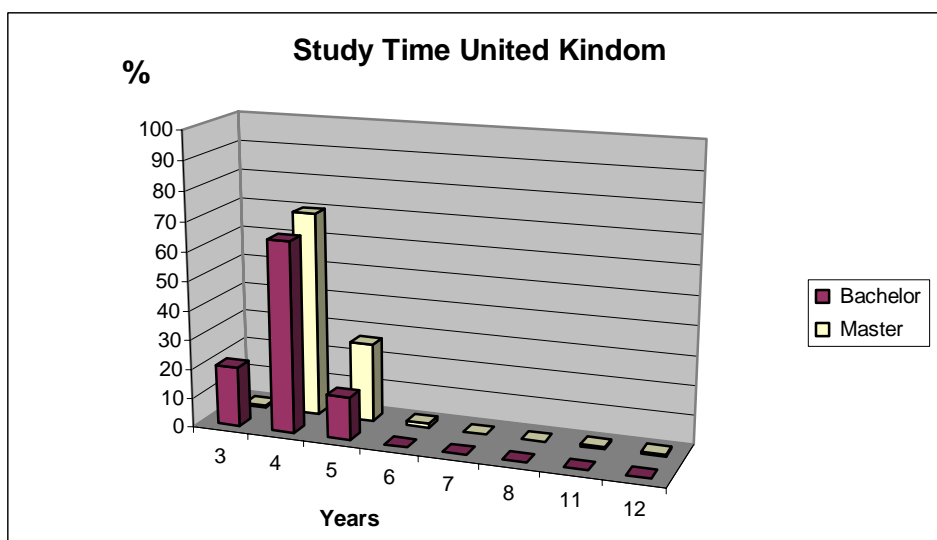


Fig. 1.4: Study Time United Kingdom

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.

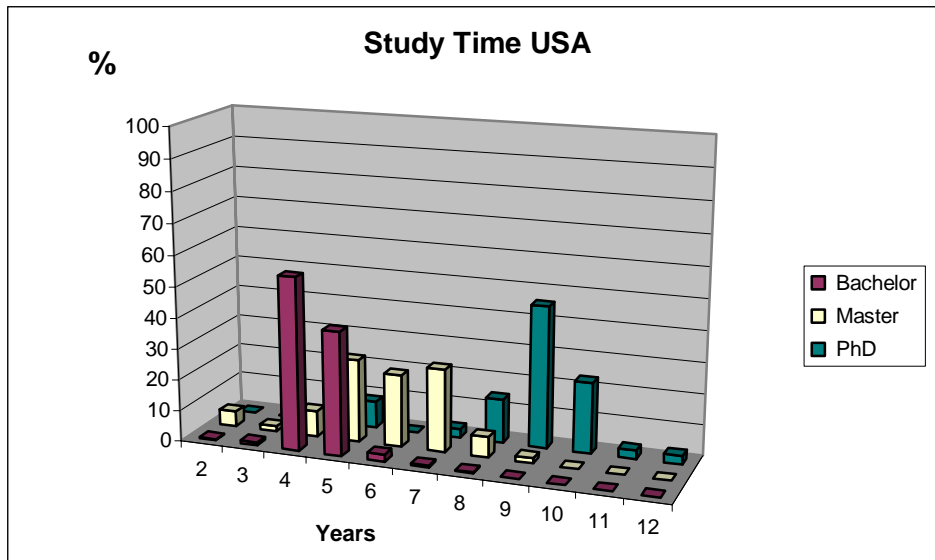


Fig. 1.5: Study Time in the USA

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.

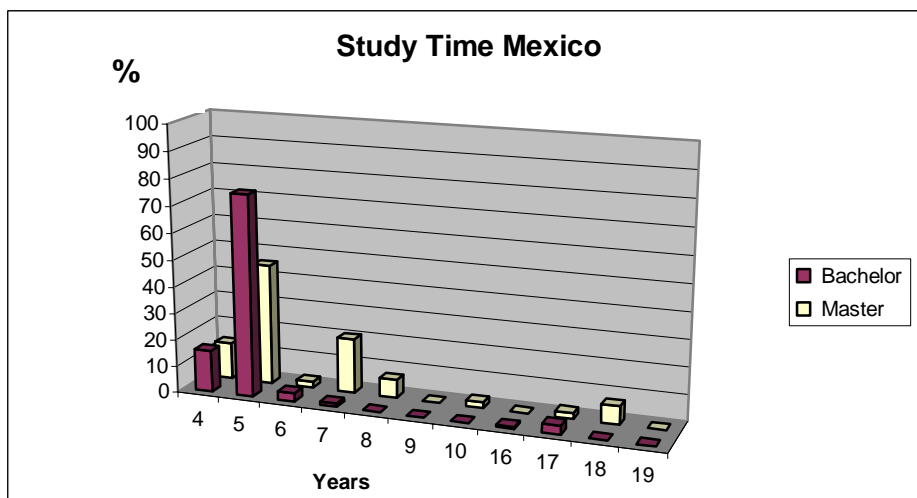


Fig. 1.6: Study Time in Mexico

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.

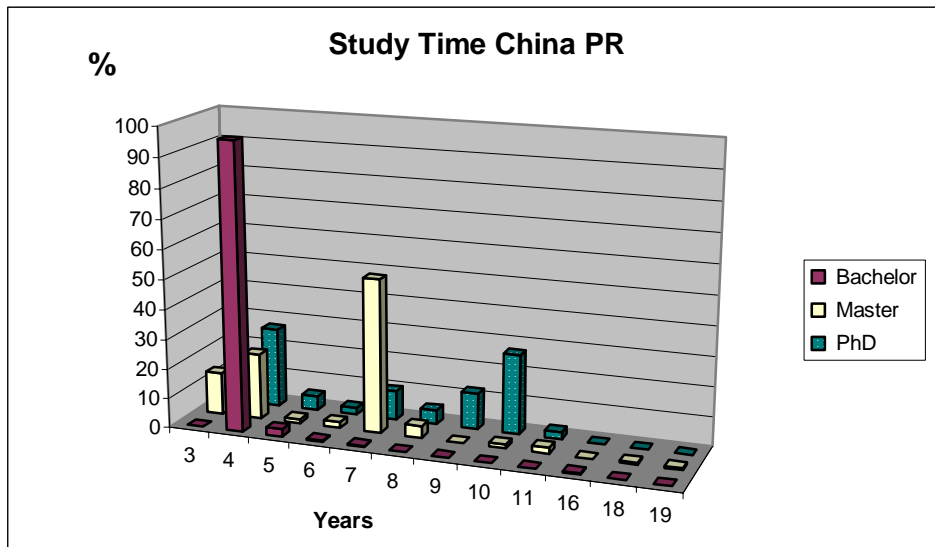


Fig. 1.7: Study Time in China

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 replies for 4 years duration) respectively.

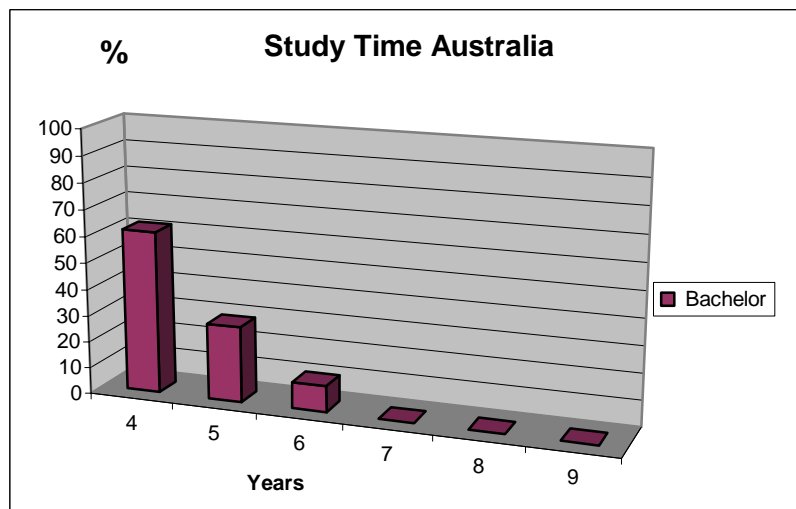


Fig. 1.8: Study Time in Australia

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.

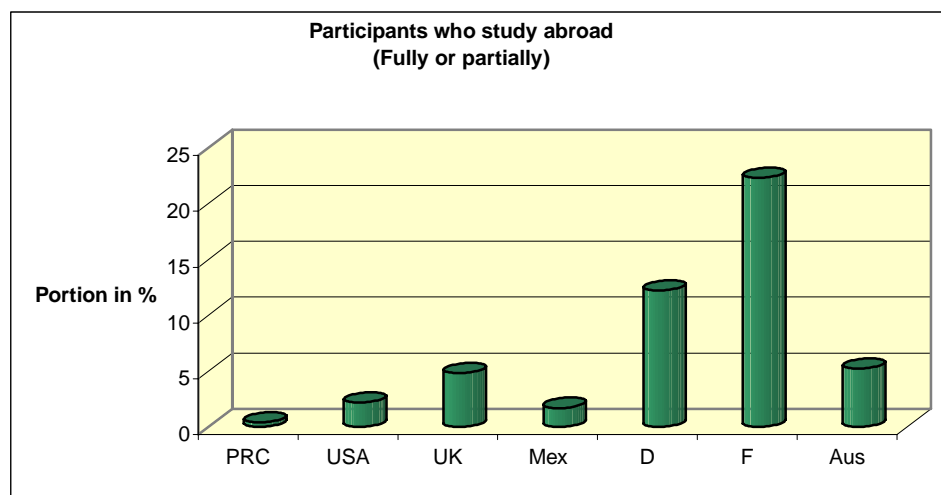


Fig. 1.9: Participants who study abroad for selected countries

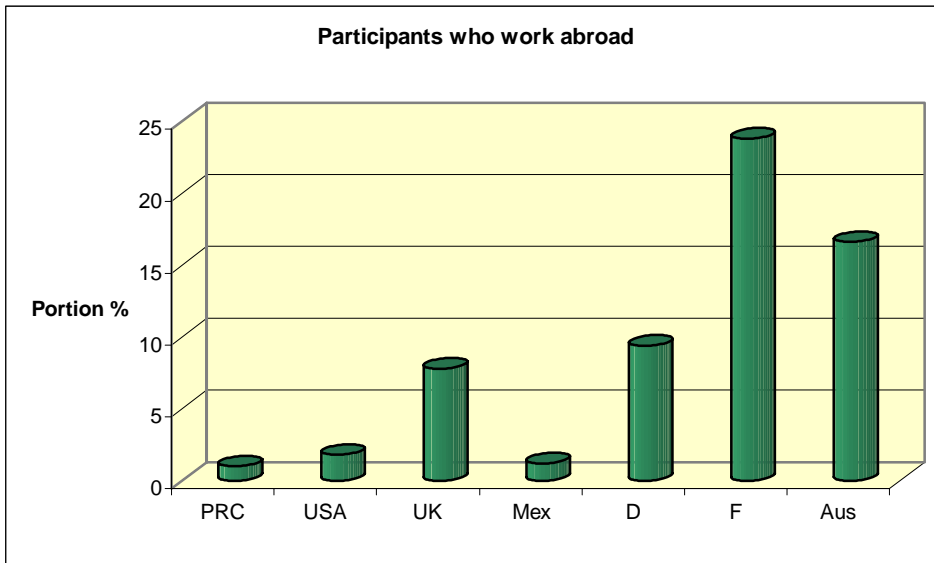


Fig. 1.10: Participants who work abroad

### 1.3 Universities and Institutes

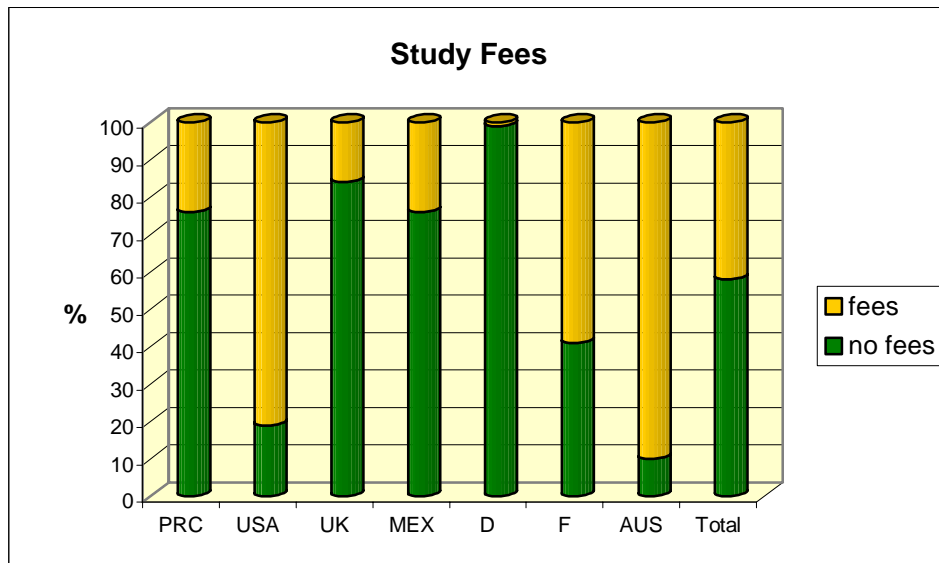
The participants specified 402 different universities and institutes where they took their courses. A complete list of the institutions is given in Annex 2.

## 2. Study Fees

The second question the participants 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.

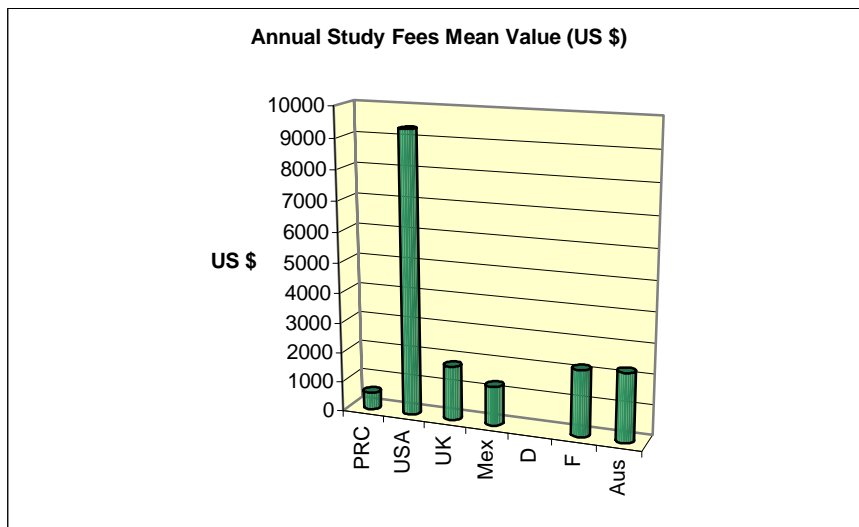


Fig. 2.2: Mean value of Annual Study Fees (US \$)

### 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 Participation 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.

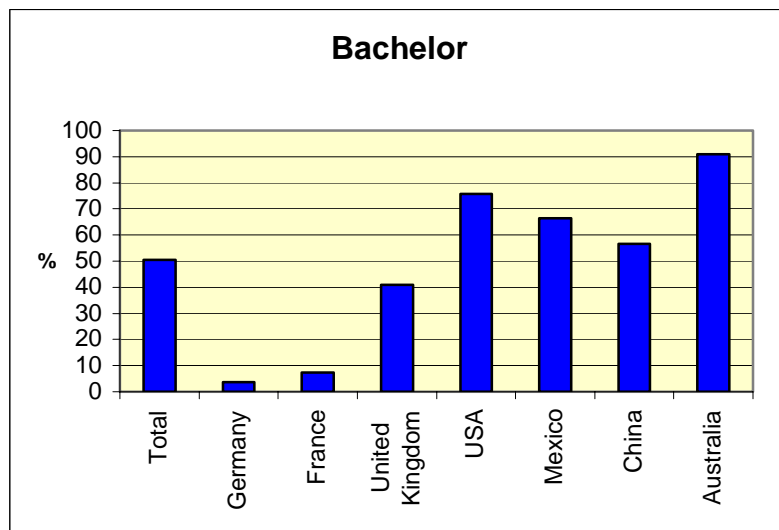


Fig. 3.1: Percentage of Bachelor Graduates per Country (see also Table p. 5.)

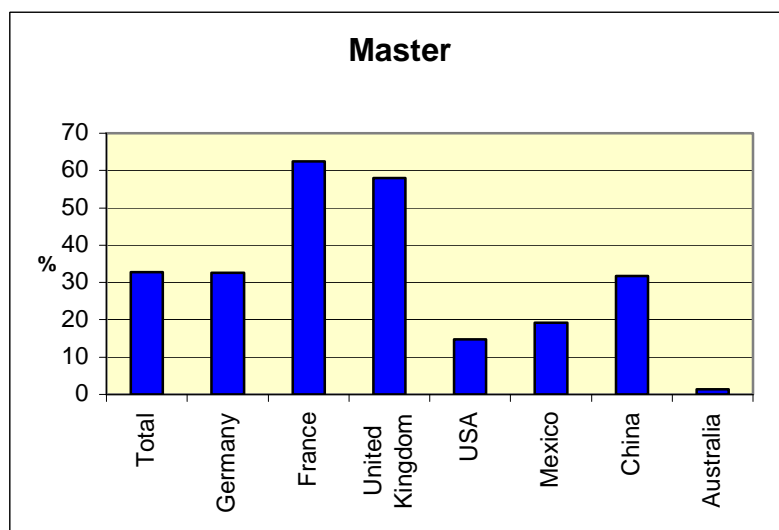


Fig. 3.2: Percentage of Master Graduates per Country (including BEng see p. 14, see also Table p. 5.)

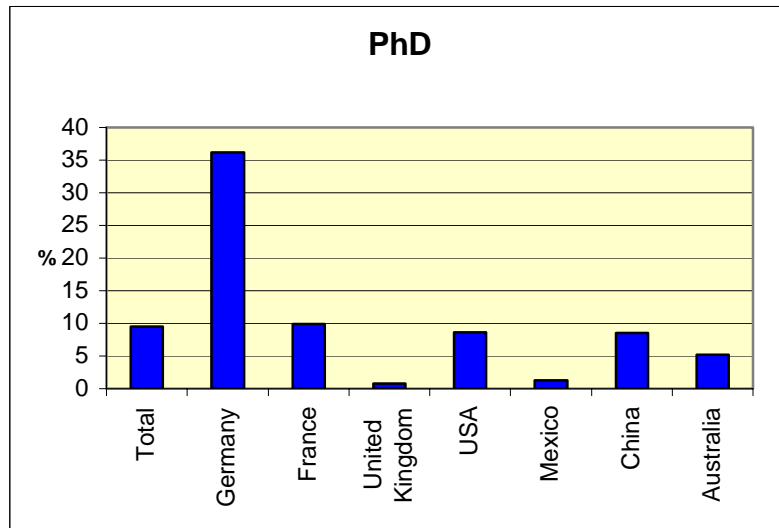


Fig. 3.3: Percentage of PhD Graduates per Country (see also Table p. 5.)

#### 4. Age, Date of Birth

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

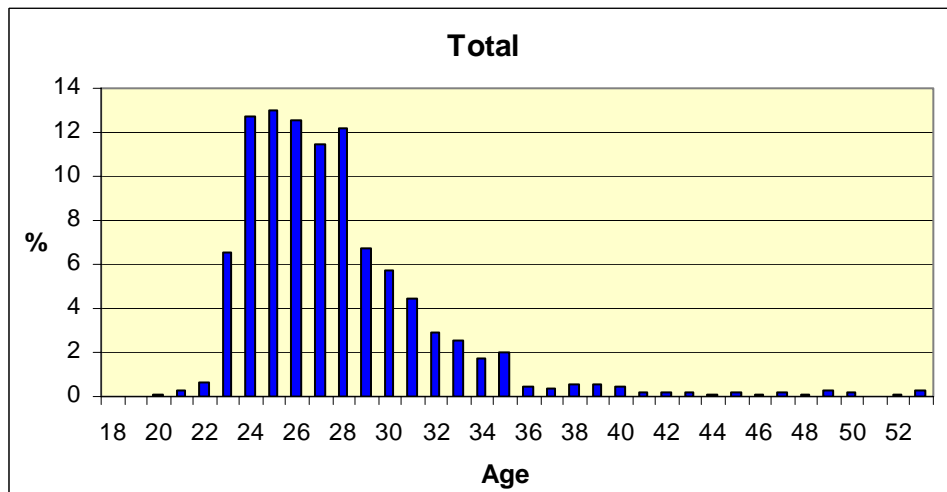


Fig. 4.1: Age Distribution for All Participants



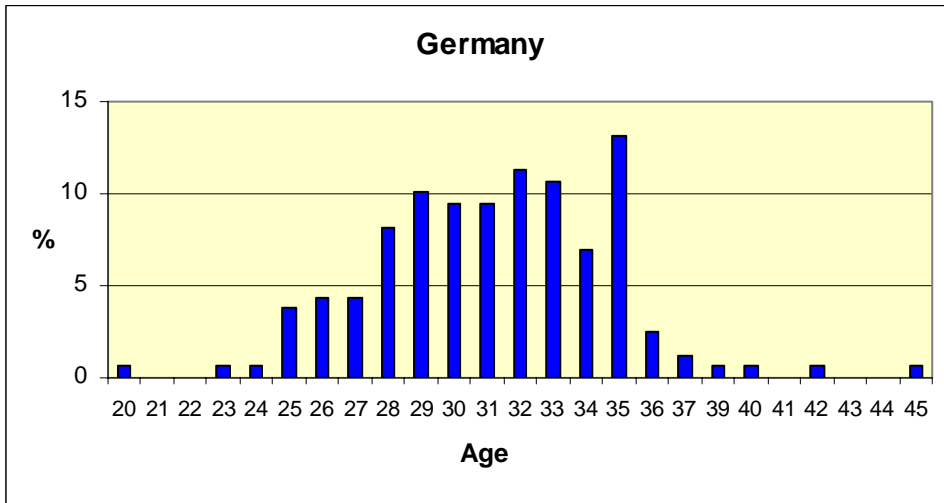


Fig. 4.2: Age Distribution for Germany

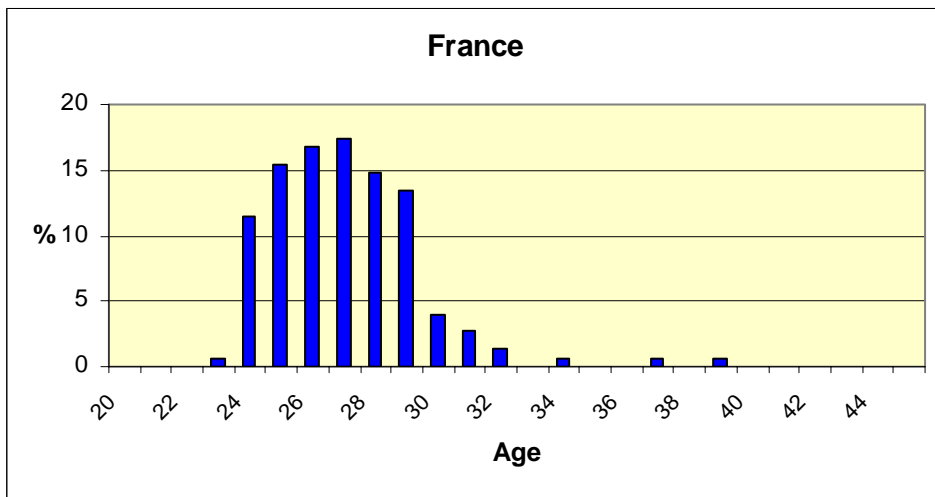


Fig. 4.3: Age Distribution for France

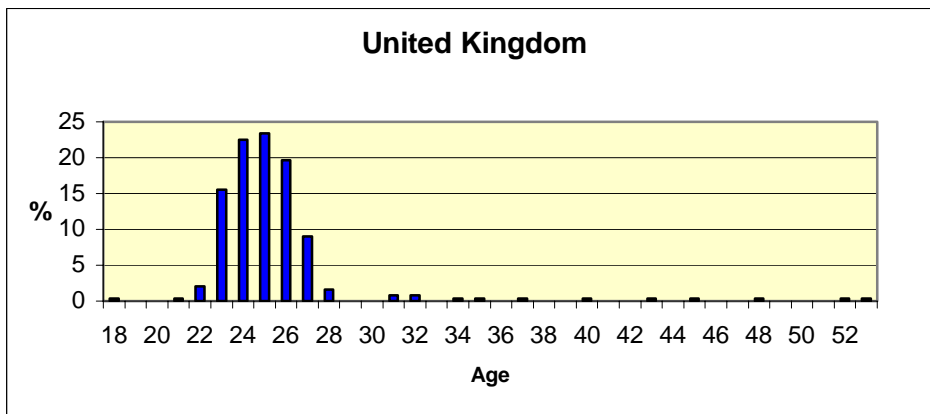


Fig. 4.4: Age Distribution for United Kingdom

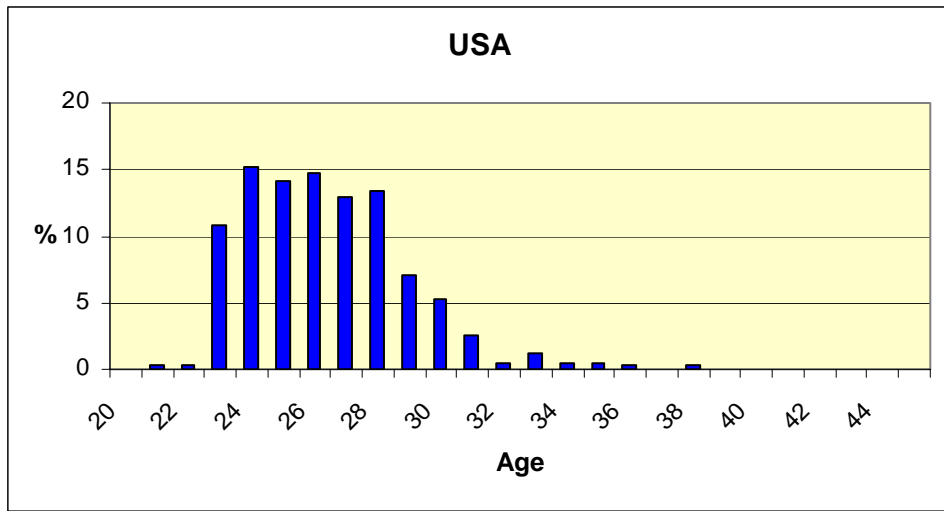


Fig. 4.4: Age Distribution for the USA

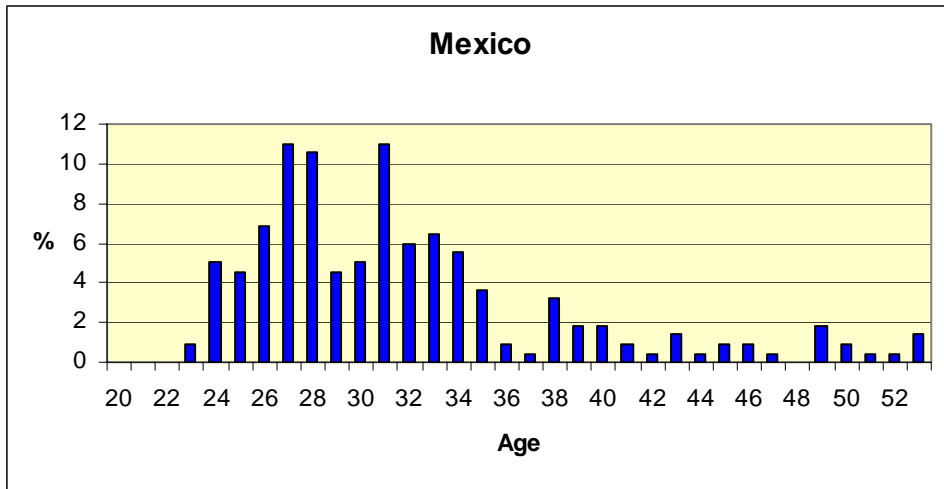


Fig. 4.5: Age Distribution for Mexico

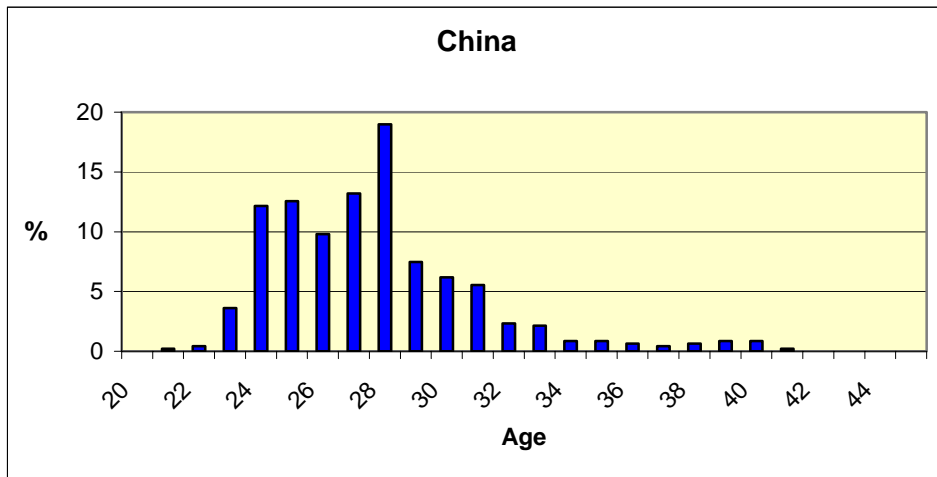


Fig. 4.7: Age Distribution for China

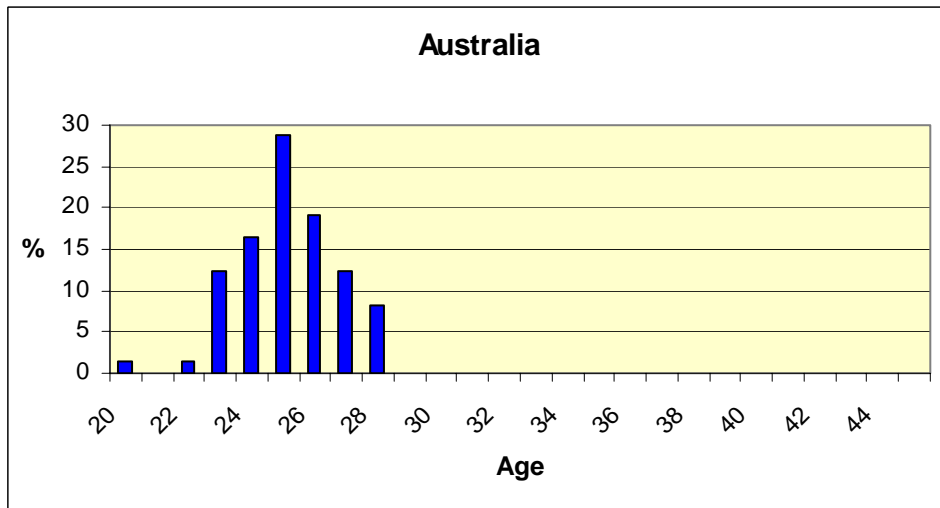


Fig. 4.8: Age Distribution for Australia

## 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 variants, 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.

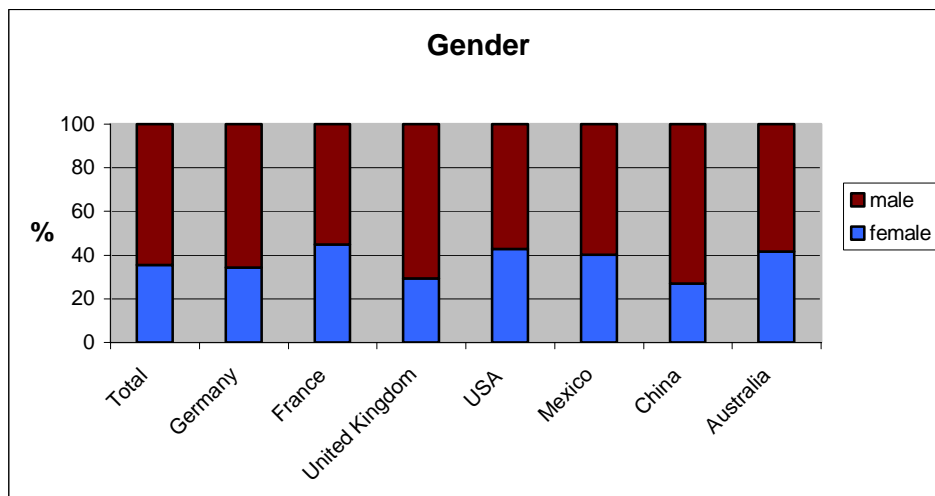


Fig. 6.1: Distribution by Gender

## 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.

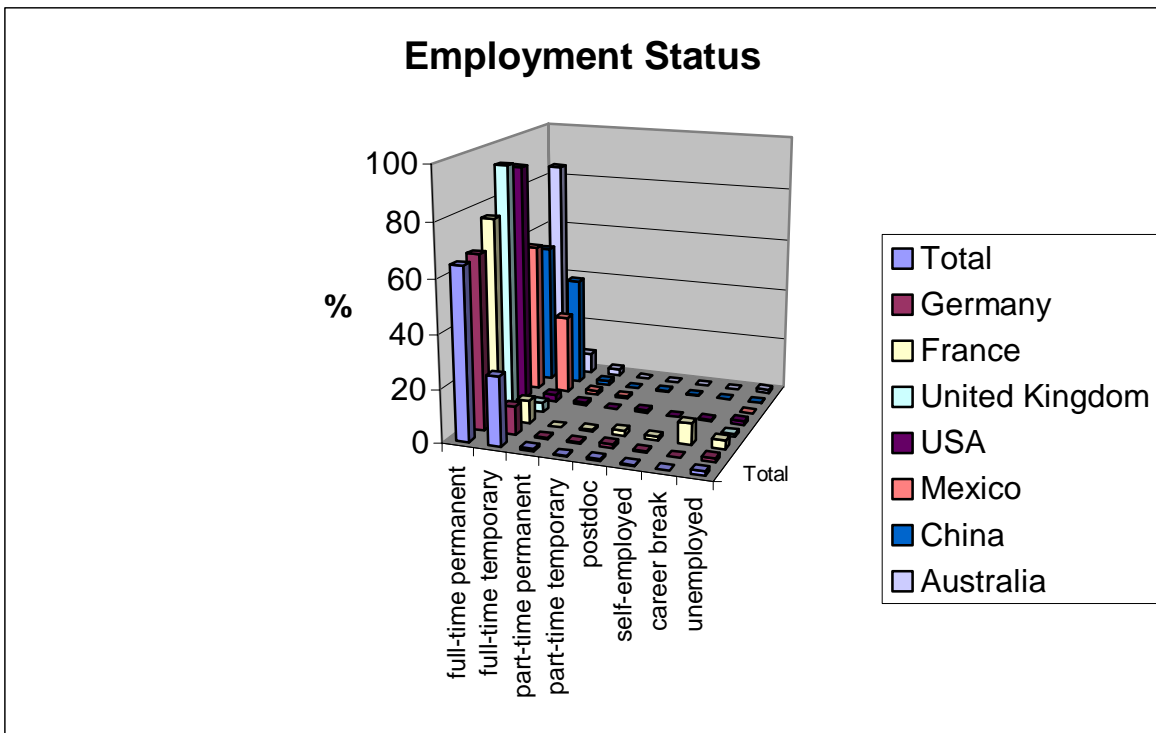


Fig. 7.1: Employment Status of Participants

## 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.

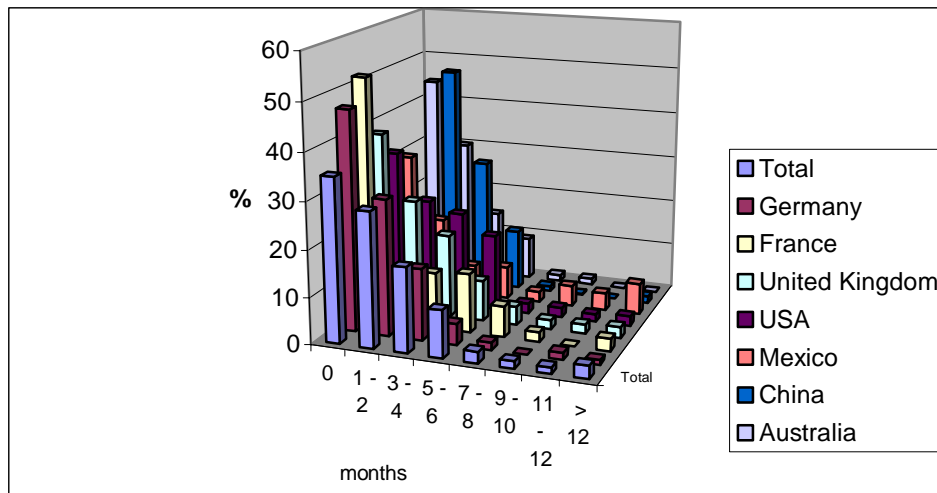


Fig. 8.1: Distribution of Time-to-Find-Job Values

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.

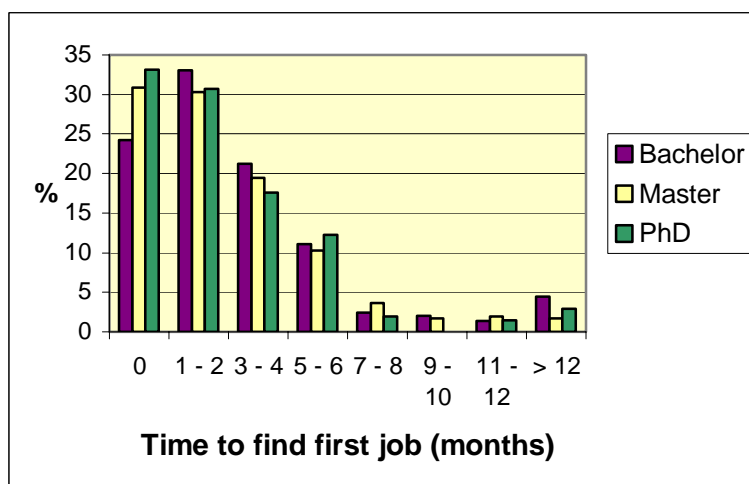


Fig. 8.2: Time-to-Find-Job Values for the Different Degrees

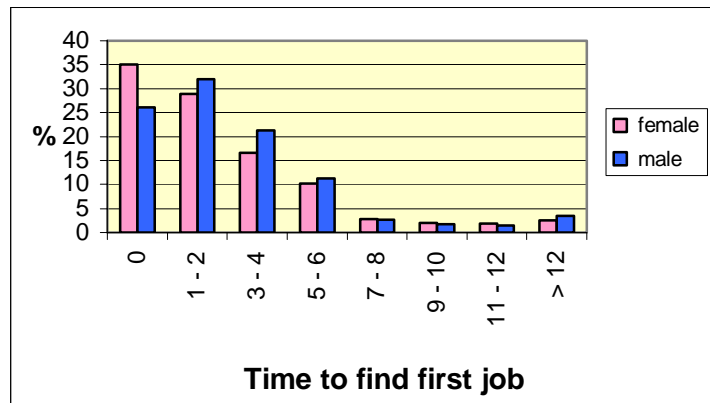


Fig. 8.3: Time-to-Find-Job Values for Male and Female

## 8.2 Duration of Employment

The second question concerning employment details was

**How long have you been employed?.**

One prerequisite 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.

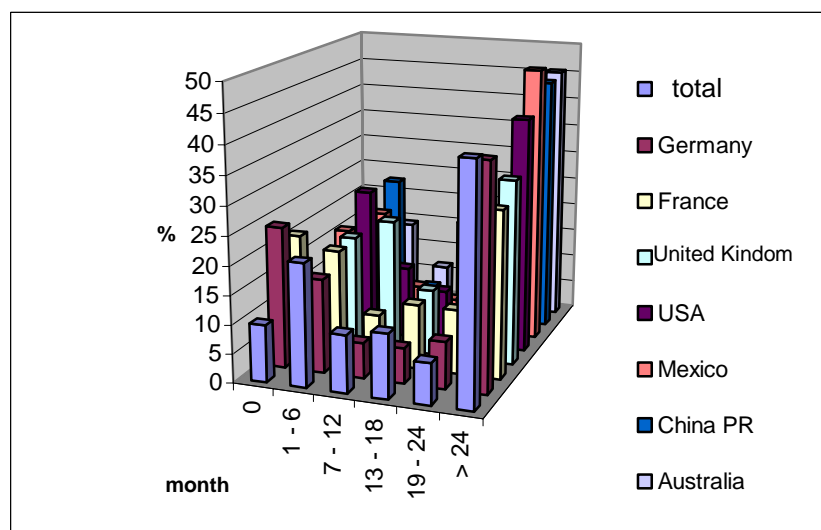


Fig. 8.4: Distribution of Employment Time

### 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.

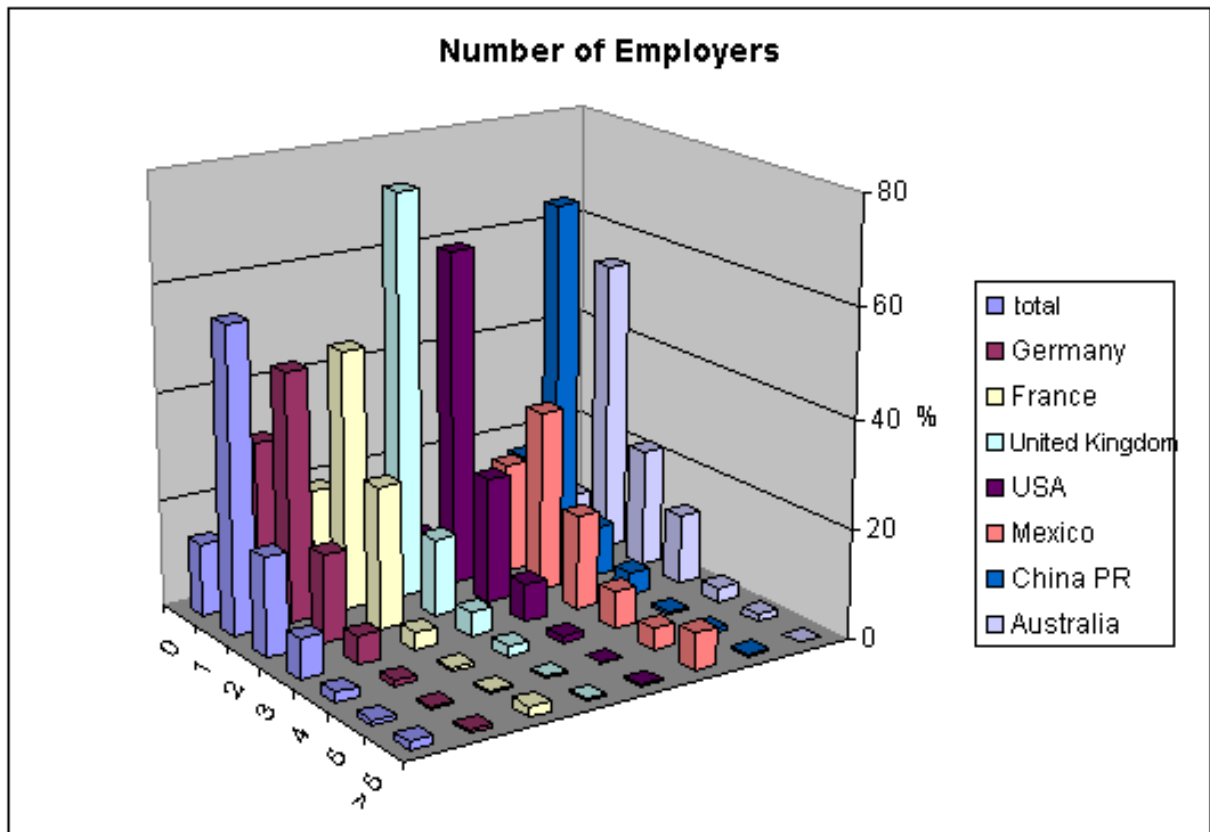


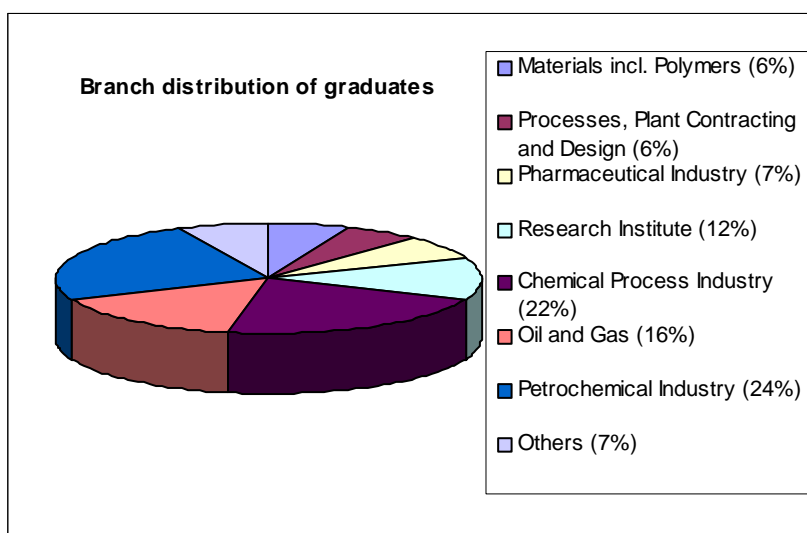
Fig. 8.5: Distribution of the number of Employers

### 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.

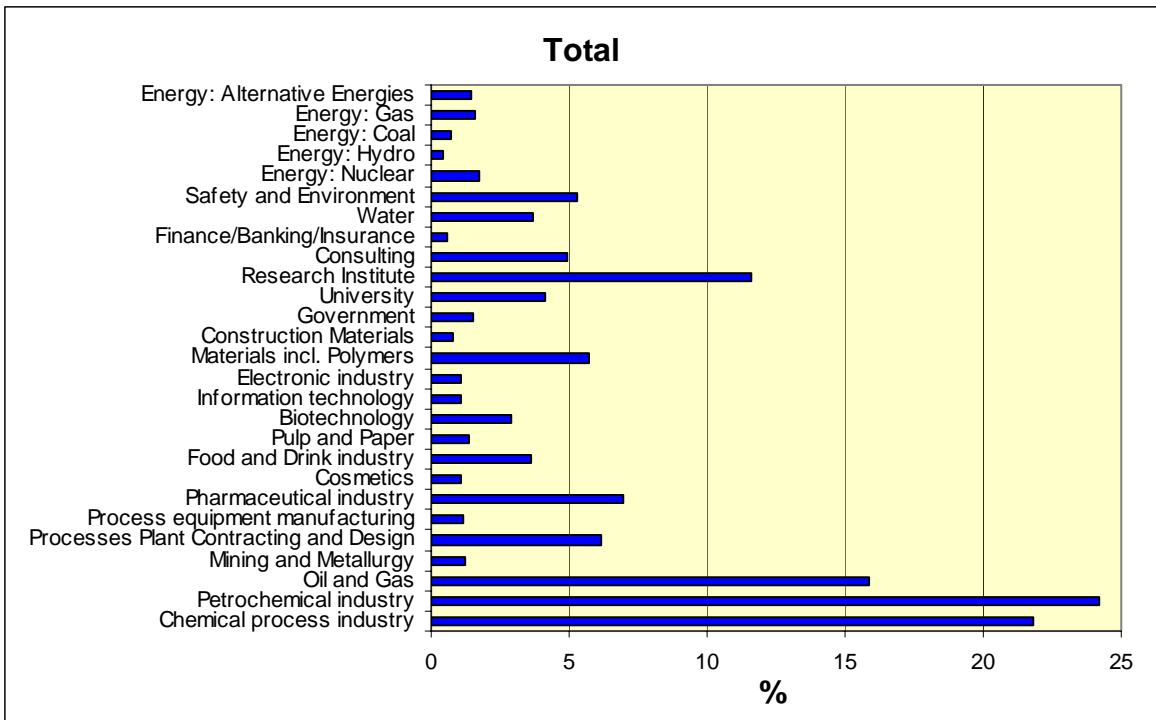


Fig. 9.2: Distribution of branches for all participants

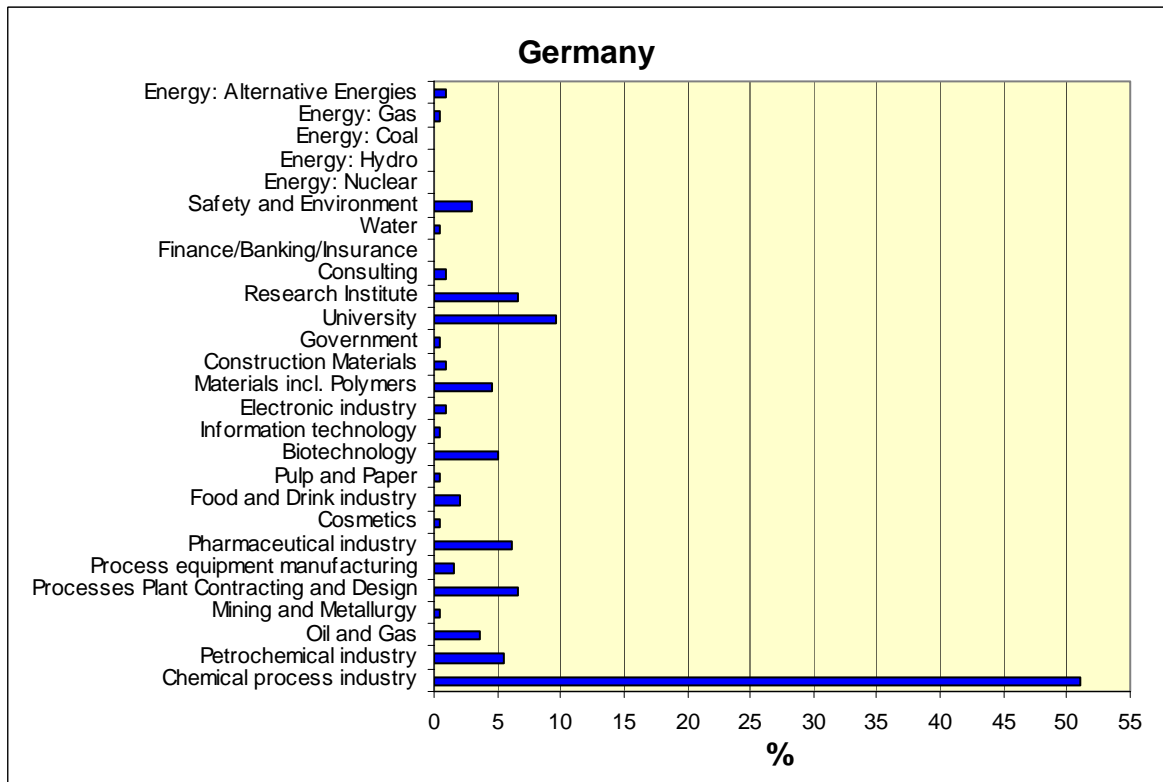


Fig. 9.3: Distribution of branches for Germany

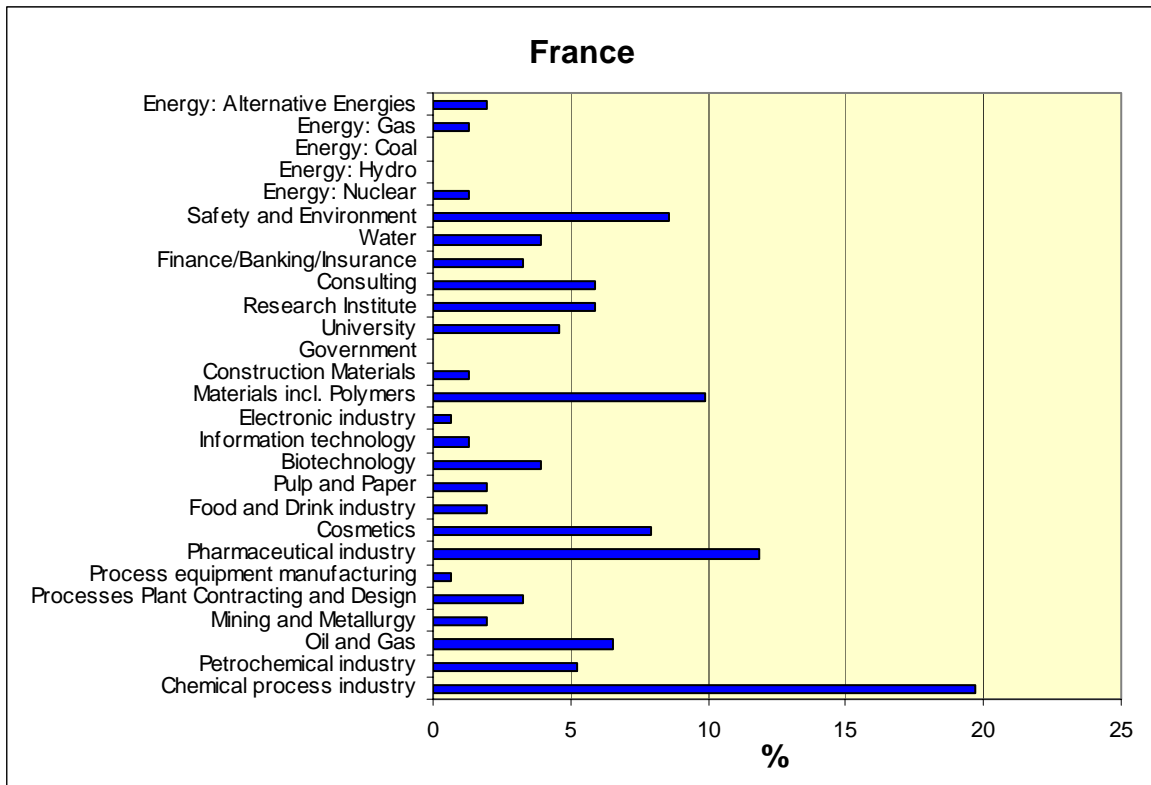


Fig. 9.4: Distribution of branches for France

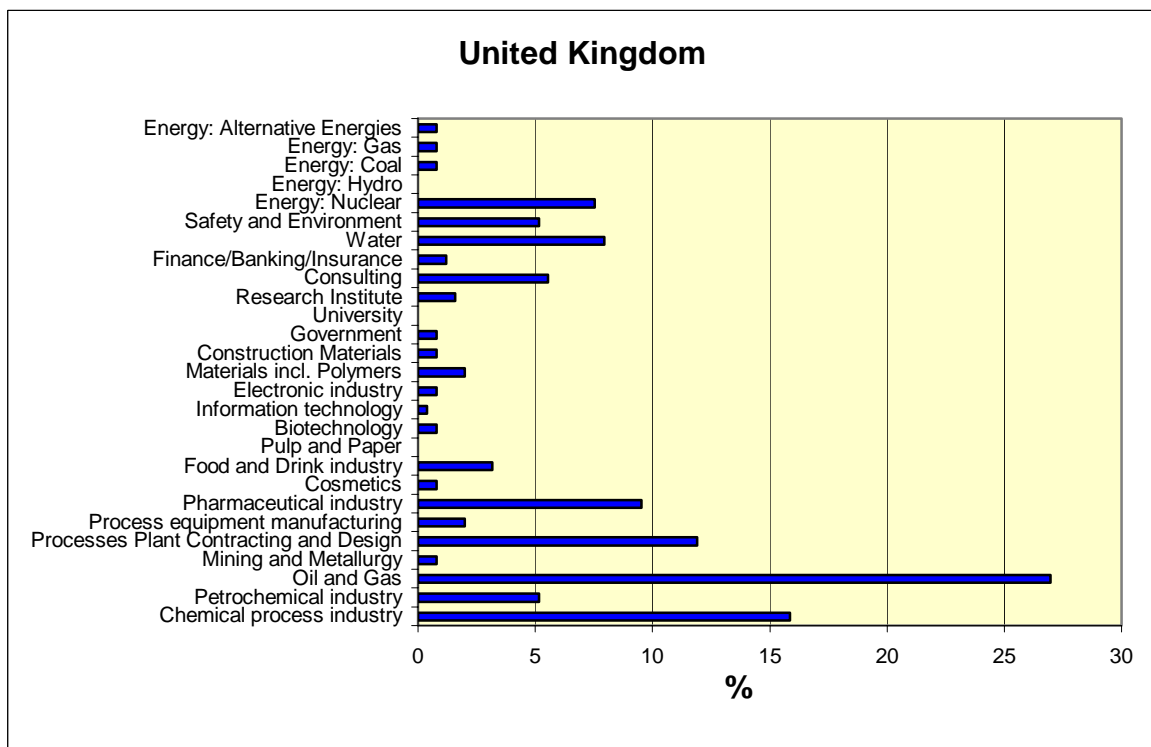


Fig. 9.5: Distribution of branches for United Kingdom

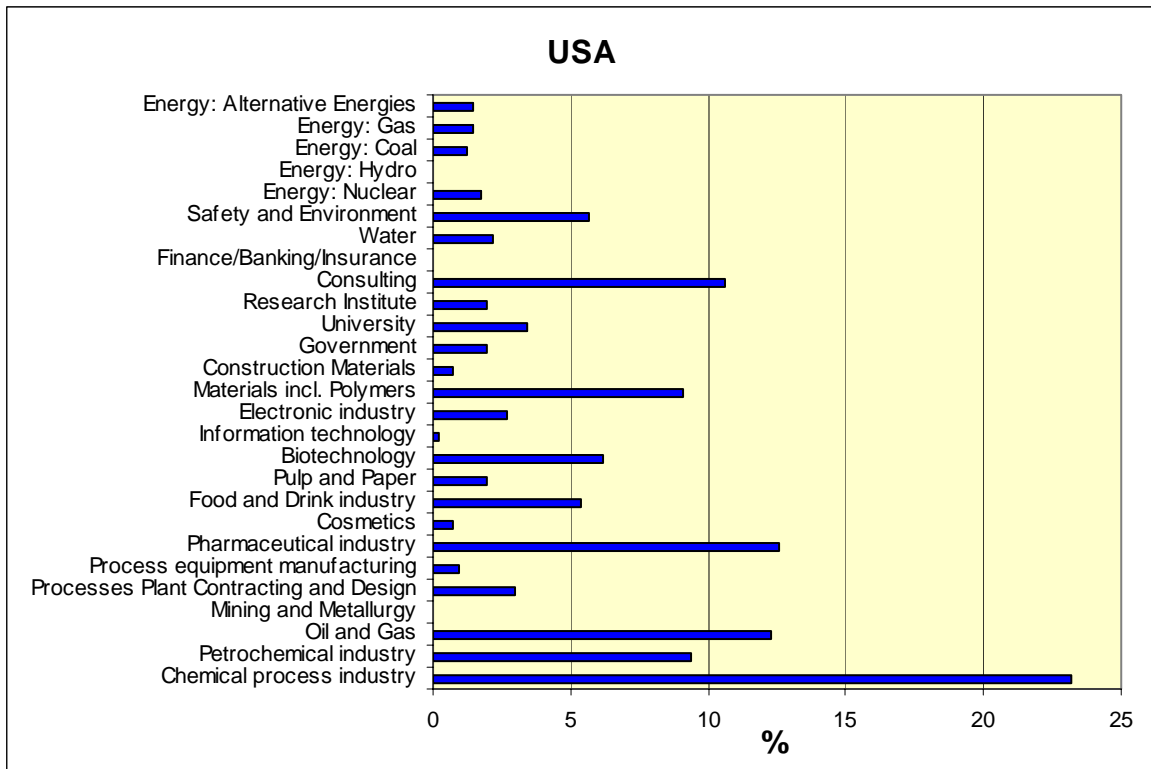


Fig. 9.6: Distribution of branches for USA

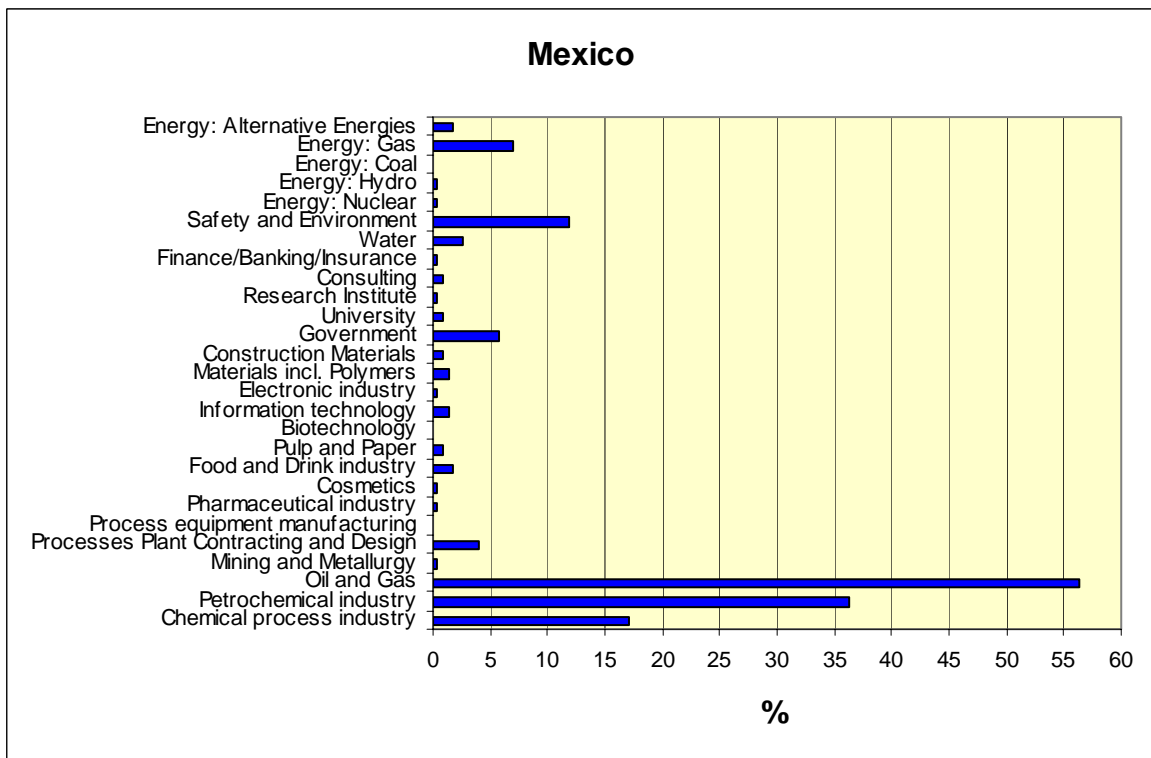


Fig. 9.7: Distribution of branches for Mexico

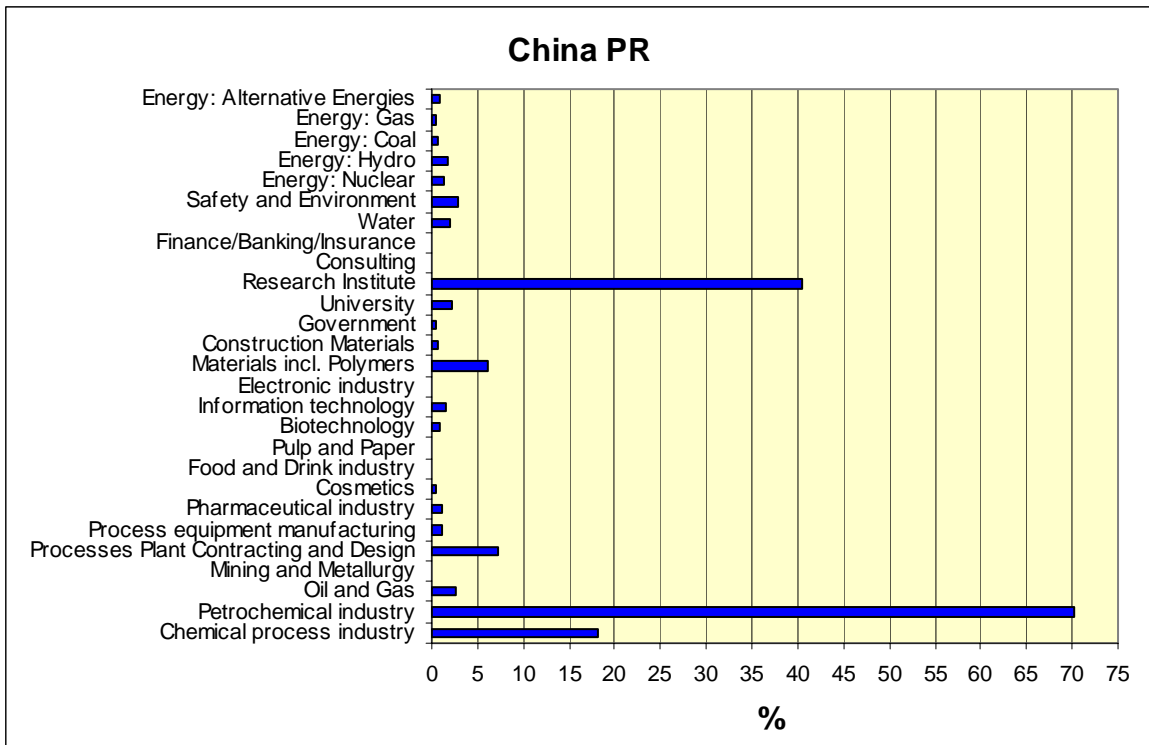


Fig. 9.8: Distribution of branches for China

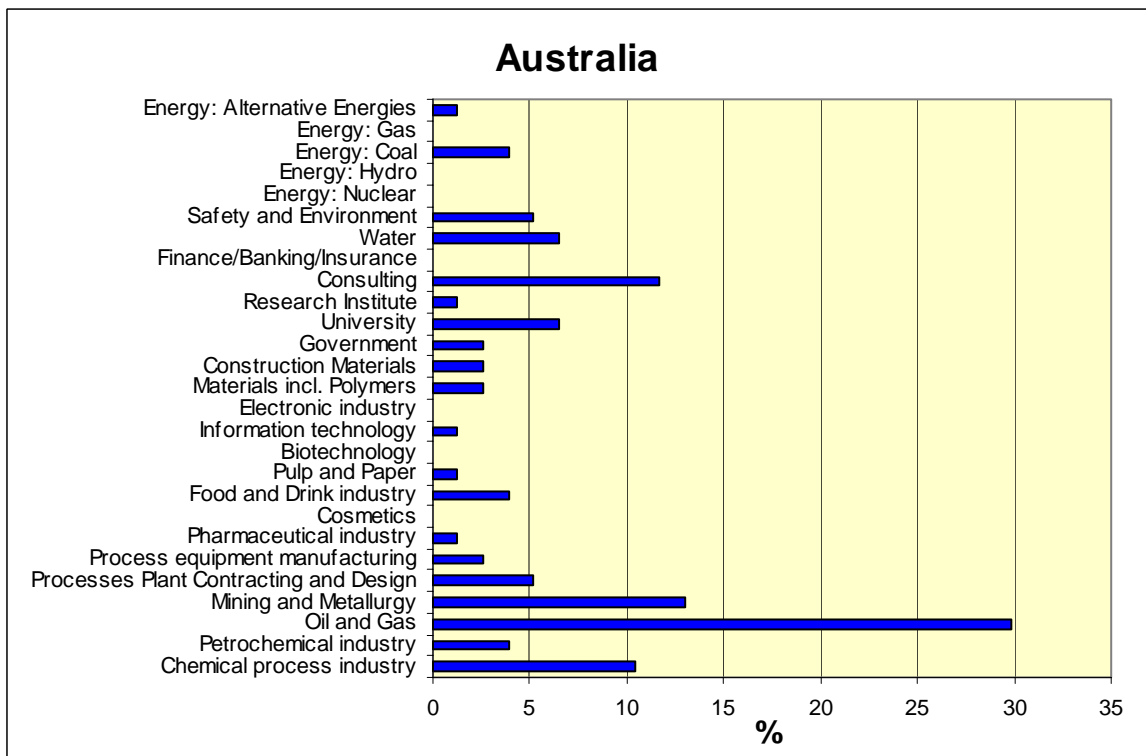


Fig. 9.9: Distribution of branches for Australia

## 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.

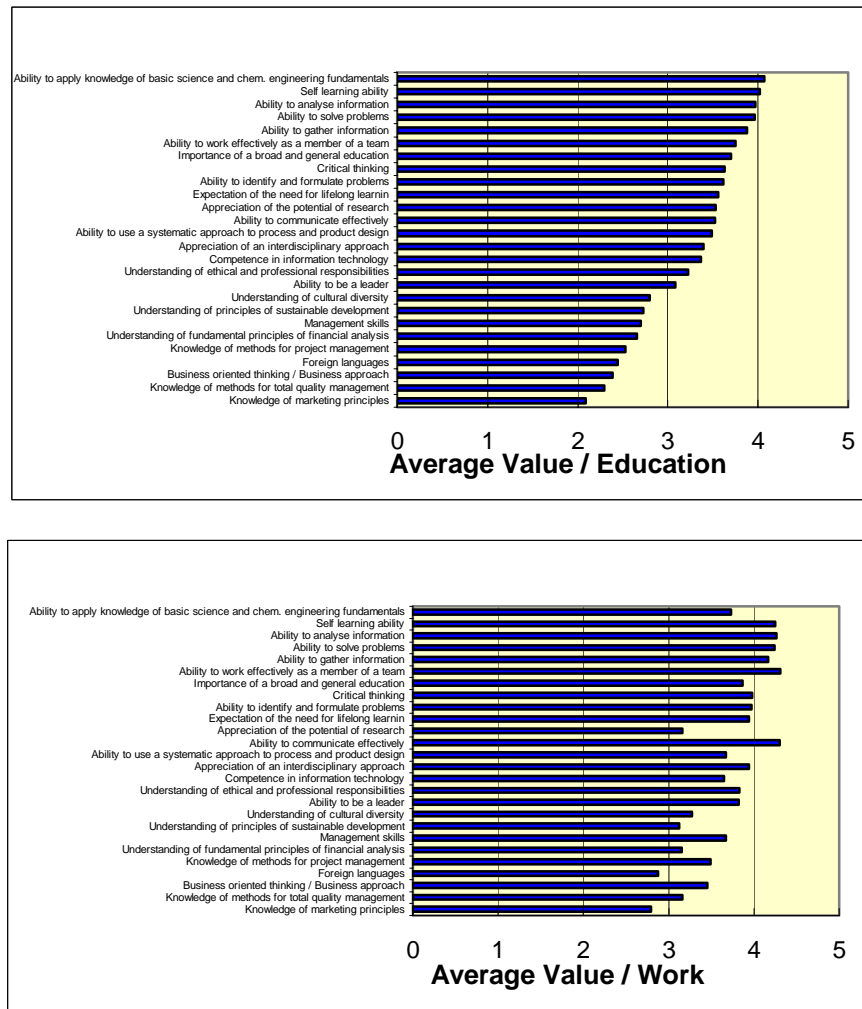


Fig. 10.1: Skills and Abilities Ranking for All Participants

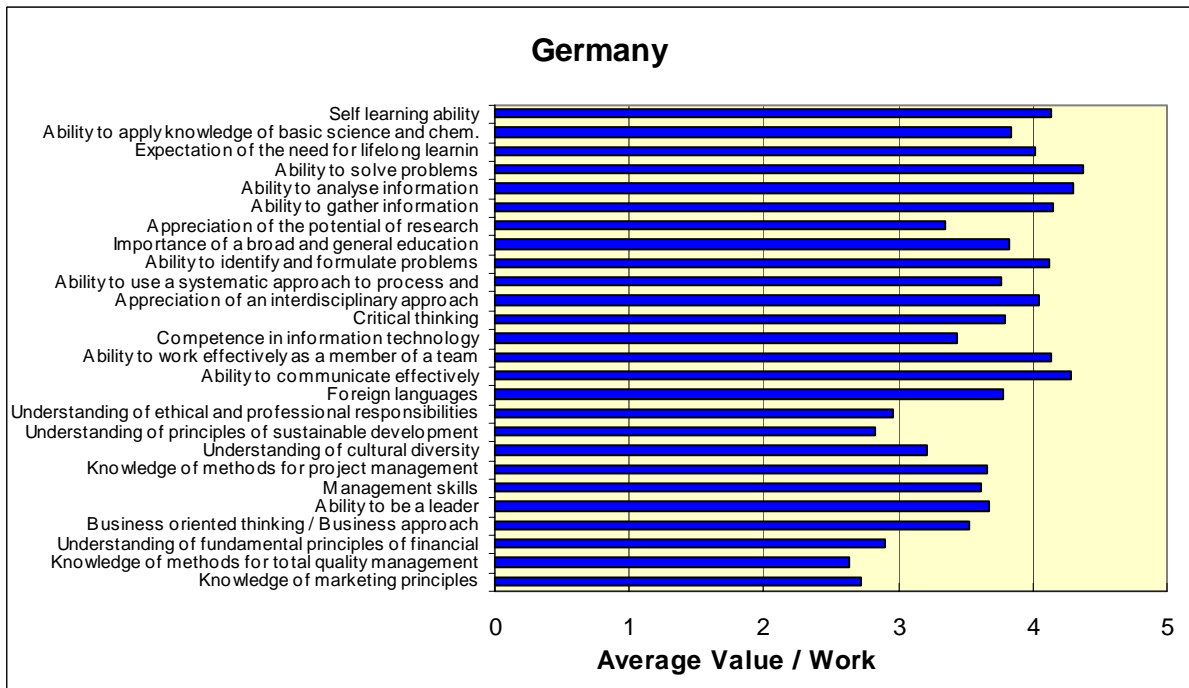
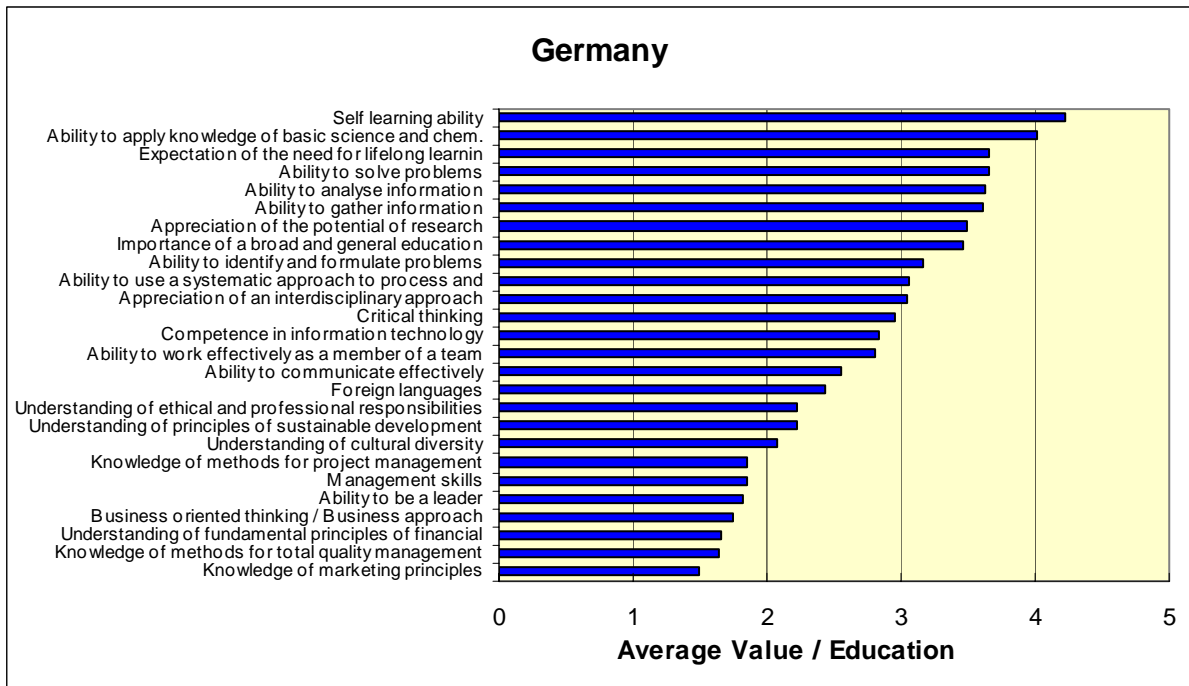


Fig. 10.2: Skills and Abilities Ranking for Germany

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

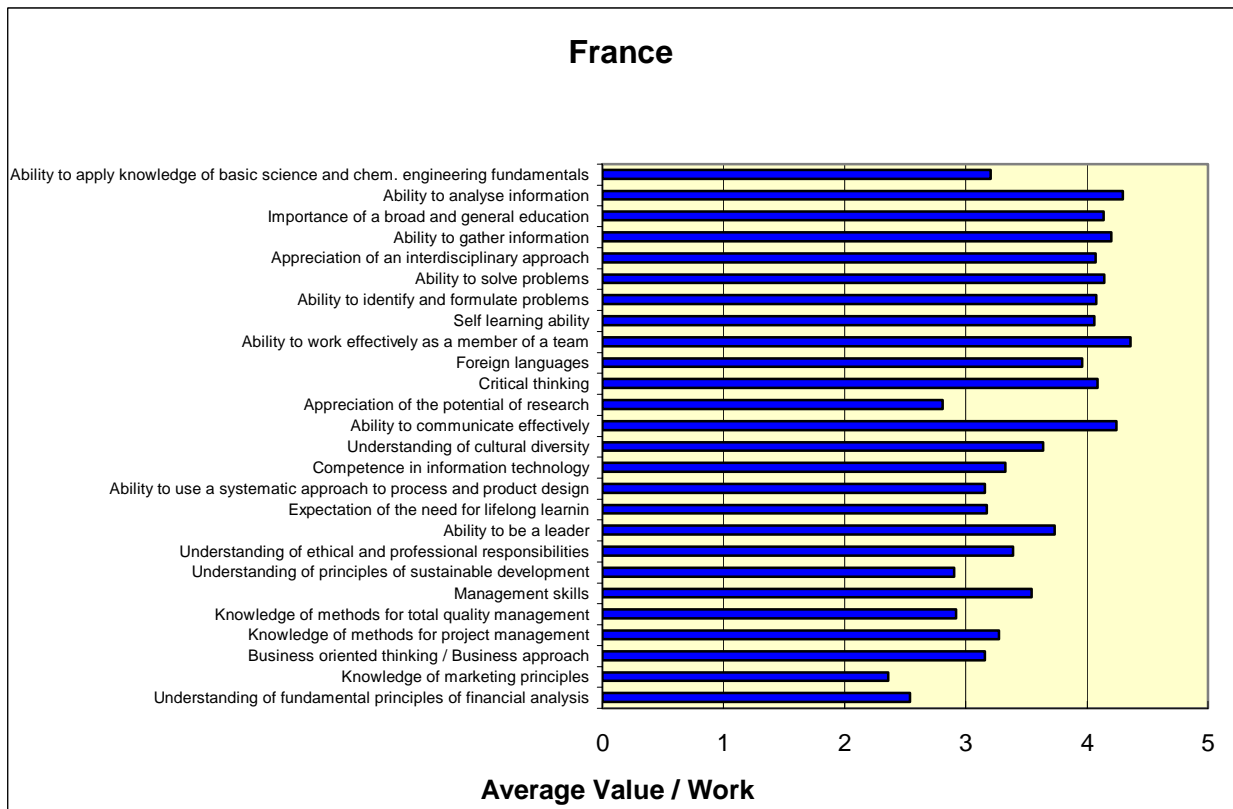
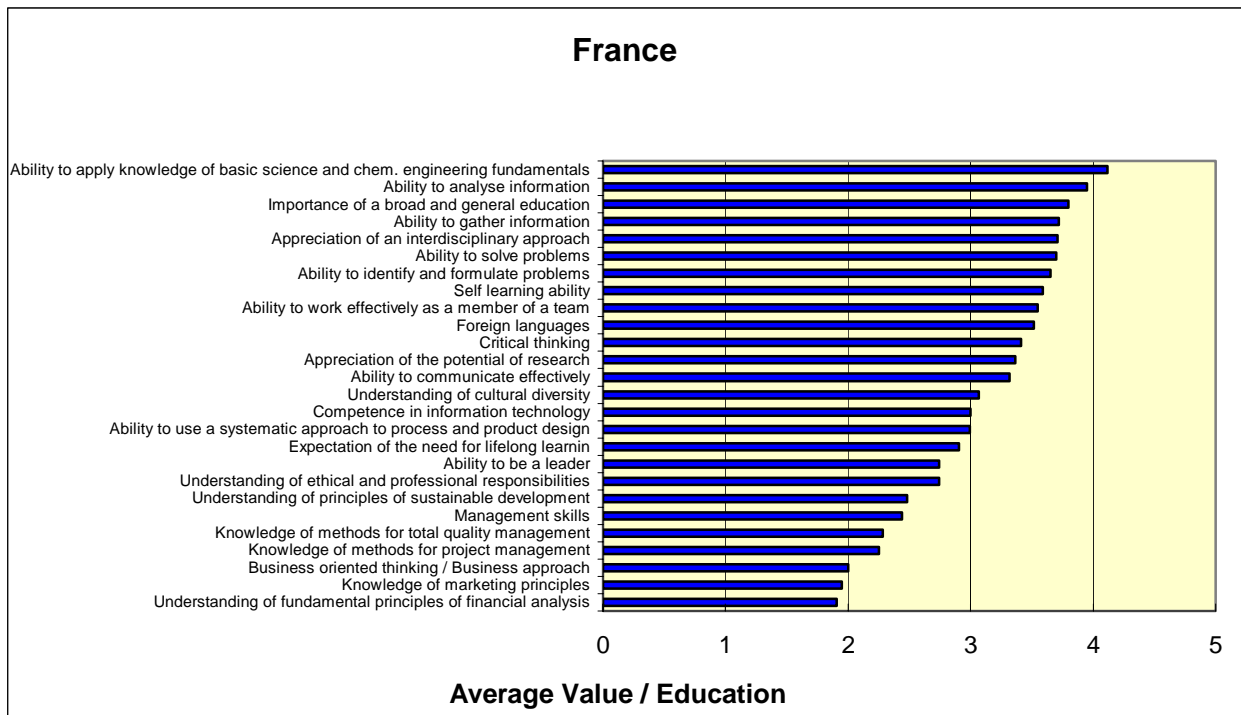


Fig. 10.3: Skills and Abilities Ranking for France

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



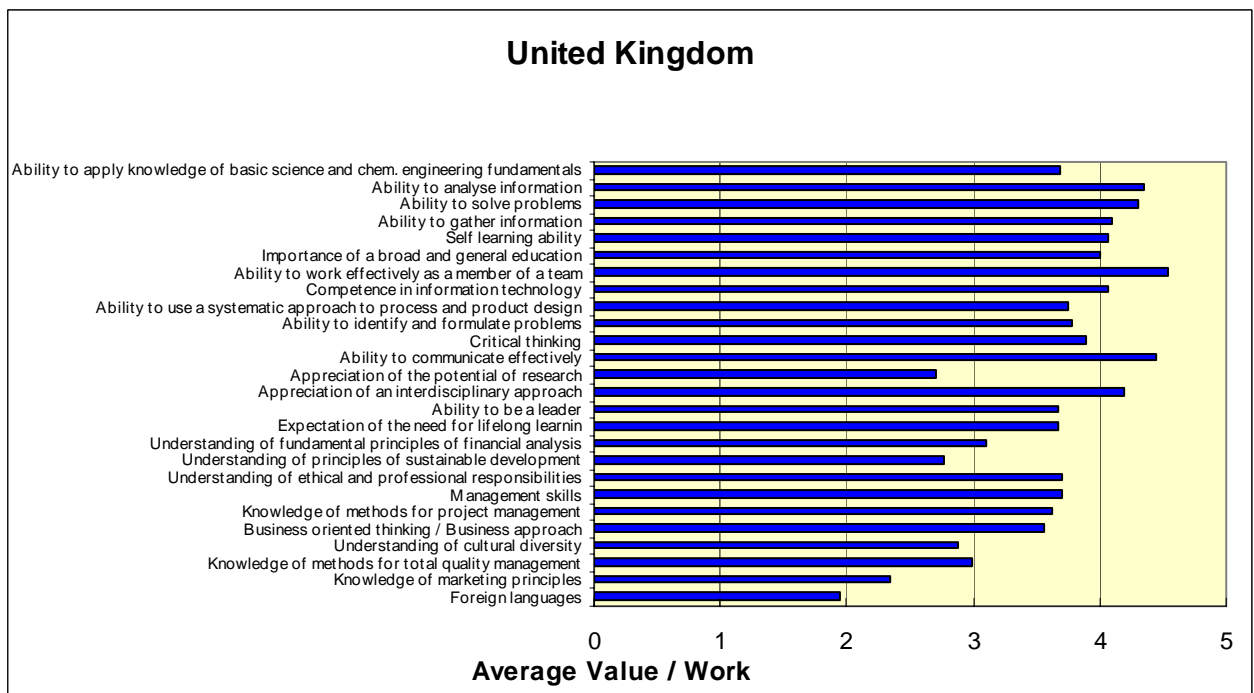
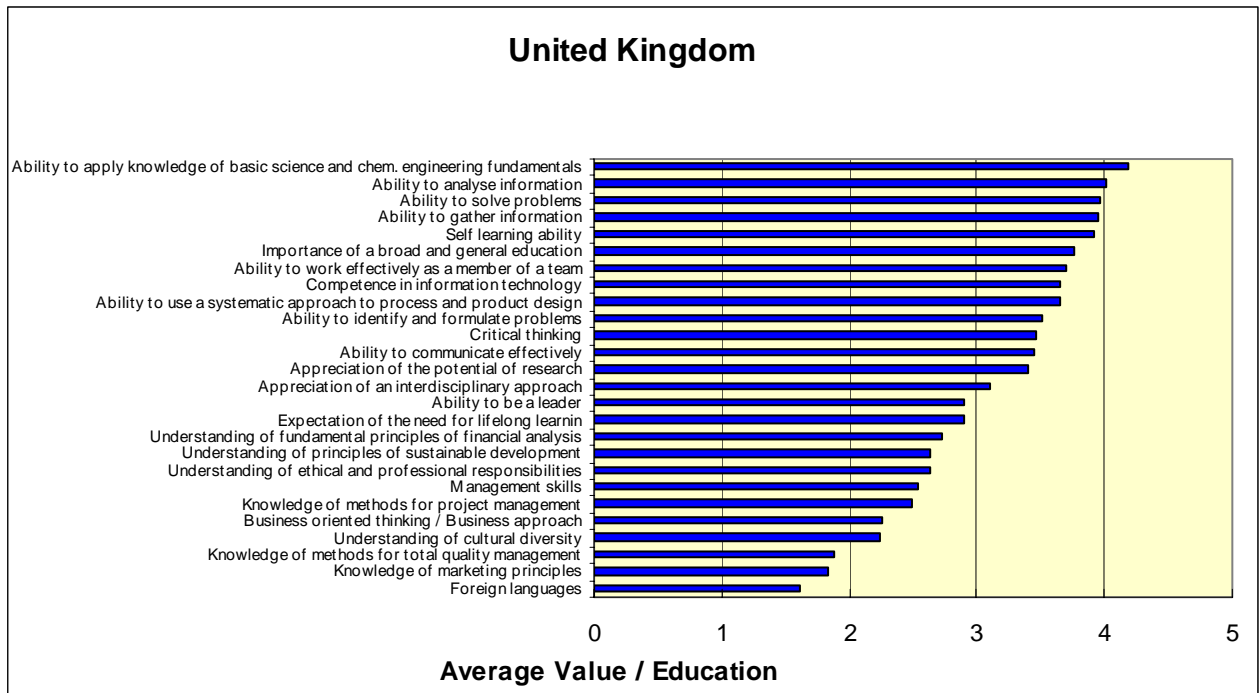


Fig. 10.4: Skills and Abilities Ranking for United Kingdom  
 1 – very low; 2 – low; 3 – medium; 4 – high; 5 – very high

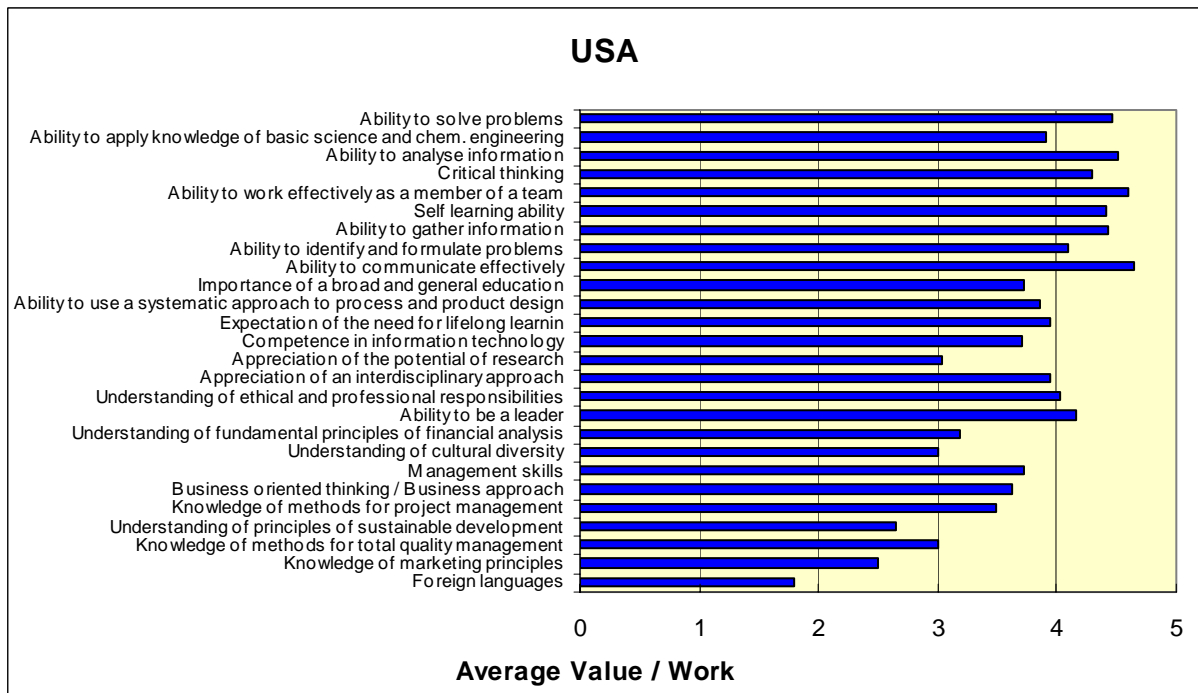
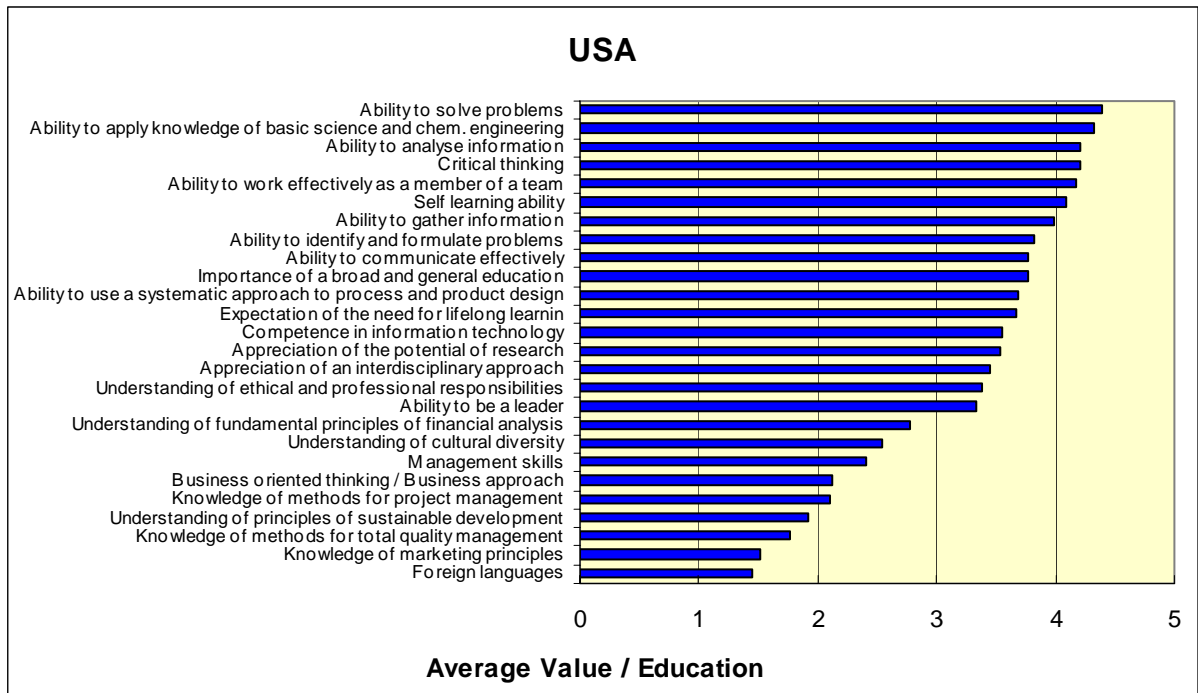


Fig. 10.5: Skills and Abilities Ranking for USA

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

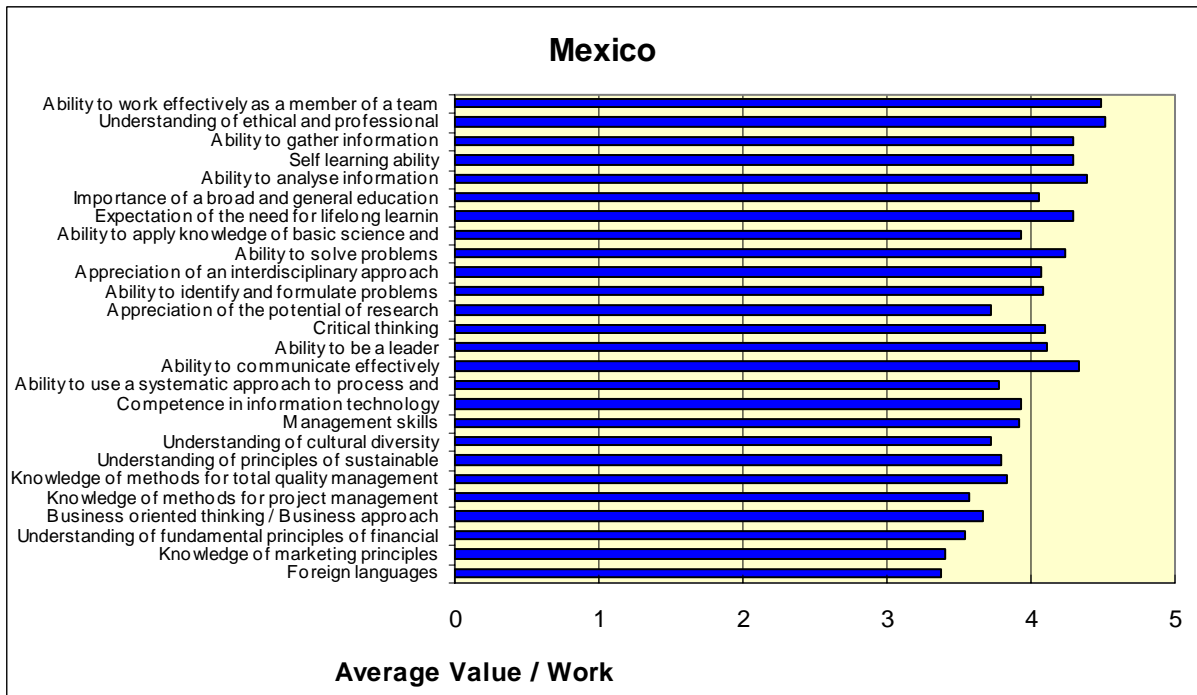
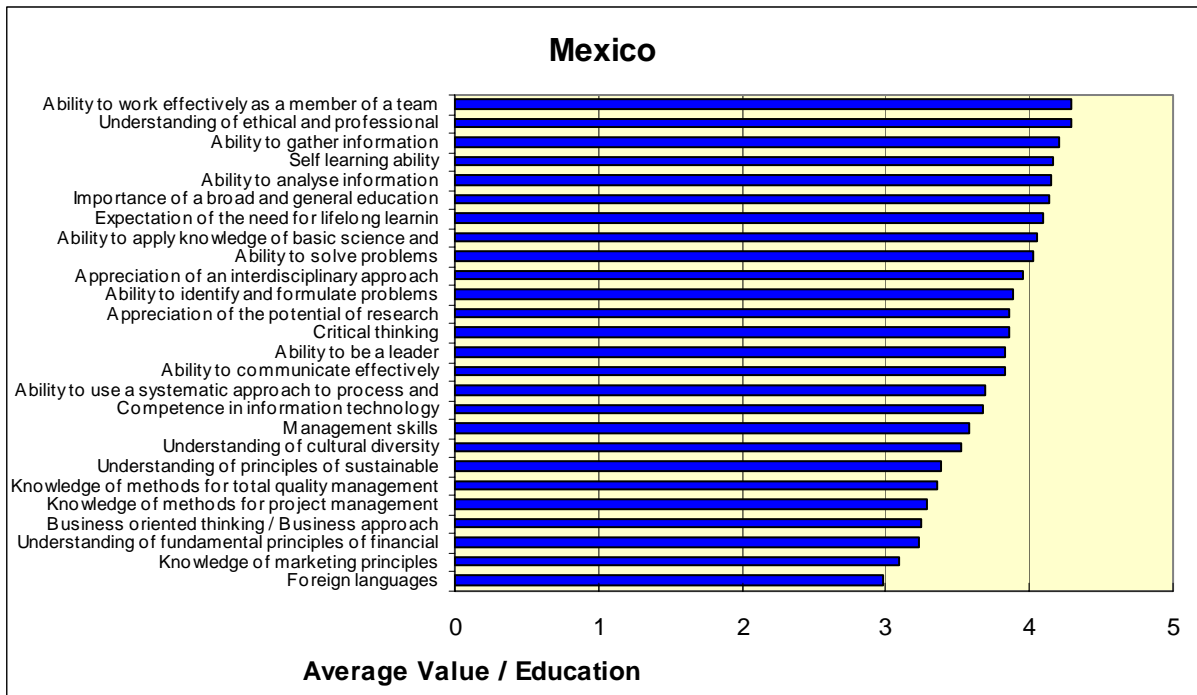


Fig. 10.6: Skills and Abilities Ranking for Mexico

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

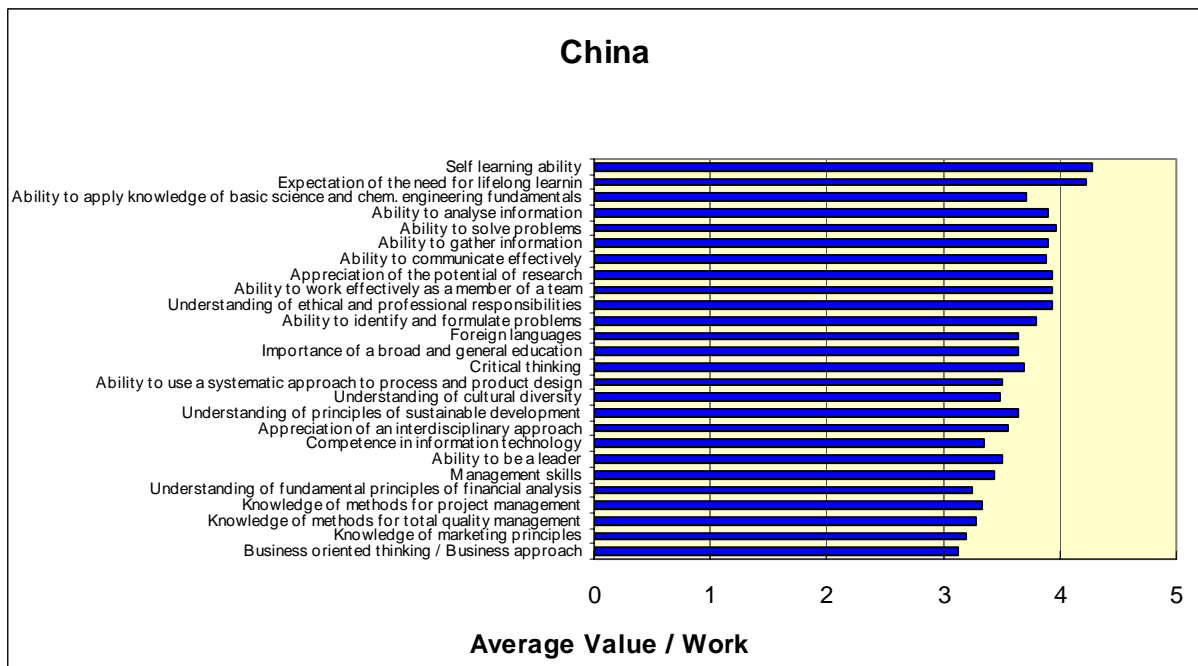
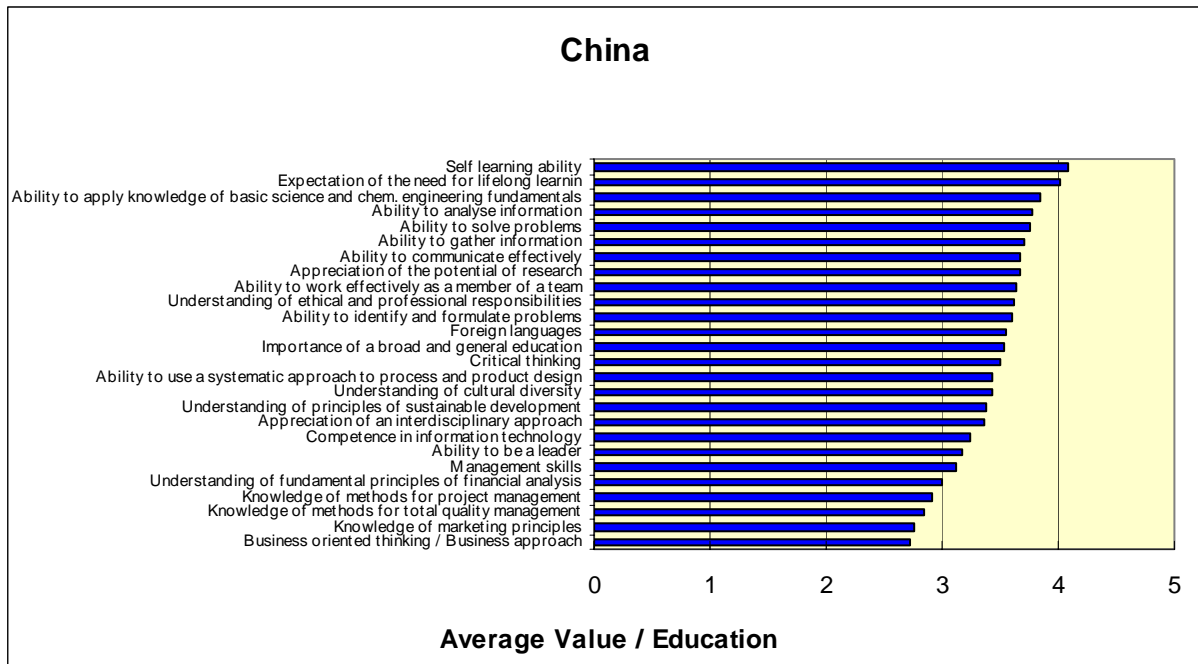


Fig. 10.7: Skills and Abilities Ranking for China

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

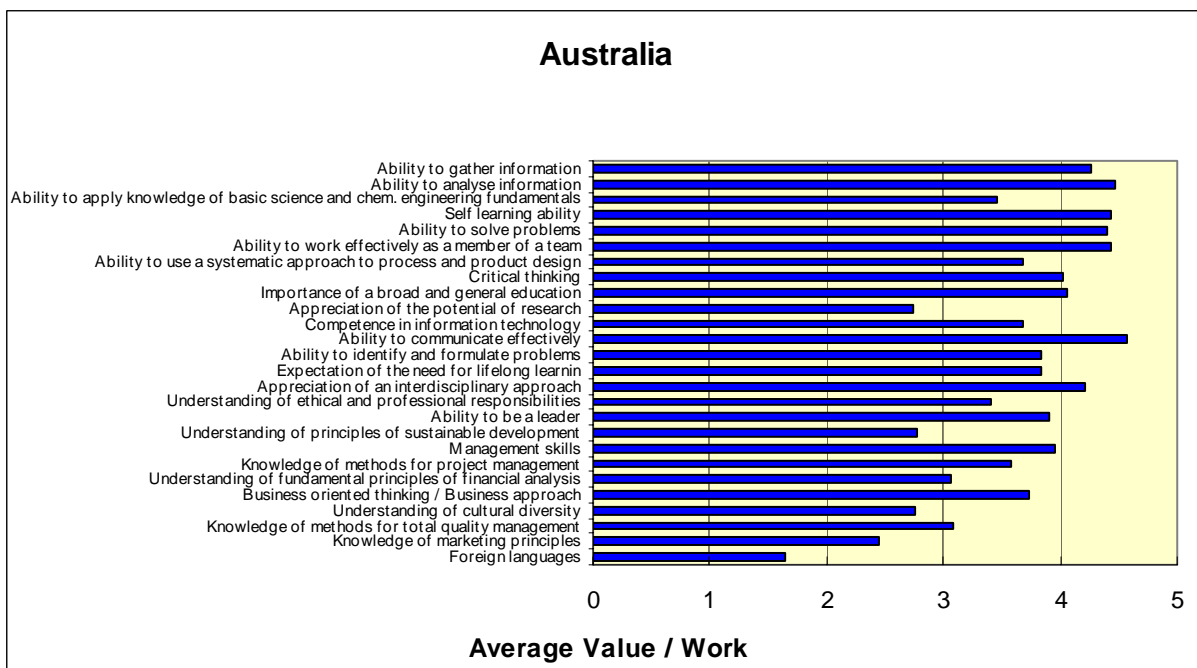
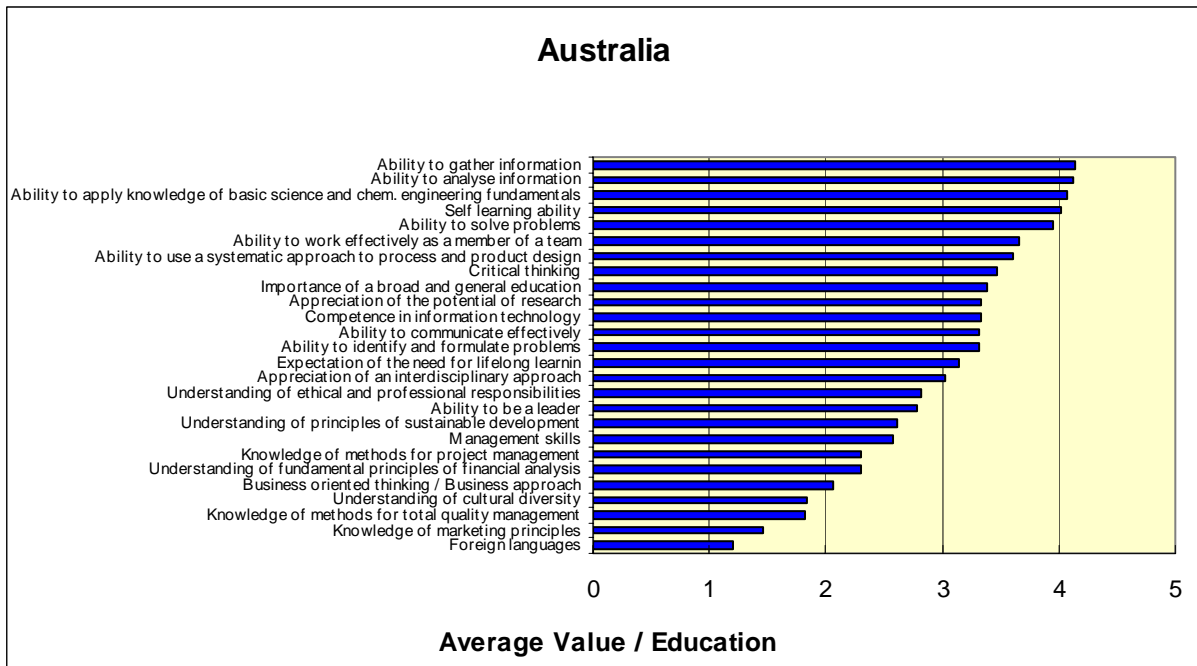


Fig. 10.8: Skills and Abilities Ranking for Australia

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

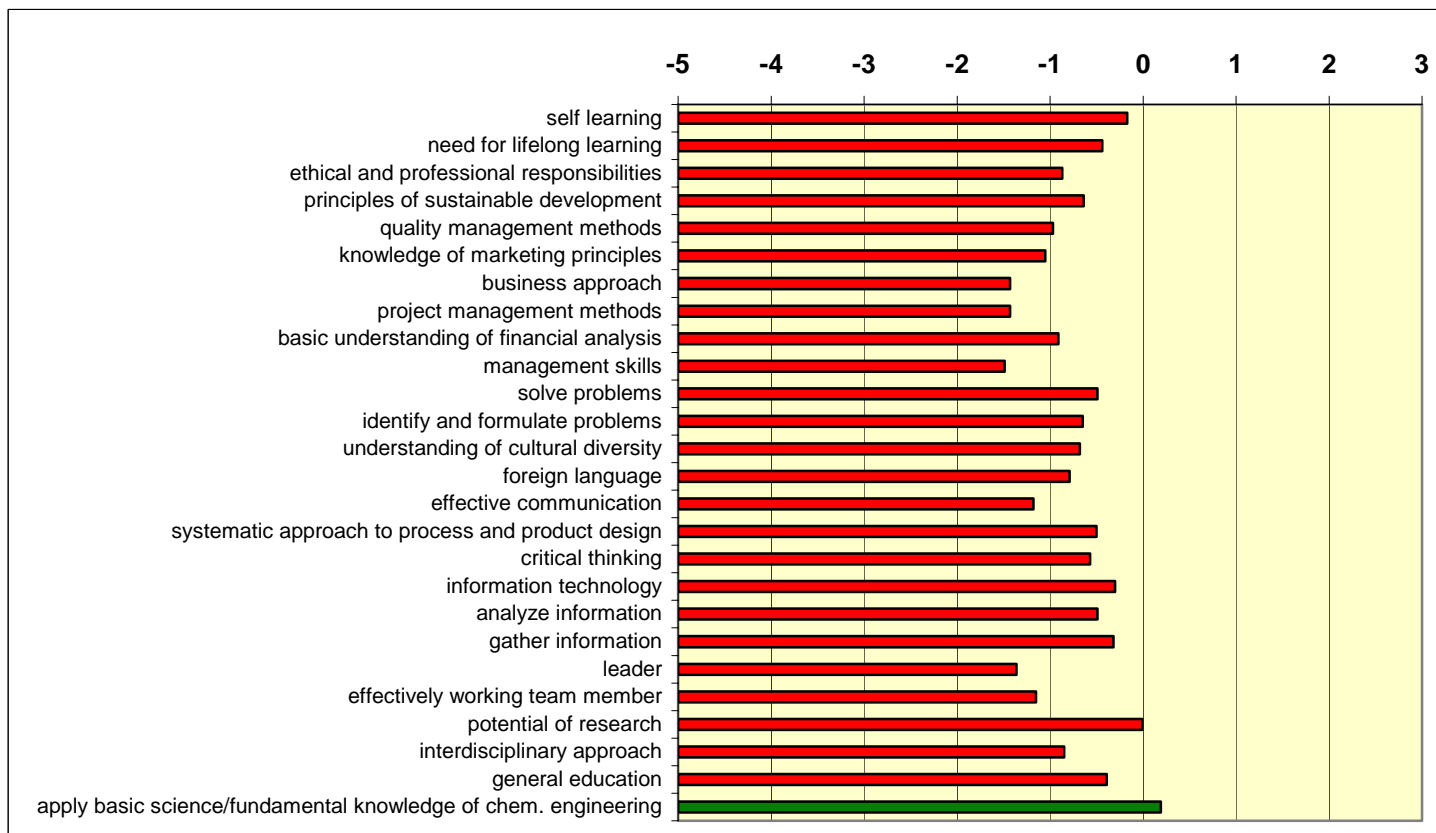


Fig. 10.9: Skills / Abilities versus **Master's Degree** (total, including British MEng., see chapter 3)

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

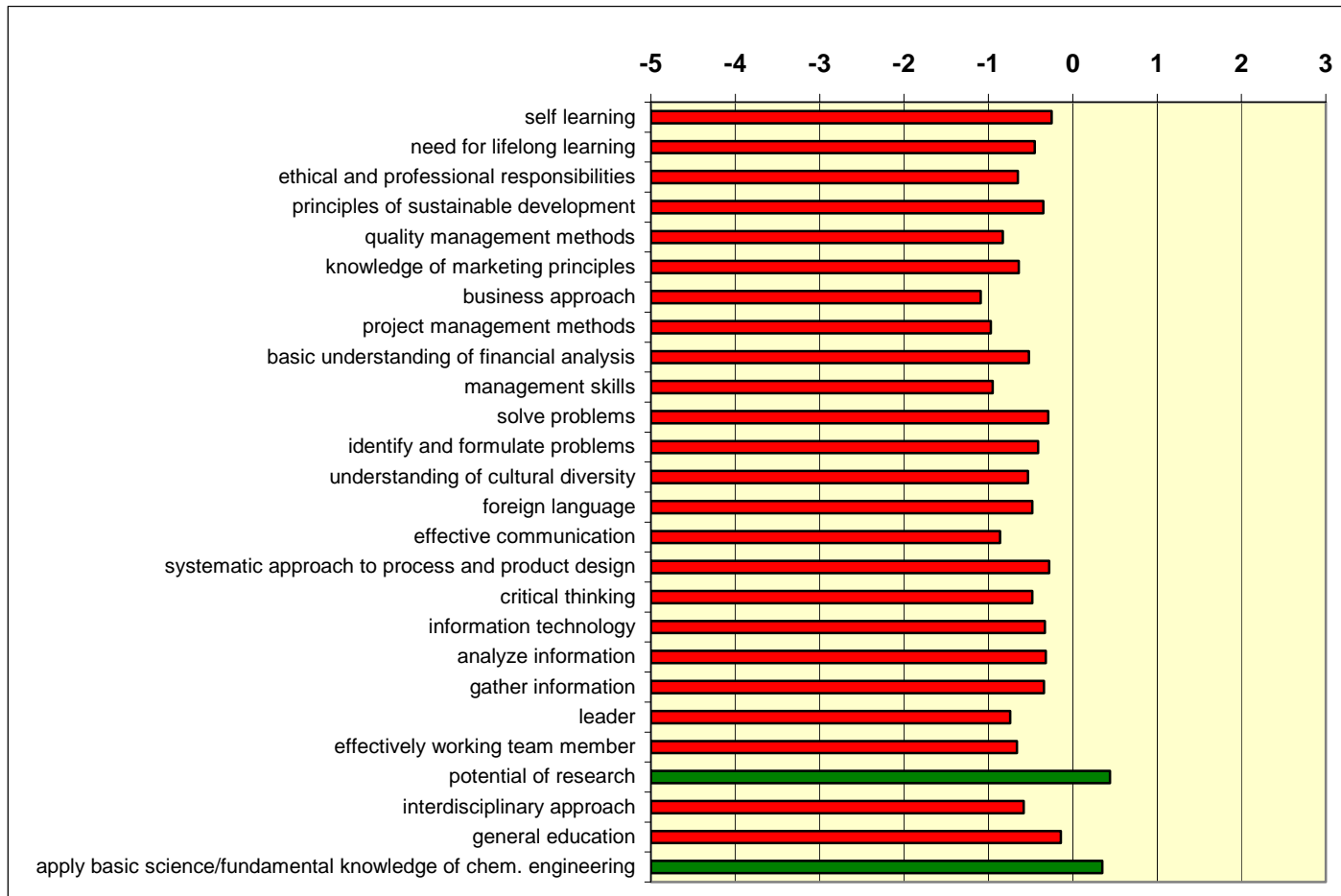




Fig. 10.10: Skills / Abilities versus

**Bachelor's Degree (total)**

Characteristic value v:

$v < 0$  lack of qualification

$v > 0$  higher qualification than needed for professional job

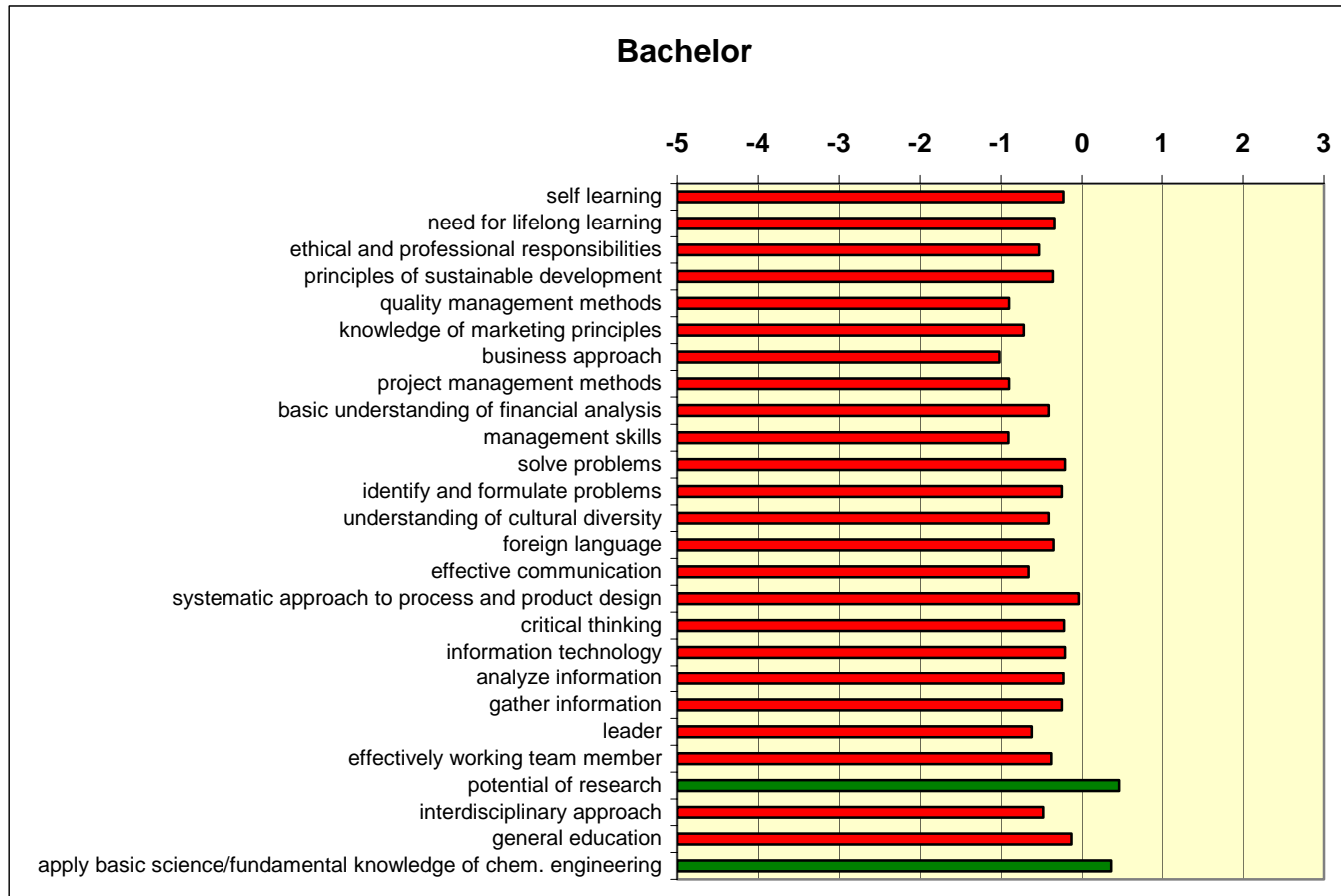


Fig. 10.11: Skills / Abilities versus

**PhD Degree (Germany)**

Characteristic value  $v$ :  $v < 0$  lack of qualification

$v > 0$  higher qualification than needed for professional job

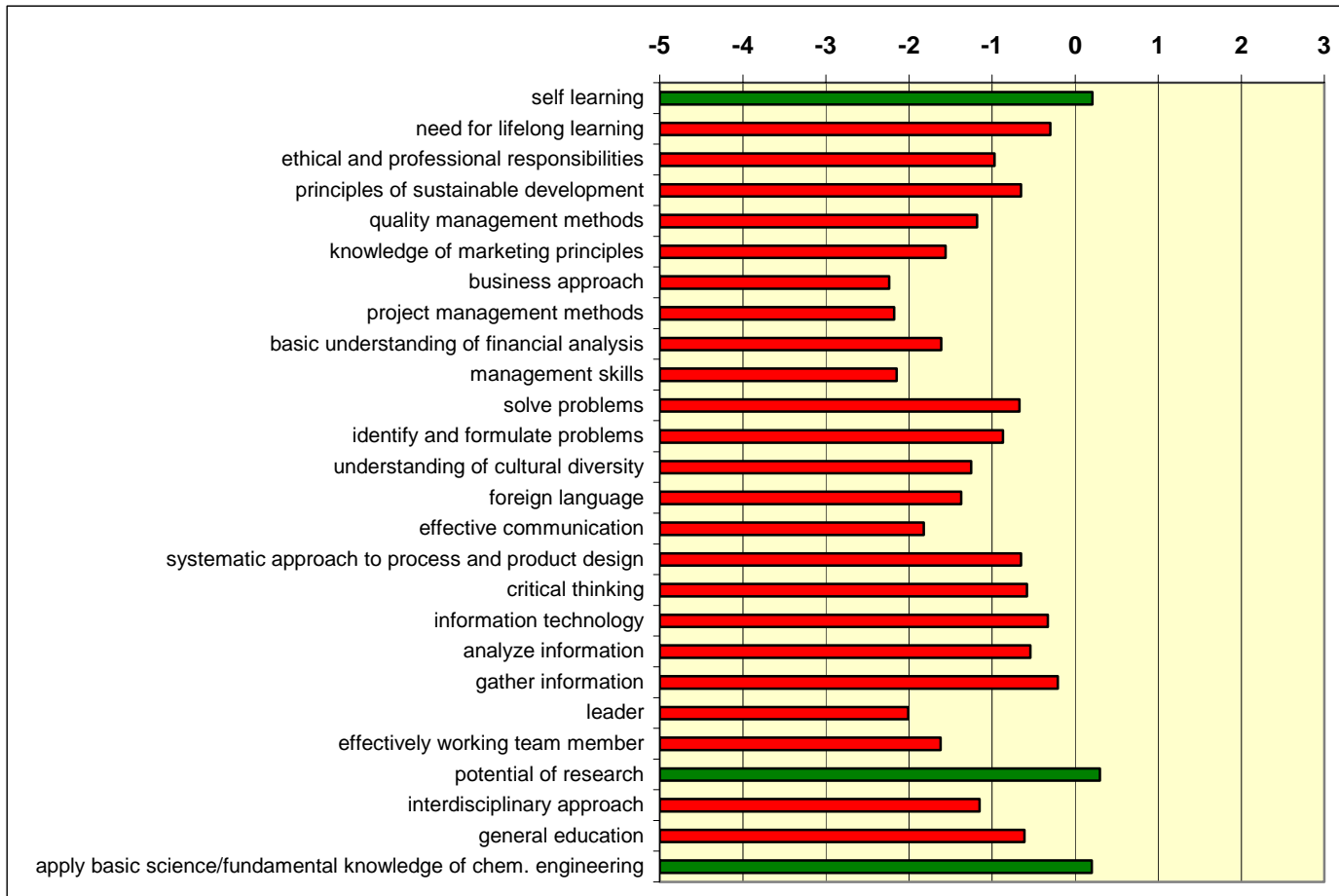


Fig. 10.12: Skills / Abilities versus

**Master's Degree (Germany)**

Characteristic value  $v$ :  $v < 0$  lack of qualification

$v > 0$  higher qualification than needed for professional job

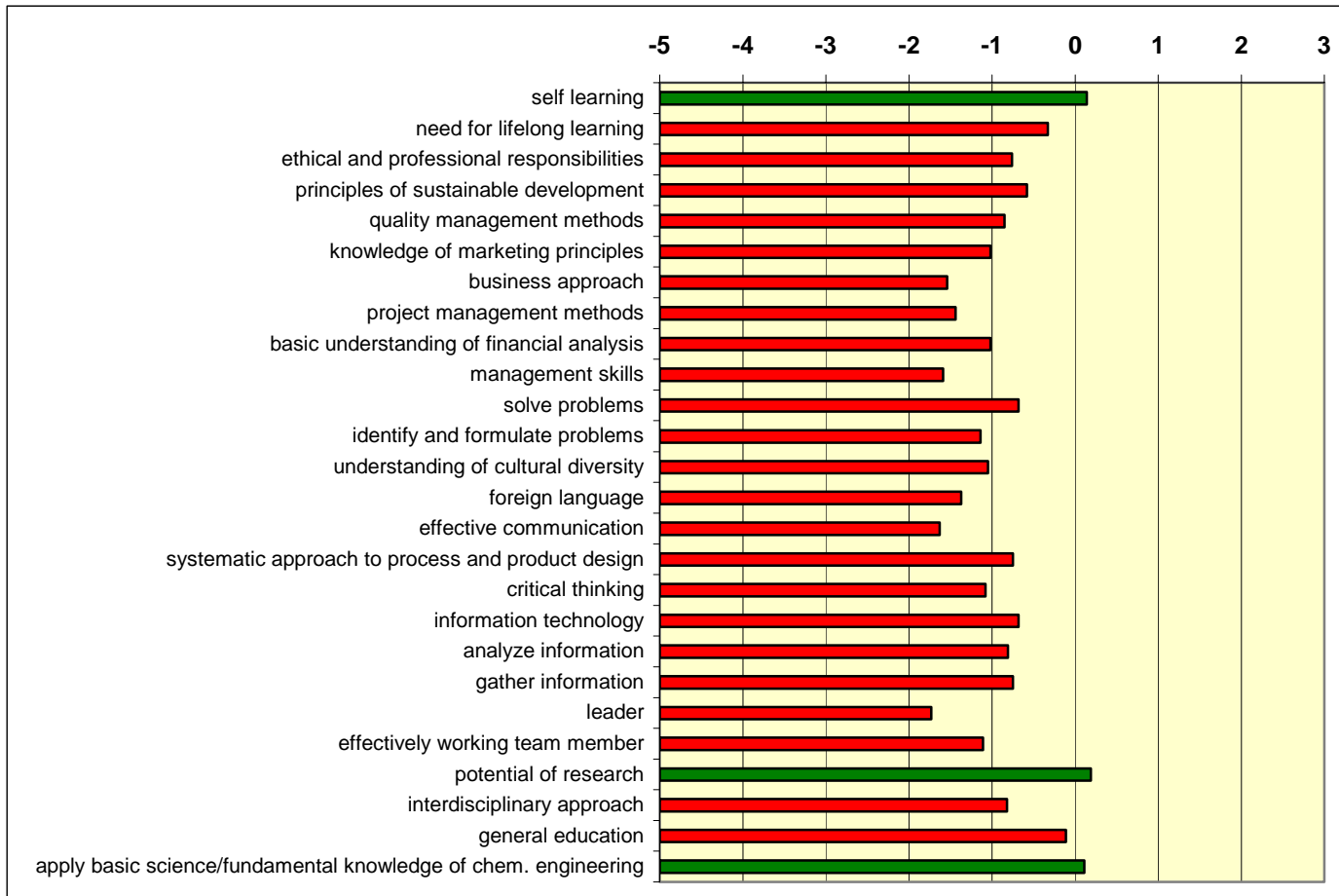


Fig. 10.13: Skills / Abilities versus

**PhD Degree (France)**

Characteristic value  $v$ :  $v < 0$  lack of qualification

$v > 0$  higher qualification than needed for professional job

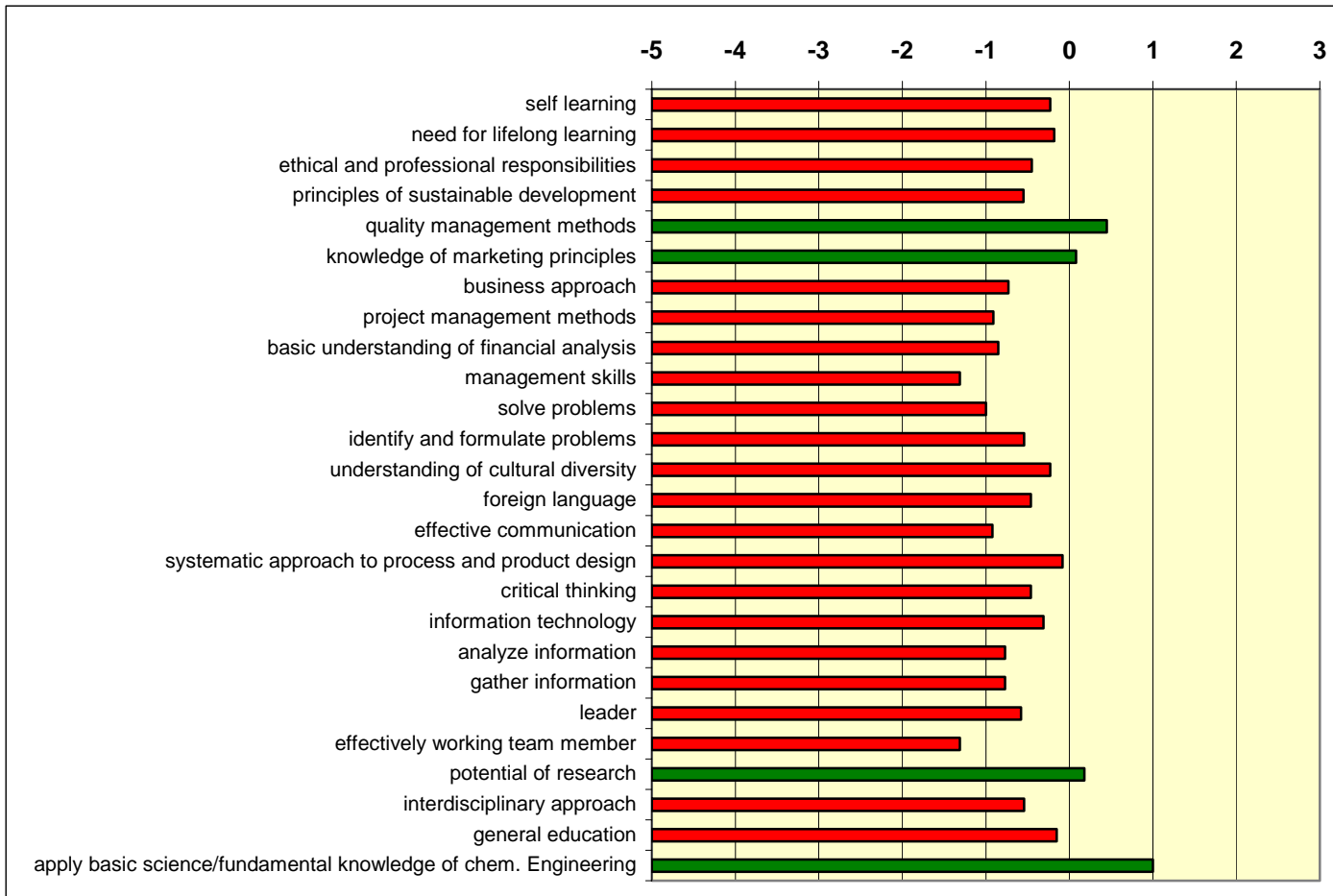


Fig. 10.14: Skills / Abilities versus  
Characteristic value v:

**Master's Degree (France)**

v < 0 lack of qualification

v > 0 higher qualification than needed for professional job

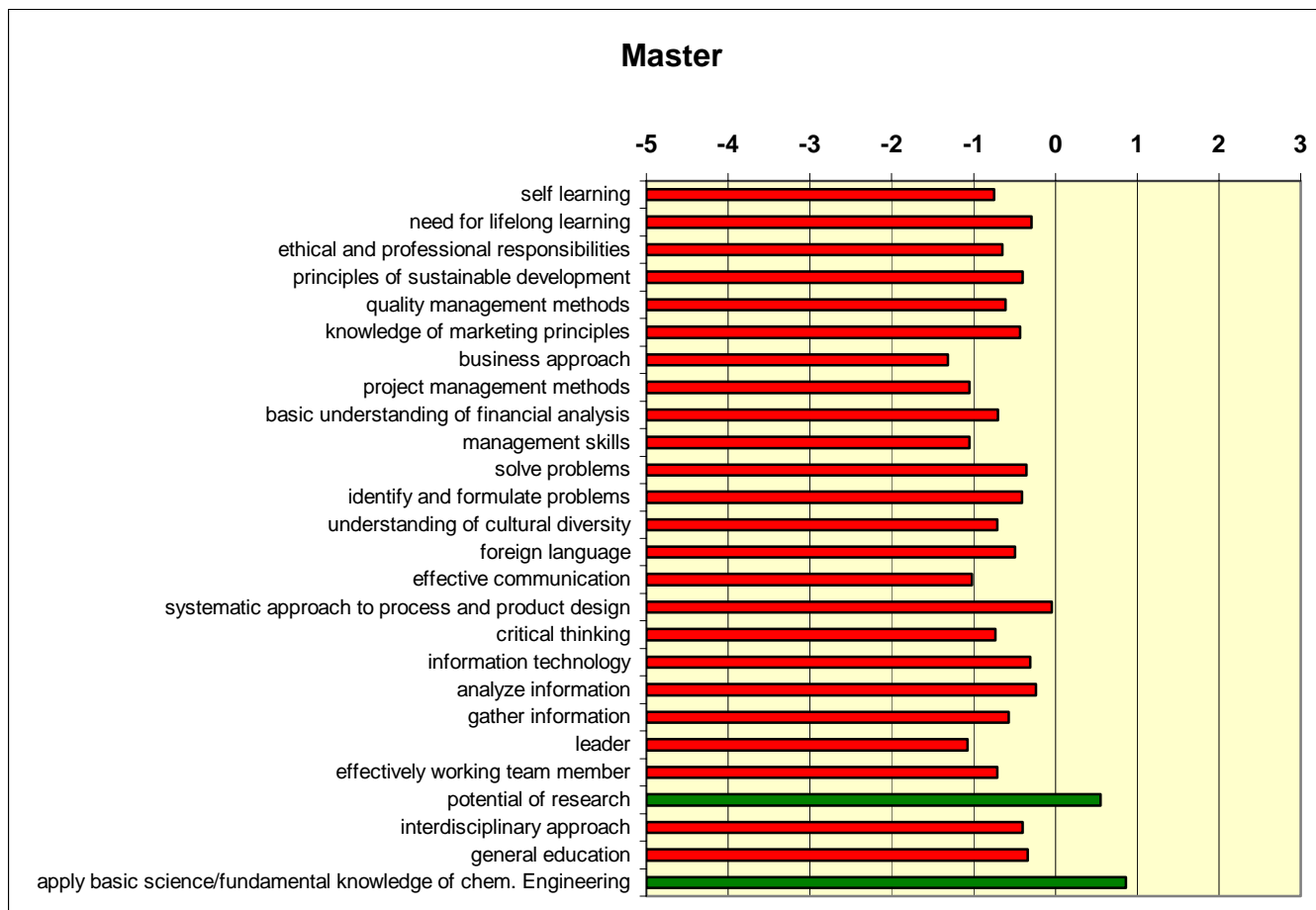


Fig. 10.15: Skills / Abilities versus **Bachelor's Degree (France)**  
 Characteristic value  $v$ :  $v < 0$  lack of qualification  
 $v > 0$  higher qualification than needed for professional job

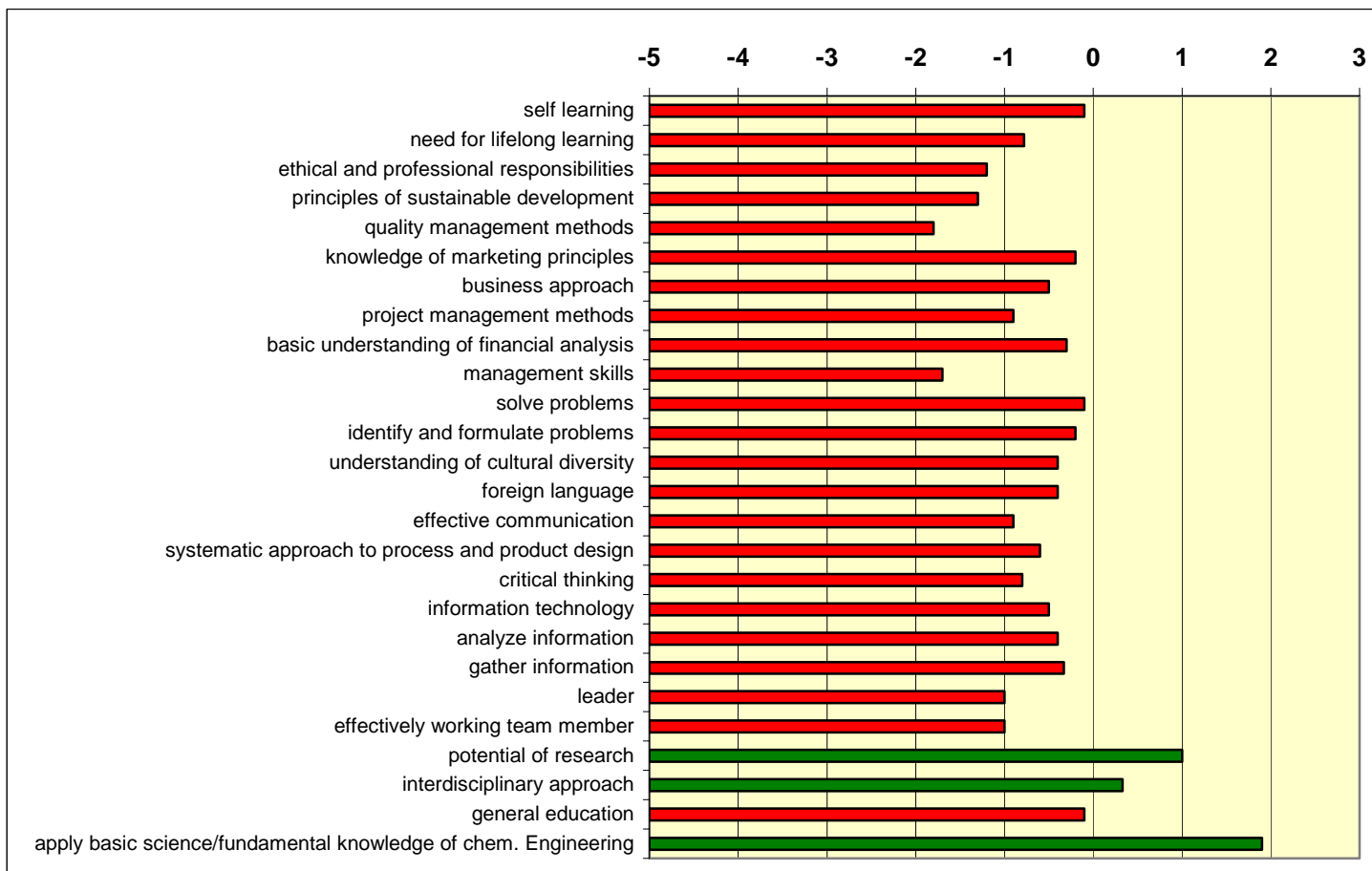


Fig. 10.16: Skills / Abilities versus **Master's Degree (United Kingdom, including British MEng., see chapter 3)**  
Characteristic value  $v$ :  
 $v < 0$  lack of qualification  
 $v > 0$  higher qualification than needed for professional job

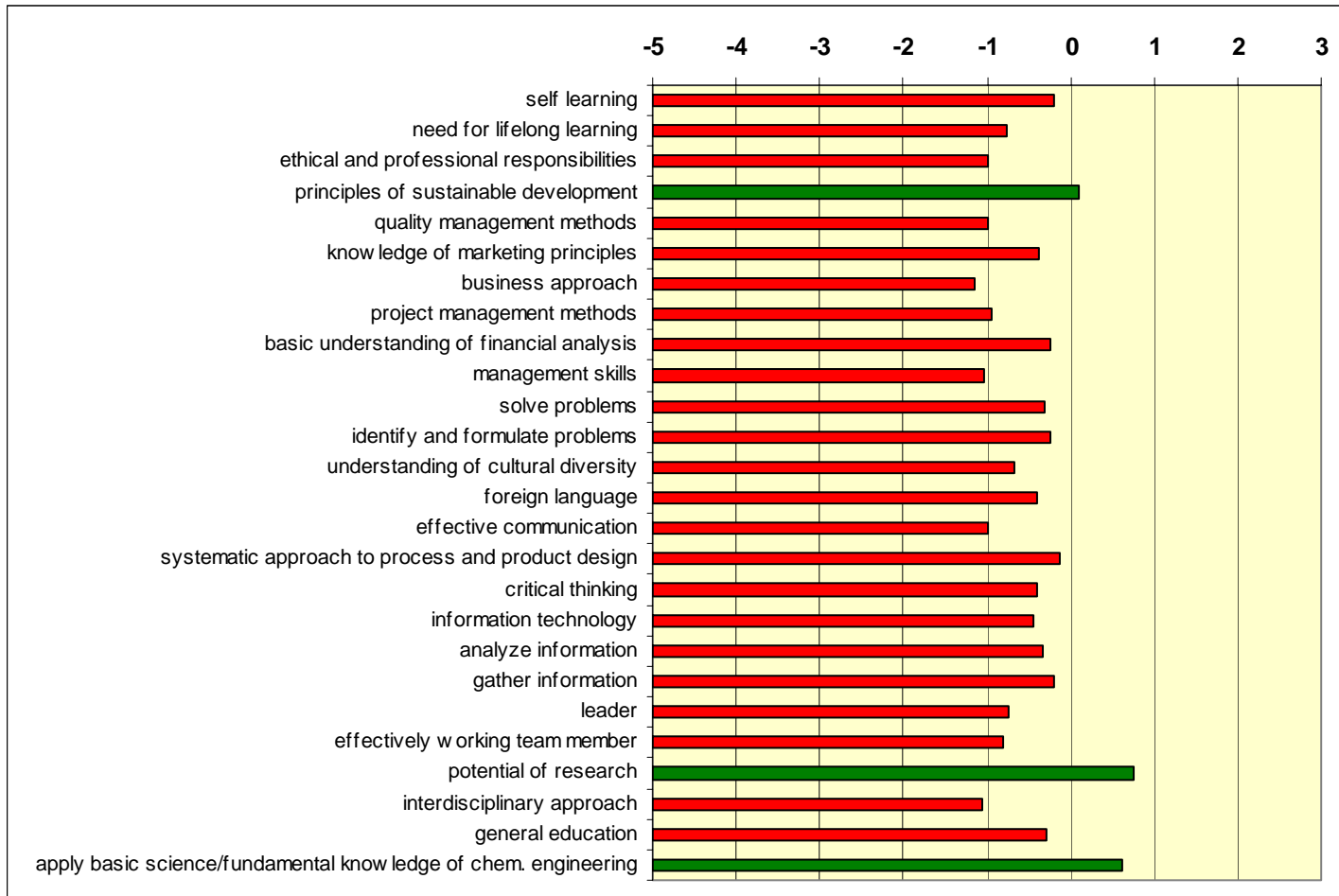


Fig. 10.17: Skills / Abilities versus **Bachelor's Degree (United Kingdom)**  
 Characteristic value v: v < 0 lack of qualification  
 v > 0 higher qualification than needed for professional job

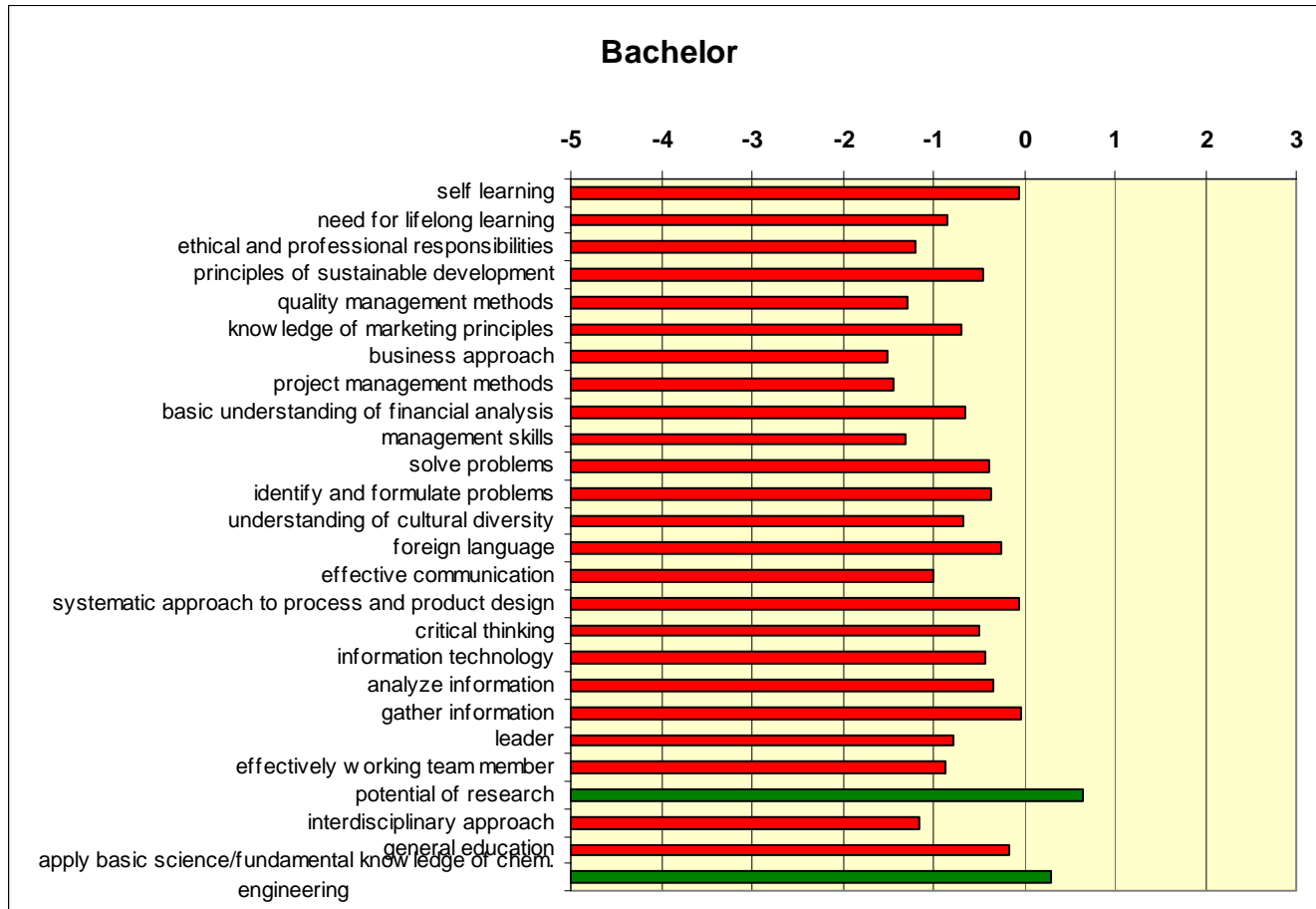




Fig. 10.18: Skills / Abilities versus

PhD (USA)

Characteristic value  $v$ :  $v < 0$  lack of qualification

$v > 0$  higher qualification than needed for professional job

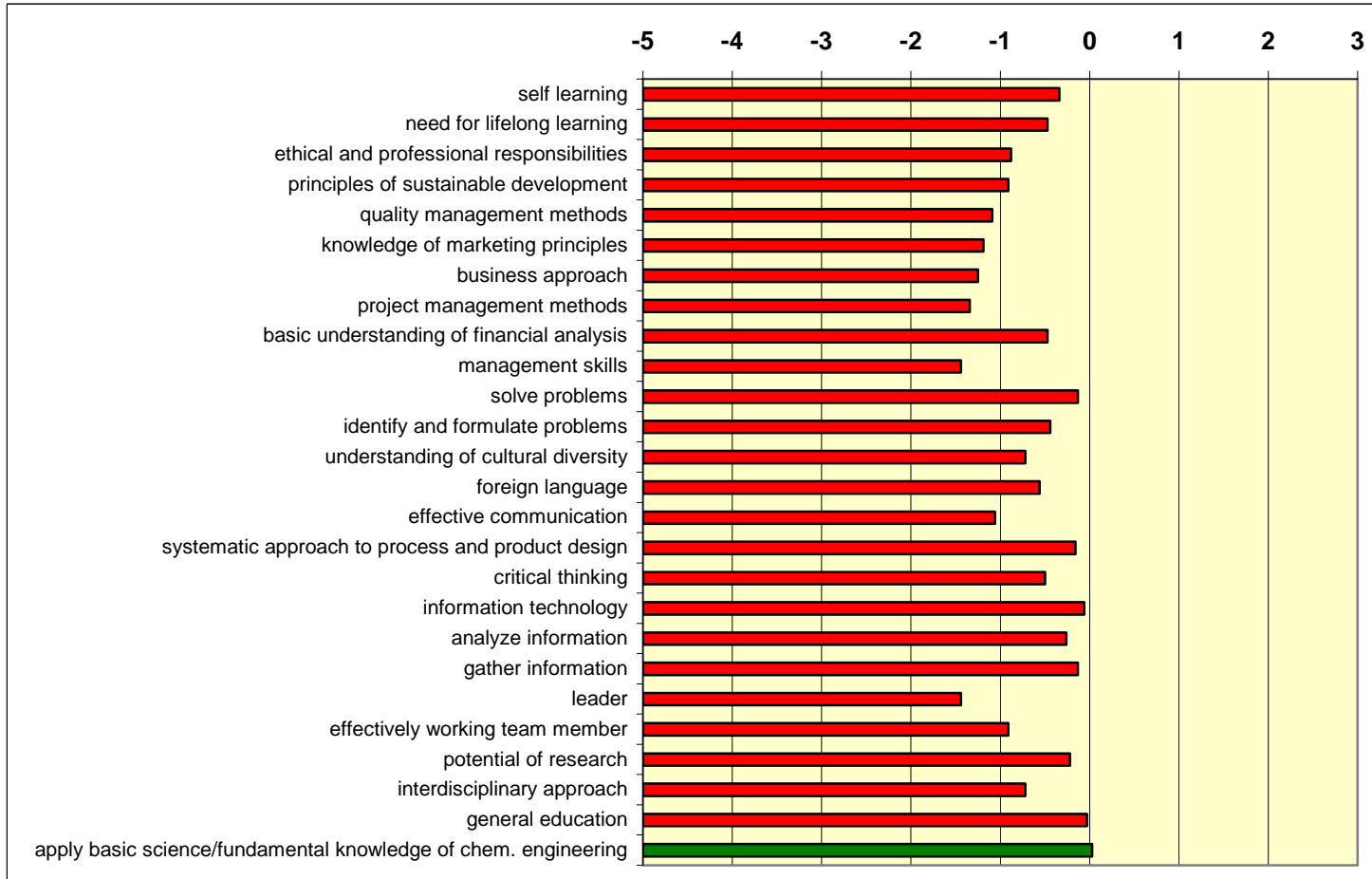


Fig. 10.18: Skills / Abilities versus

**Master's Degree (USA)**

Characteristic value v: v < 0 lack of qualification

v > 0 higher qualification than needed for professional job

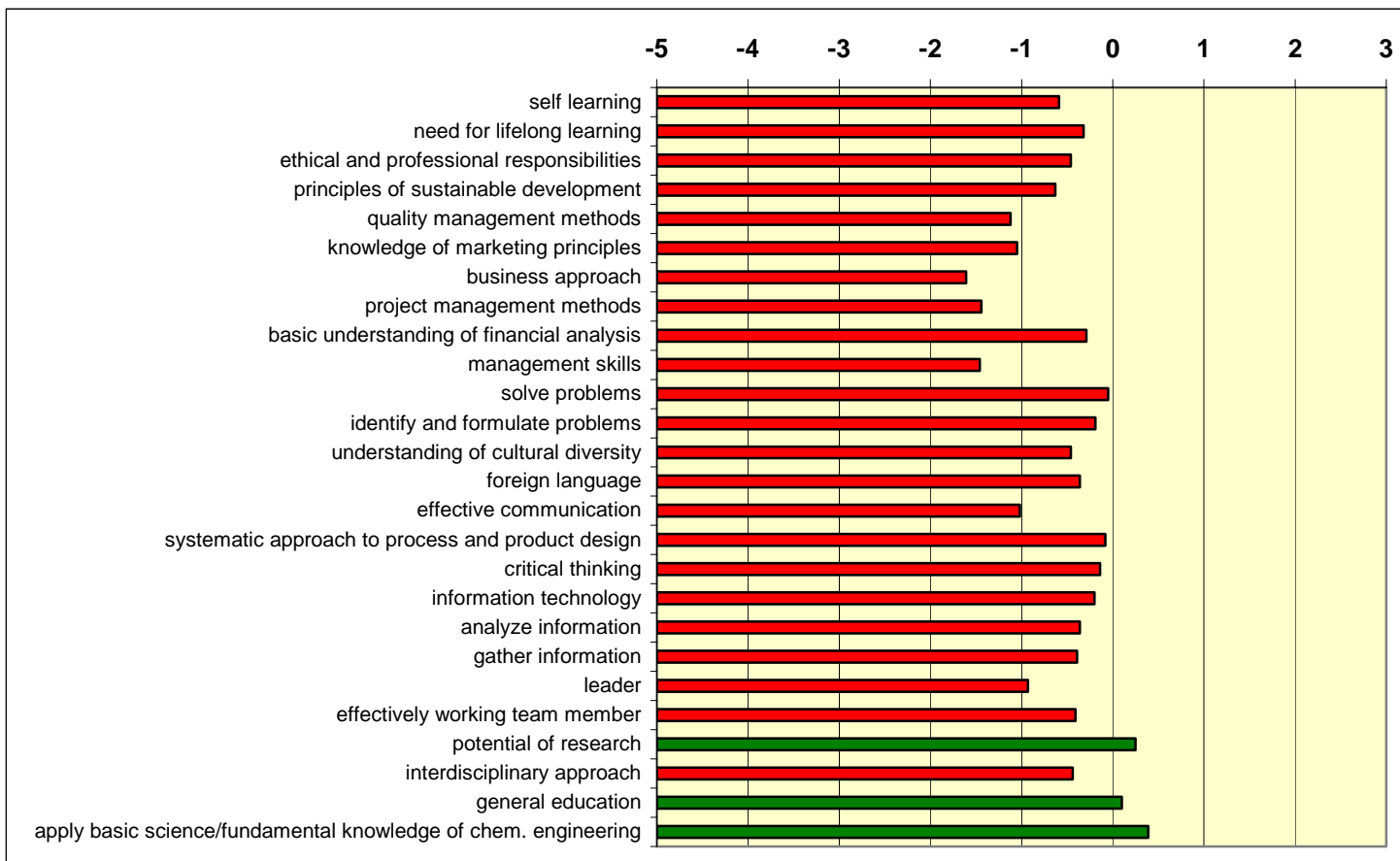


Fig. 10.19: Skills / Abilities versus

**Bachelor's Degree (USA)**

Characteristic value  $v$ :  $v < 0$  lack of qualification

$v > 0$  higher qualification than needed for professional job

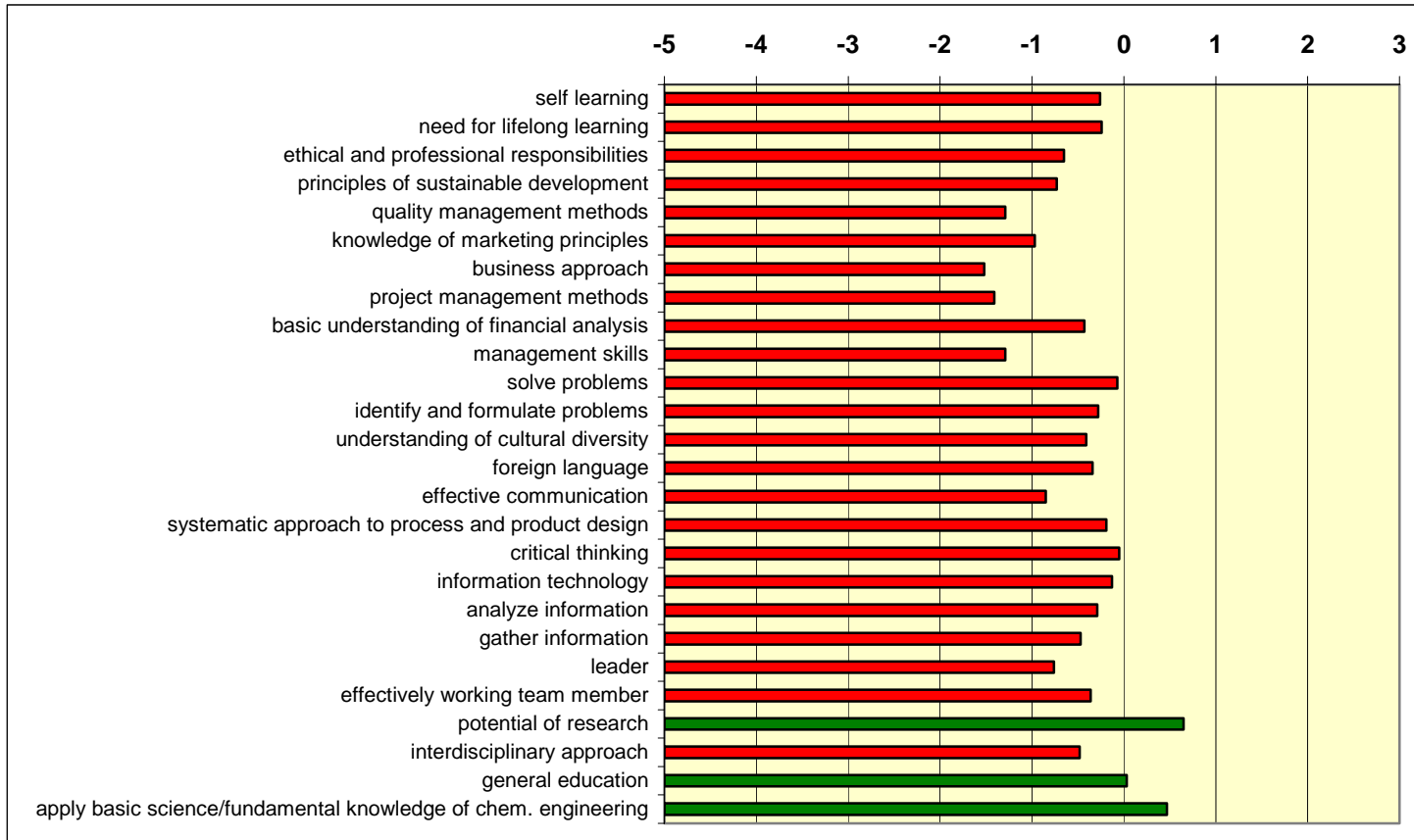


Fig. 10.19: Skills / Abilities versus

**Master's Degree (Mexico)**

Characteristic value v:  $v < 0$  lack of qualification

$v > 0$  higher qualification than needed for professional job

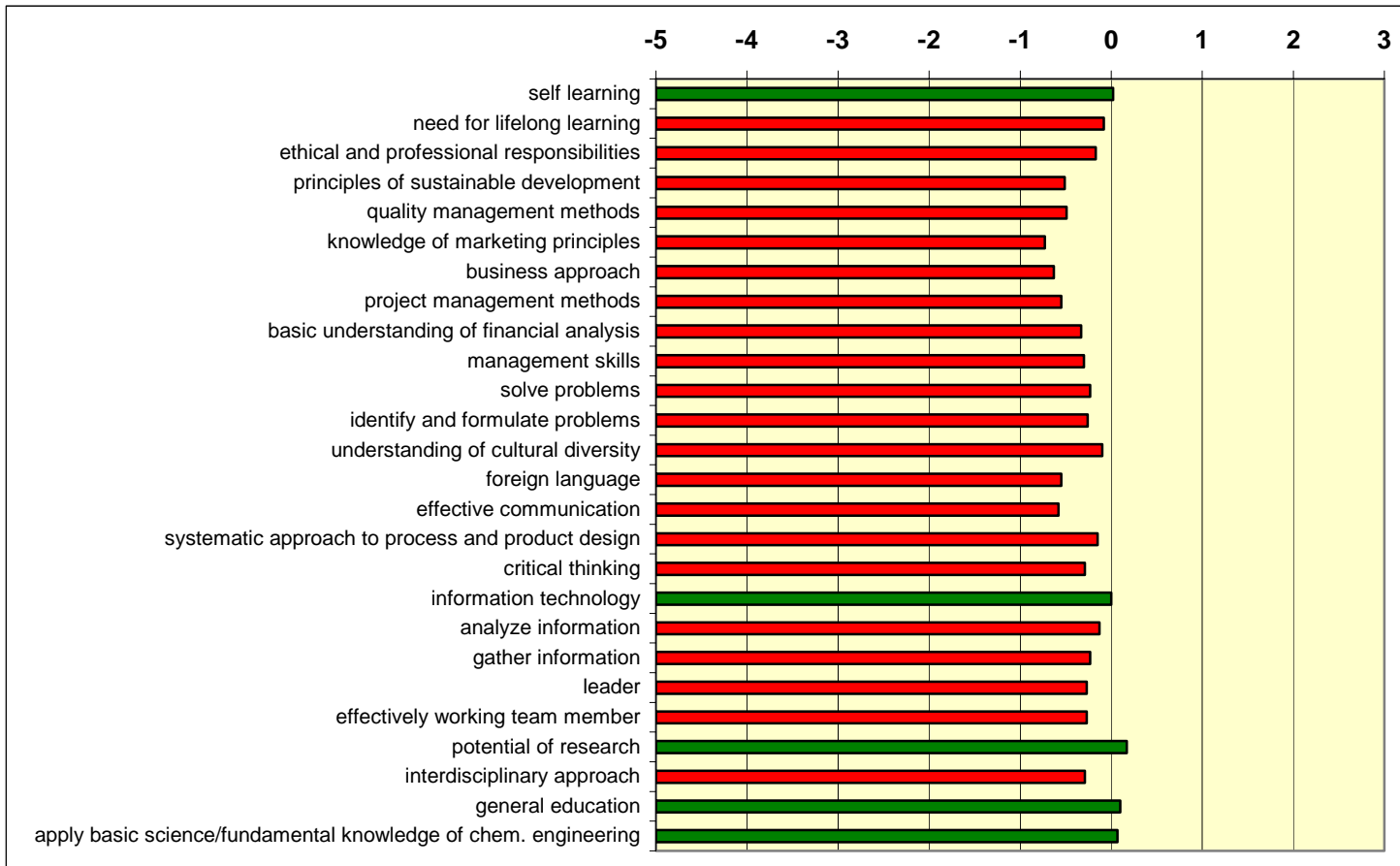


Fig. 10.20: Skills / Abilities versus

**Bachelor's Degree (Mexico)**

Characteristic value v:

$v < 0$  lack of qualification

$v > 0$  higher qualification than needed for professional job

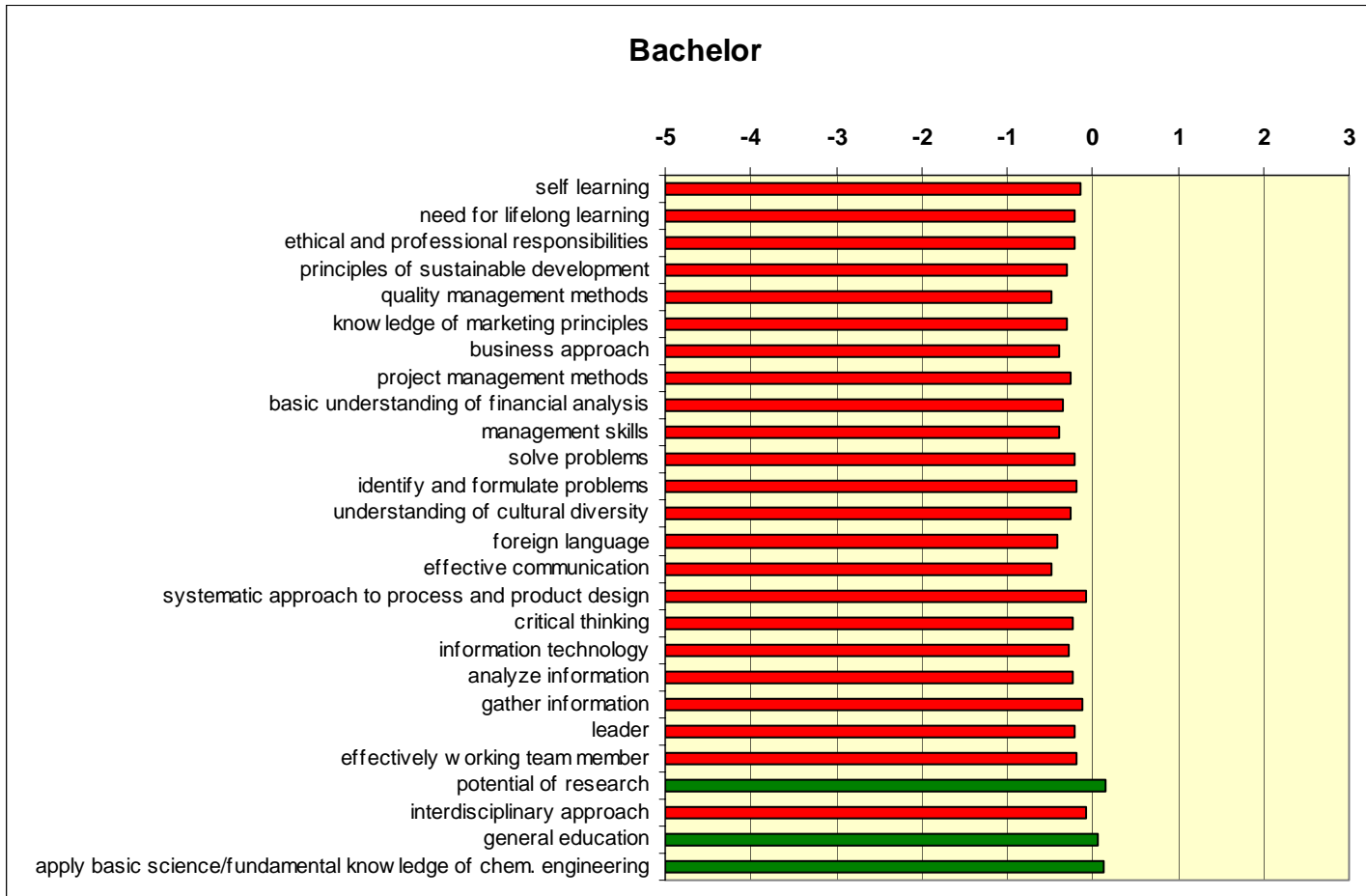


Fig. 10.21: Skills / Abilities versus **PhD Degree(China)**

Characteristic value v:  $v < 0$  lack of qualification

$v > 0$  higher qualification than needed for professional job

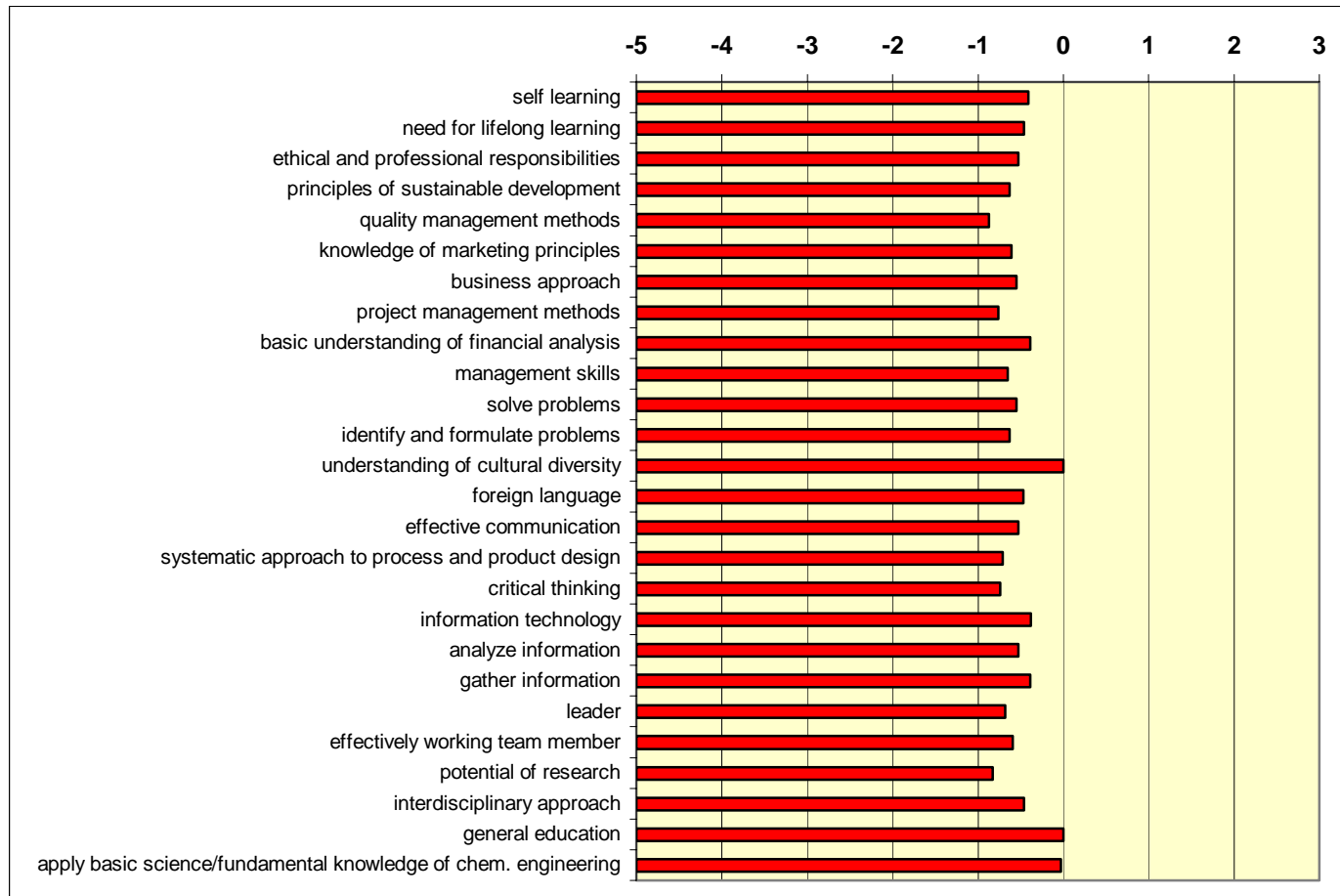


Fig. 10.22: Skills / Abilities versus **Master's Degree (China)**  
 Characteristic value  $v$ :  $v < 0$  lack of qualification  
 $v > 0$  higher qualification than needed for professional job

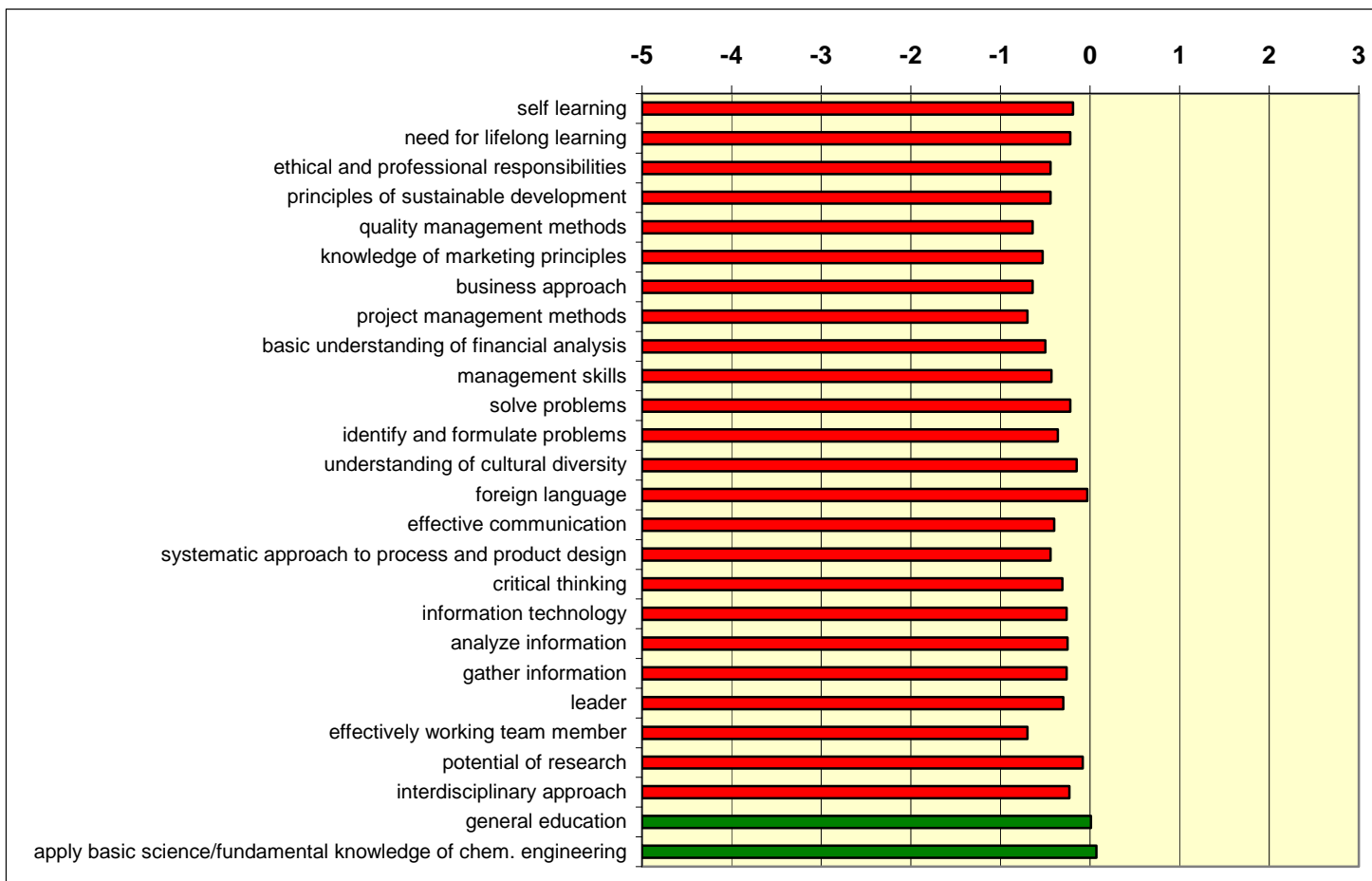


Fig. 10.23: Skills / Abilities versus **Bachelor's Degree (China)**  
 Characteristic value  $v$ :  $v < 0$  lack of qualification  
 $v > 0$  higher qualification than needed for professional job

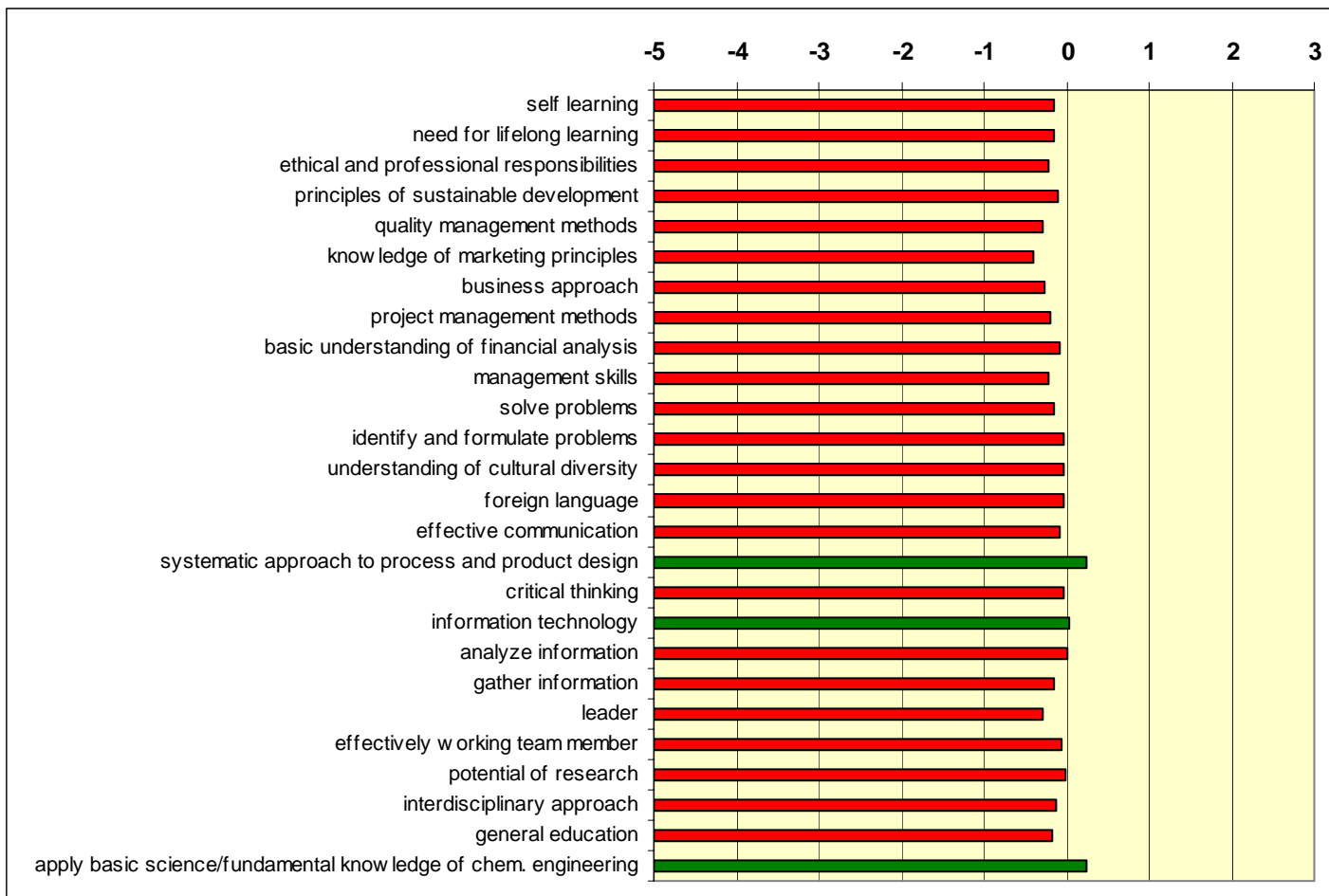


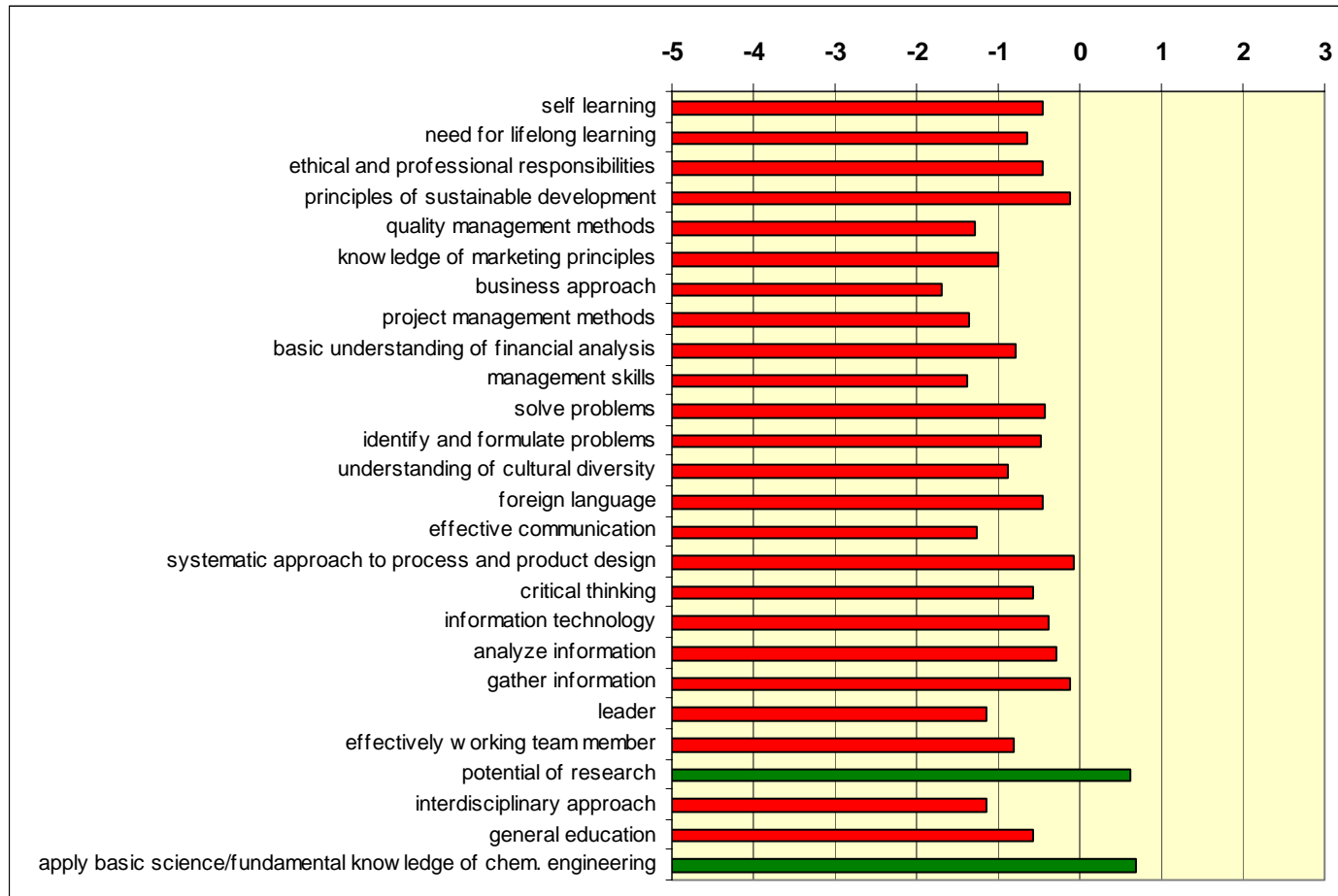


Fig. 10.24: Skills / Abilities versus  
Characteristic value v:

**Bachelor's Degree (Australia)**

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.

<b>The 5 most important Generic Skills/Abilities at work</b>	<b>rank for education</b>
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.

<b>The 5 Generic Skills/Abilities, which are least fostered at university compared with the demands of employment</b>	<b>deviation</b>	<b>rank at work</b>
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.

<b>Country</b>	<b>Bachelor</b>	<b>Master</b>	<b>PhD</b>
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 similar 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

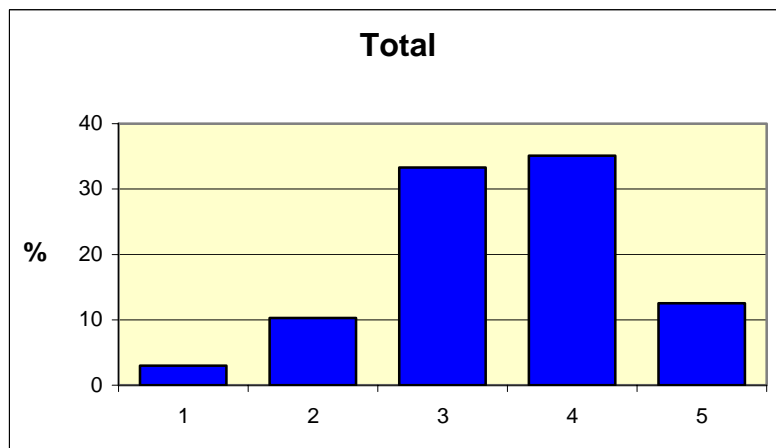


Fig. 11.1: Ranking of "The teaching staff motivated me" for All Participants

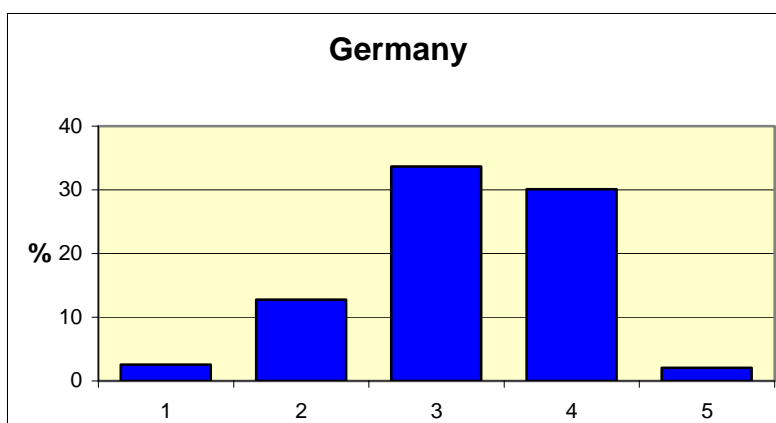


Fig. 11.2: Ranking of "The teaching staff motivated me" for Germany

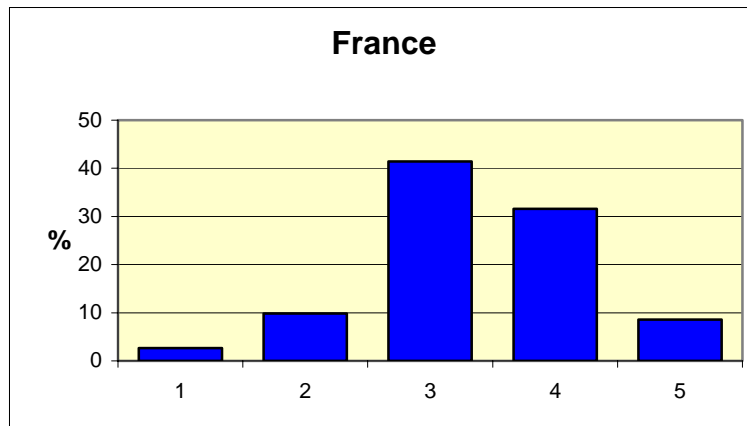


Fig. 11.3: Ranking of "The teaching staff motivated me" for France

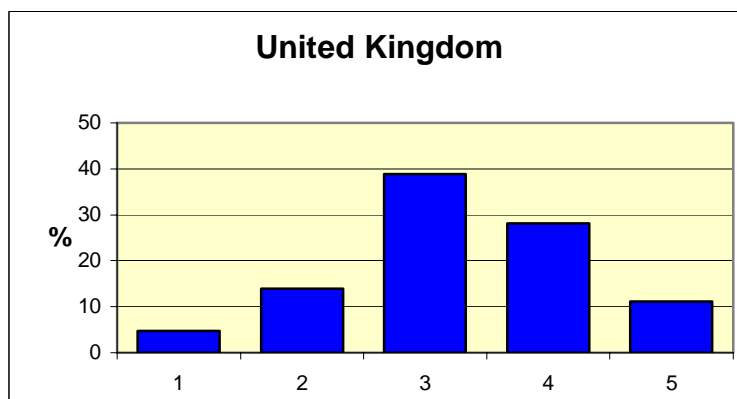


Fig. 11.4: Ranking of "The teaching staff motivated me" for United Kingdom

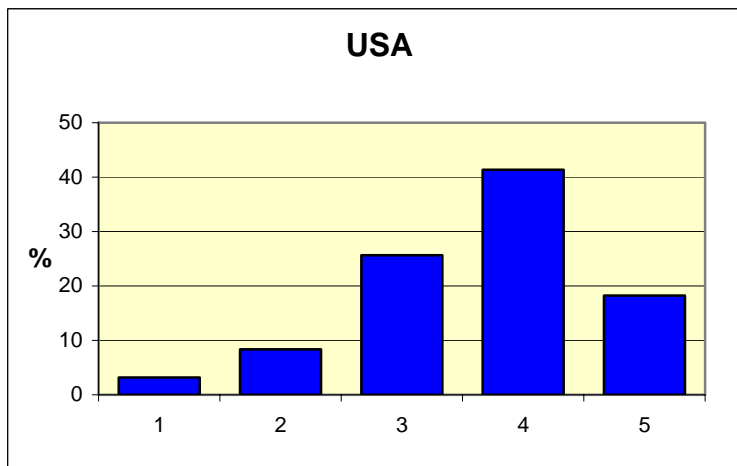


Fig. 11.5: Ranking of "The teaching staff motivated me" for USA

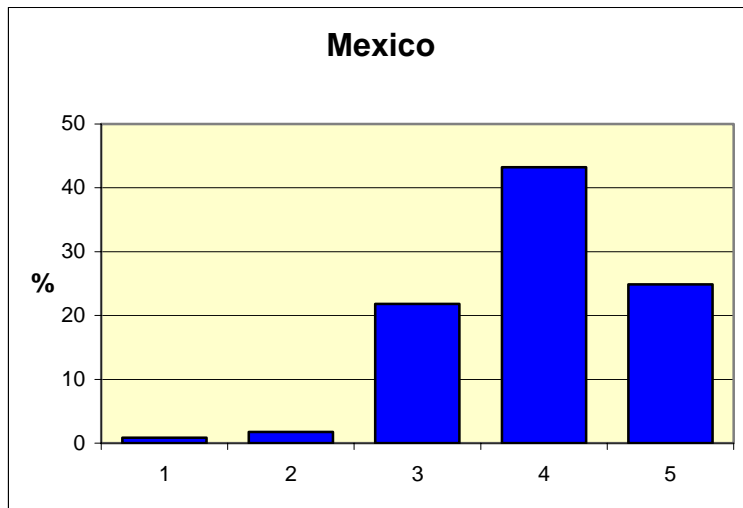


Fig. 11.6: Ranking of "The teaching staff motivated me" for Mexico

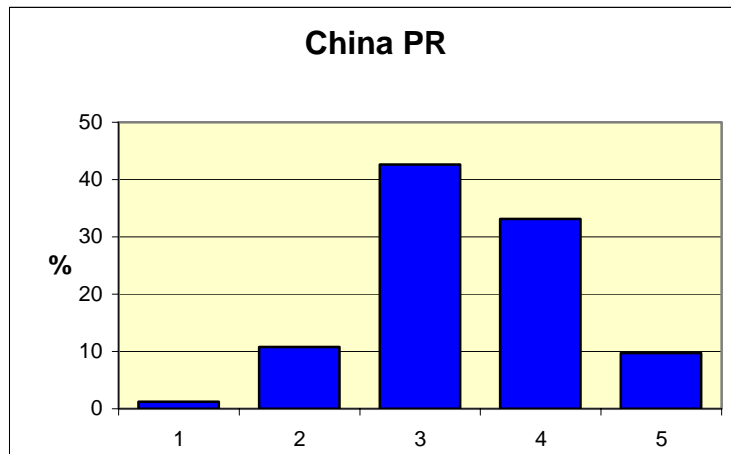


Fig. 11.7: Ranking of "The teaching staff motivated me" for China

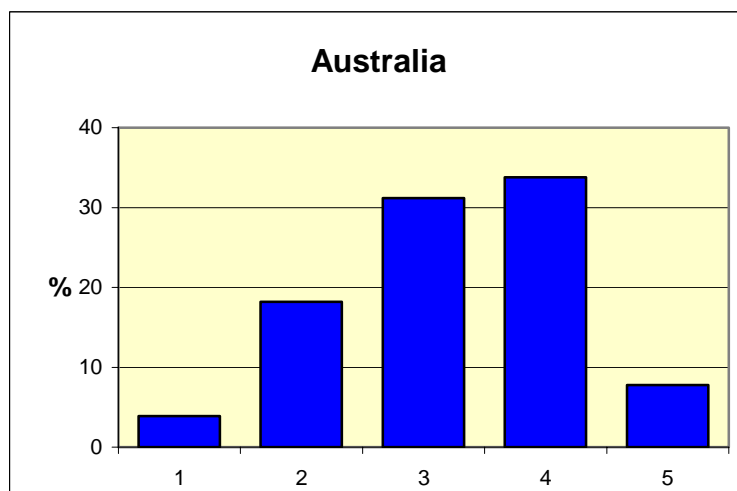


Fig. 11.8: Ranking of "The teaching staff motivated me" for Australia

## 11.2 The Teaching Staff Normally Gave Me Helpful Feedback

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

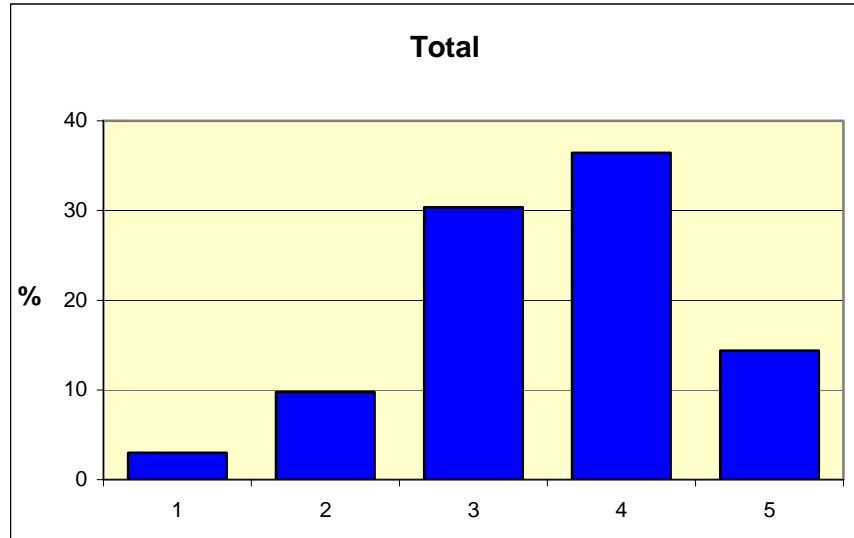


Fig. 11.9: Ranking of "The teaching staff normally gave me helpful feedback" for all participants

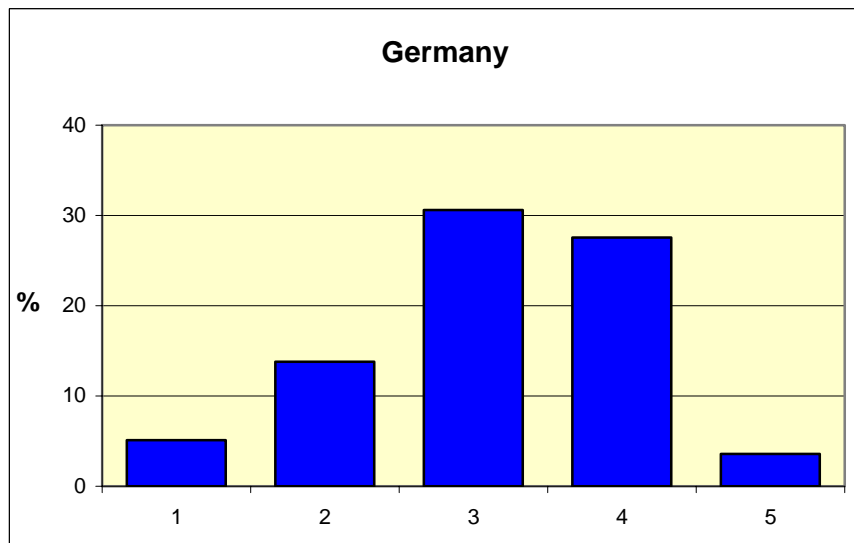


Fig. 11.10 Ranking of "The teaching staff normally gave me helpful feedback" for Germany



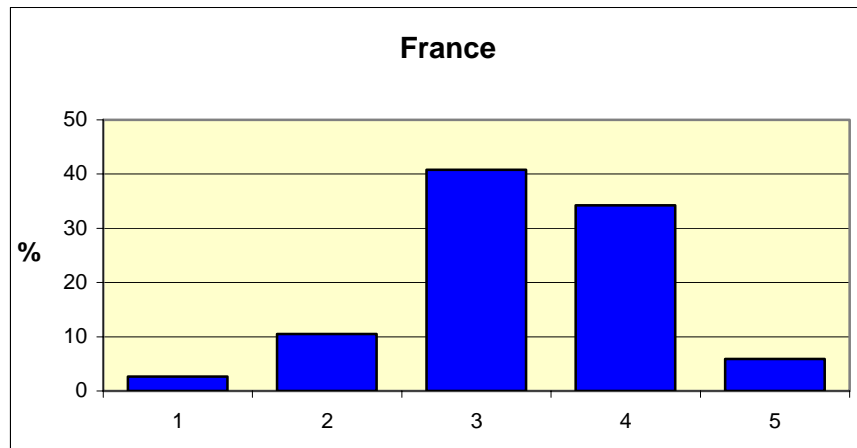


Fig. 11.11 Ranking of "The teaching staff normally gave me helpful feedback" for France

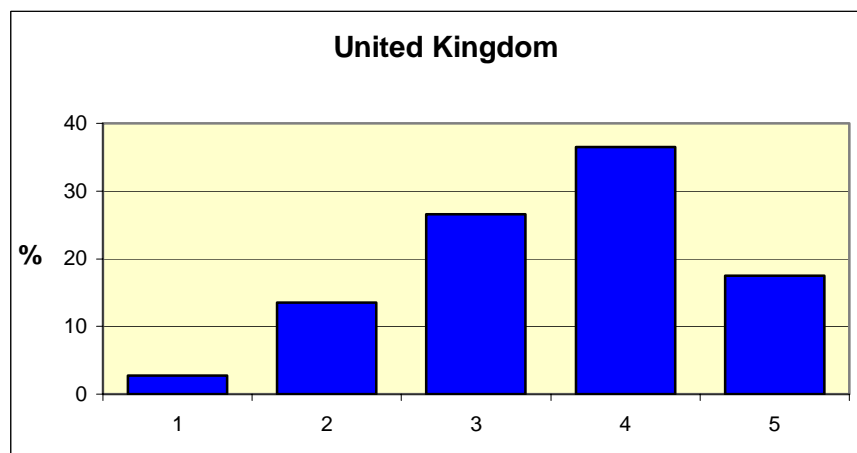


Fig. 11.12 Ranking of "The teaching staff normally gave me helpful feedback" for United Kingdom

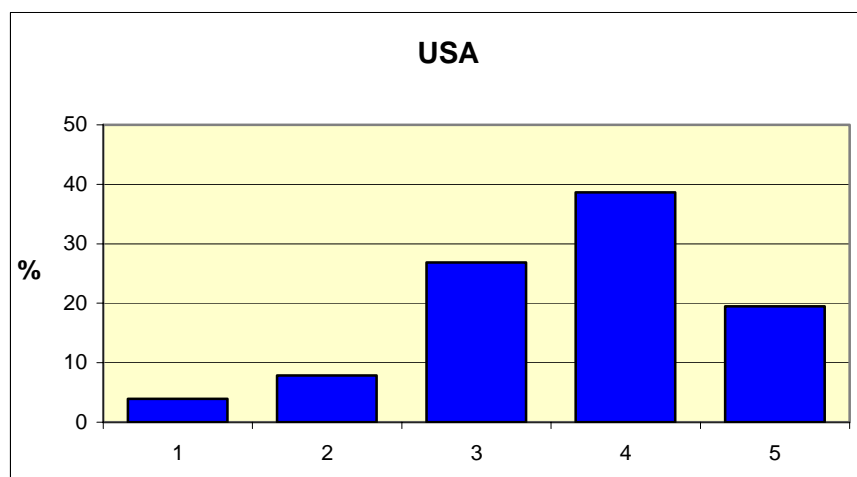


Fig. 11.13 Ranking of "The teaching staff normally gave me helpful feedback" for USA

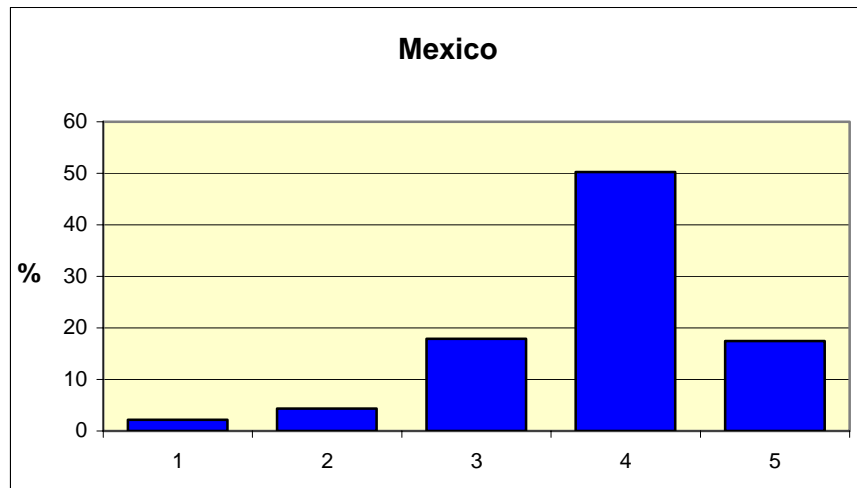


Fig. 11.14 Ranking of "The teaching staff normally gave me helpful feedback" for Mexico

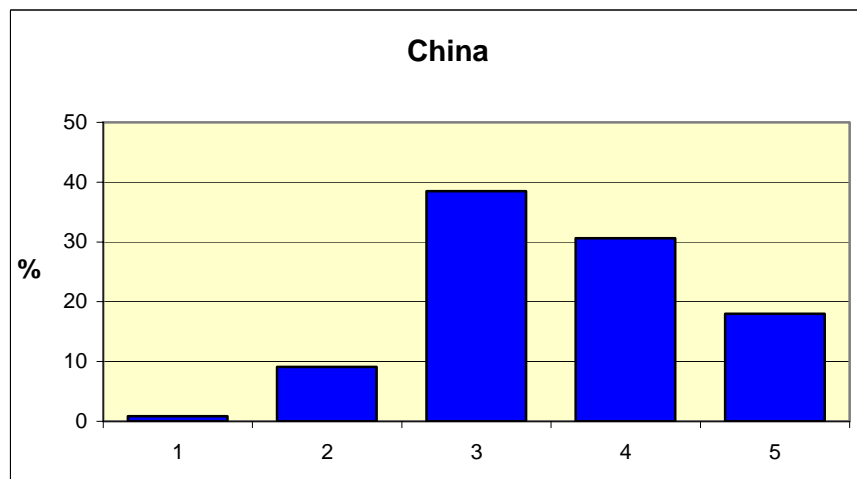


Fig. 11.15 Ranking of "The teaching staff normally gave me helpful feedback" for China

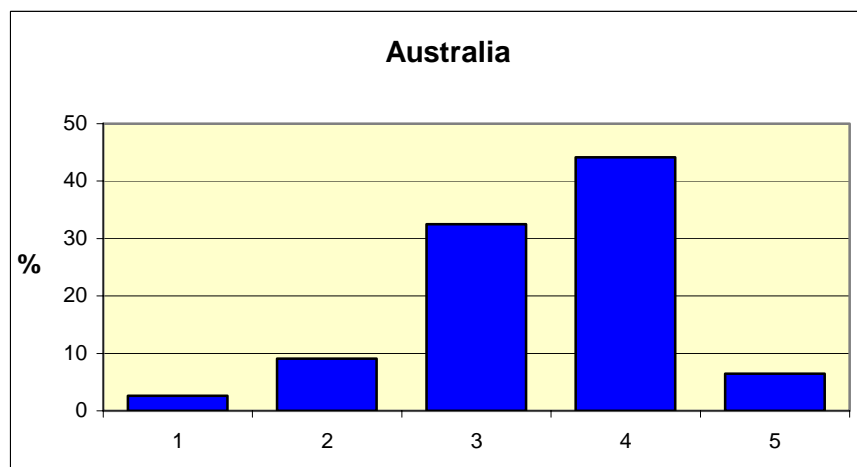


Fig. 11.16 Ranking of "The teaching staff normally gave me helpful feedback" for Australia

### 11.3 My Lectures Were Excellent and Inspiring

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

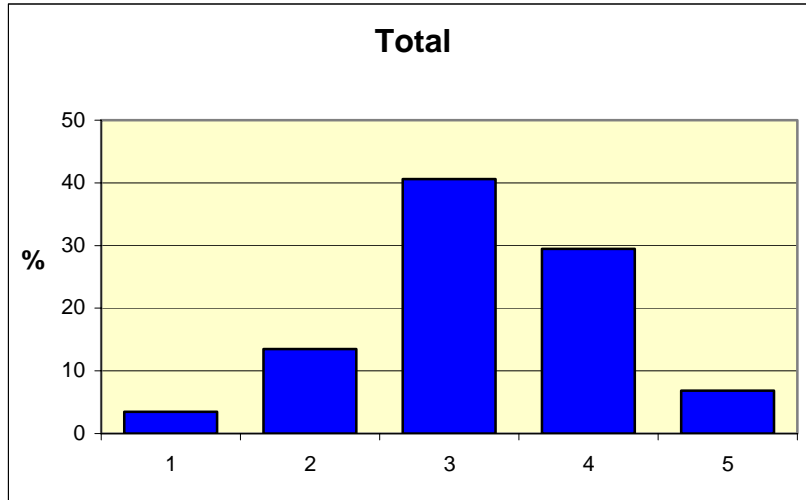


Fig. 11.17 Ranking of “My lectures were excellent and inspiring“ for all participants

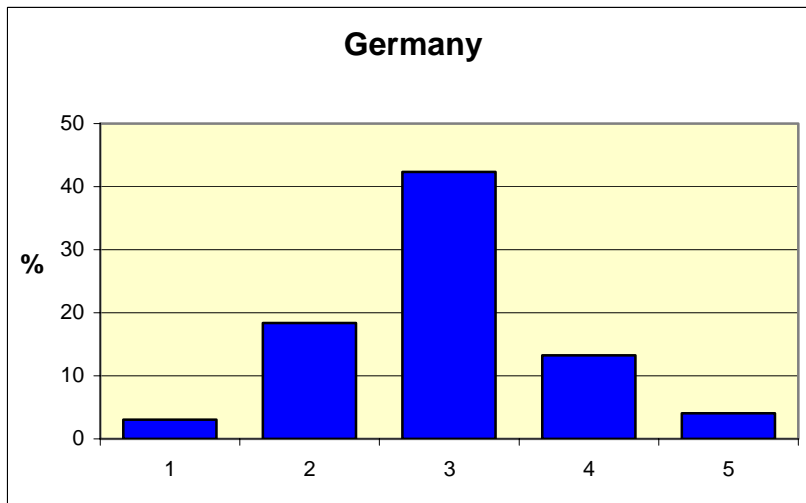


Fig. 11.18 Ranking of “My lectures were excellent and inspiring“ for Germany

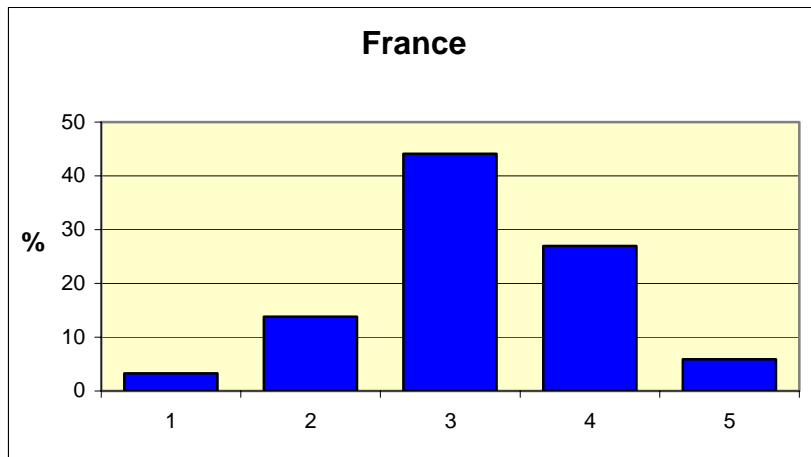


Fig. 11.19 Ranking of "My lectures were excellent and inspiring" for France

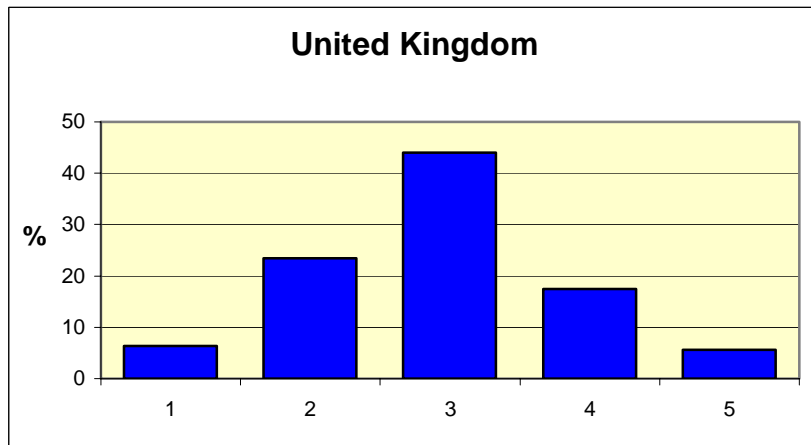


Fig. 11.20 Ranking of "My lectures were excellent and inspiring" for United Kingdom

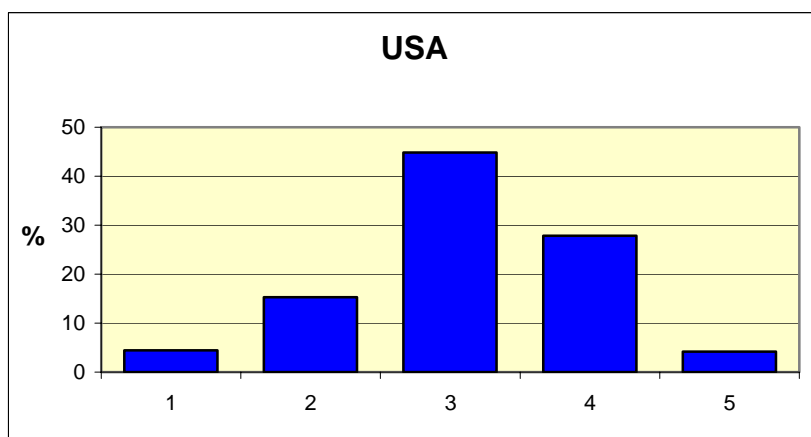


Fig. 11.21 Ranking of "My lectures were excellent and inspiring" for USA

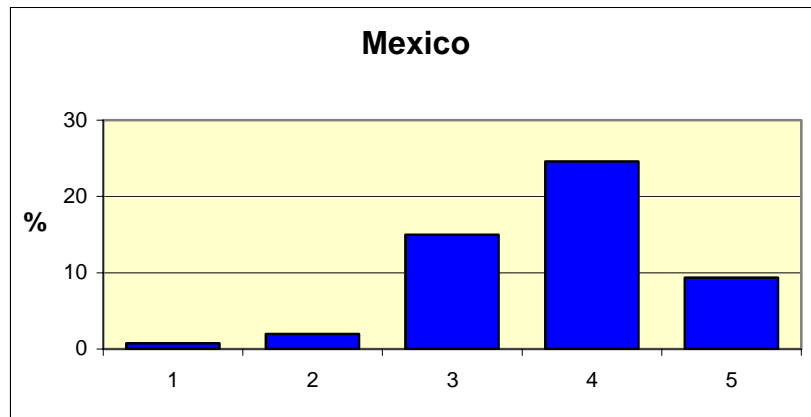


Fig. 11.22 Ranking of "My lectures were excellent and inspiring" for Mexico

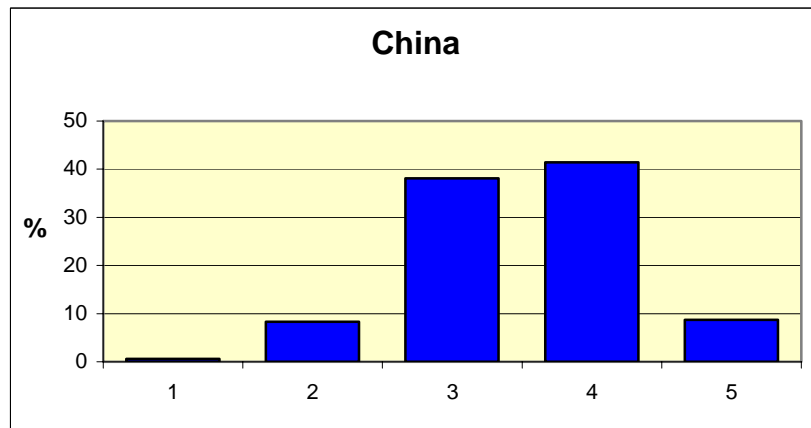


Fig. 11.23 Ranking of "My lectures were excellent and inspiring" for China

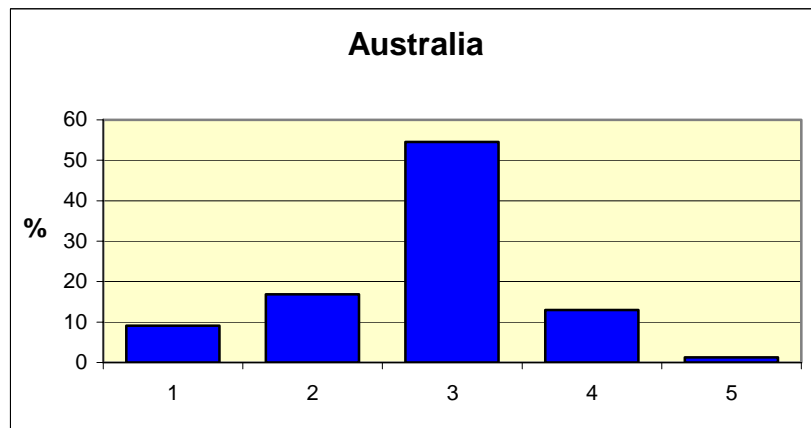


Fig. 11.24 Ranking of "My lectures were excellent and inspiring" for Australia

### 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

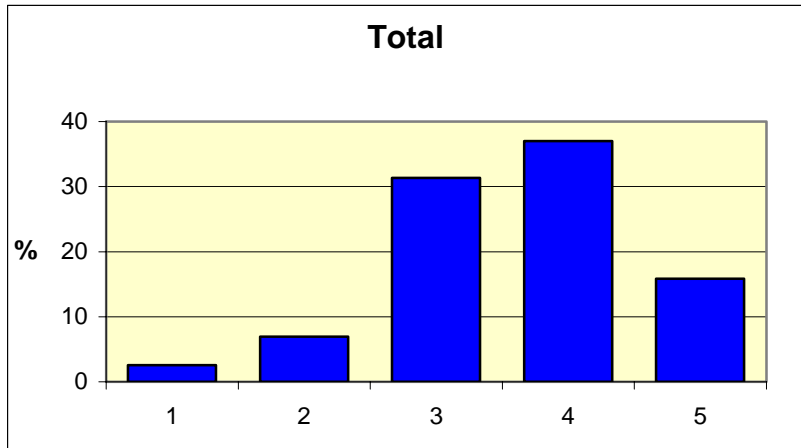


Fig. 11.25 Ranking of “The assessment methods employed required an in-depth understanding of the course content“ for all participants

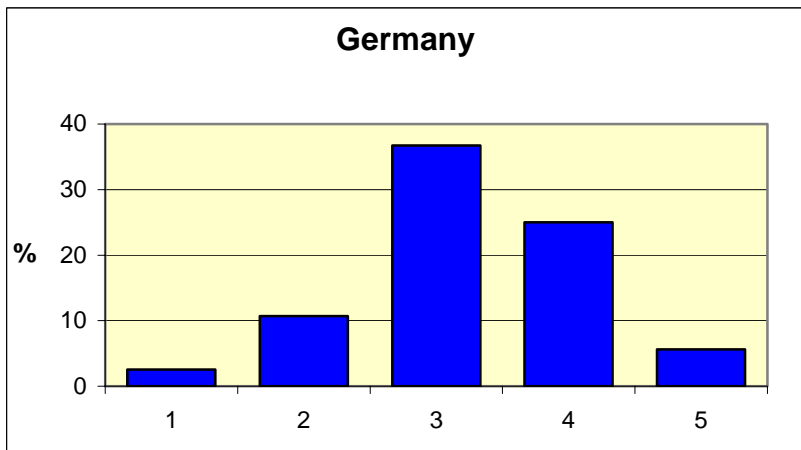


Fig. 11.26 Ranking of “The assessment methods employed required an in-depth understanding of the course content“ for Germany

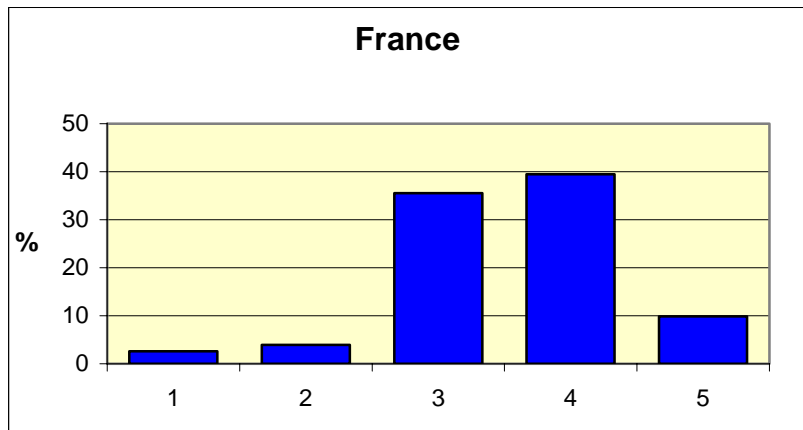


Fig. 11.27 Ranking of "The assessment methods employed required an in-depth understanding of the course content" for France

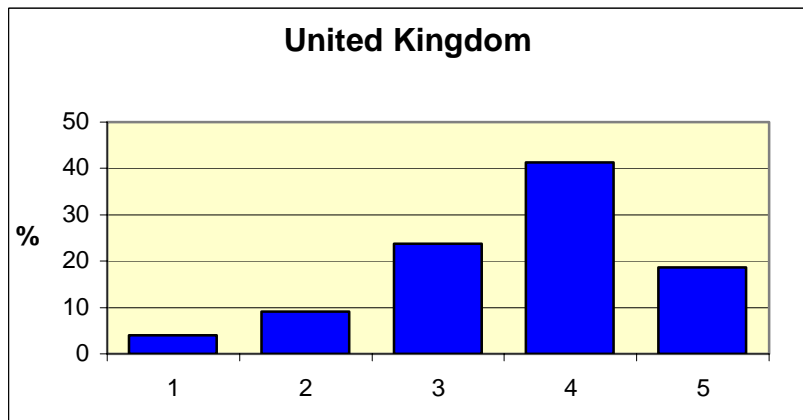


Fig. 11.28 Ranking of "The assessment methods employed required an in-depth understanding of the course content" for United Kingdom

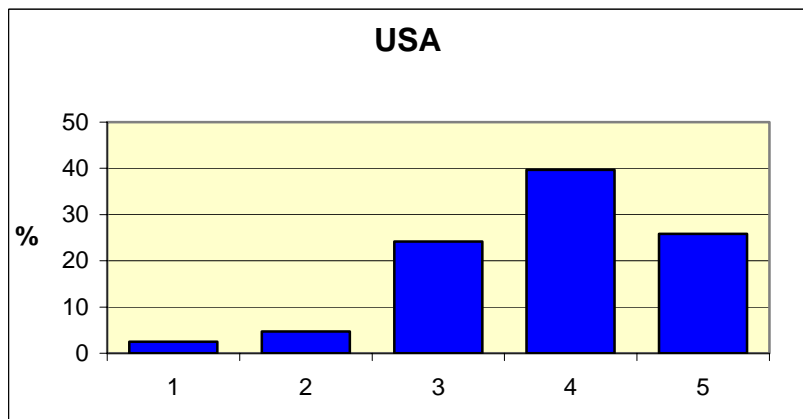


Fig. 11.29 Ranking of "The assessment methods employed required an in-depth understanding of the course content" for USA

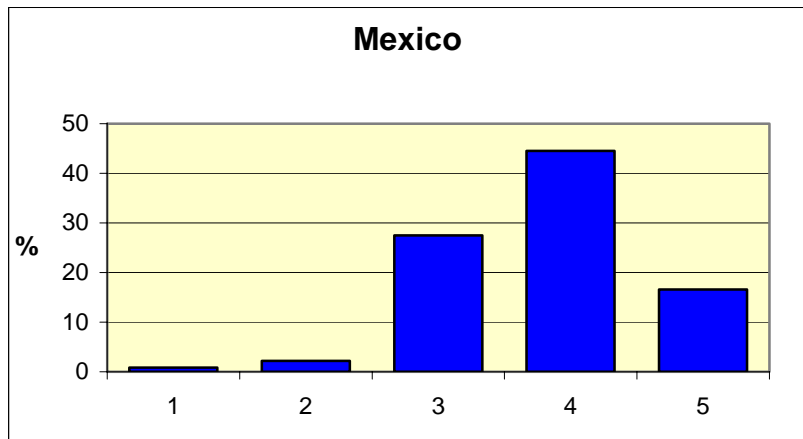


Fig. 11.30 Ranking of “The assessment methods employed required an in-depth understanding of the course content” for Mexico

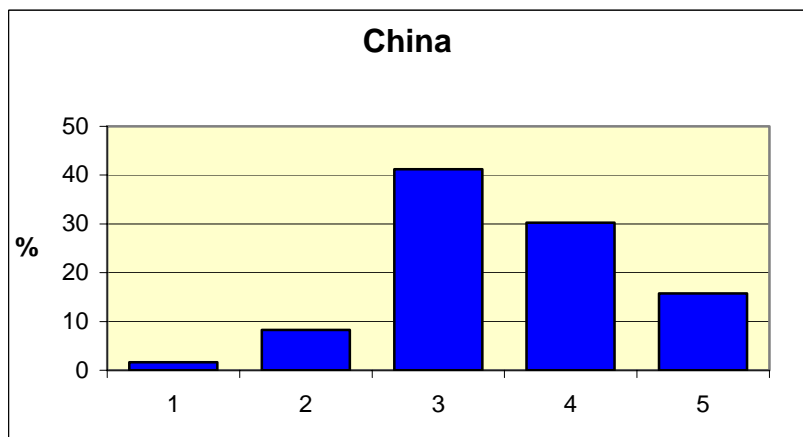


Fig. 11.31 Ranking of “The assessment methods employed required an in-depth understanding of the course content” for China

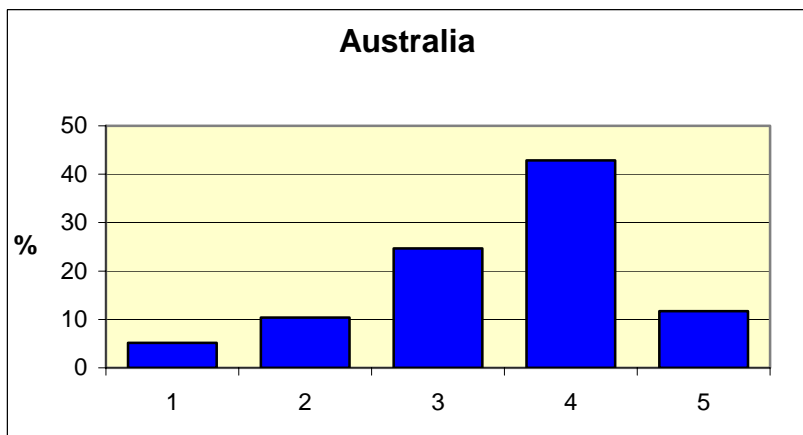


Fig. 11.32 Ranking of “The assessment methods employed required an in-depth understanding of the course content” for Australia



### 11.5 The Study Programme was Efficiently Organised

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

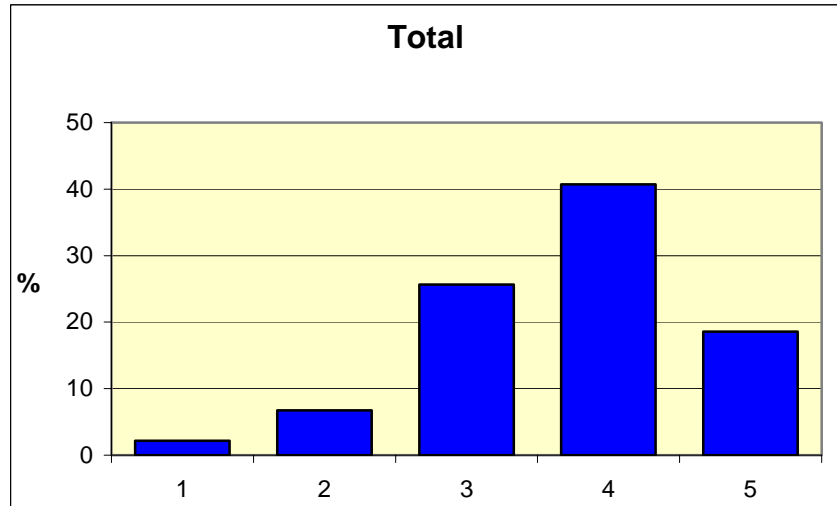


Fig. 11.33 Ranking of "The study programme was efficiently organised" for all participants

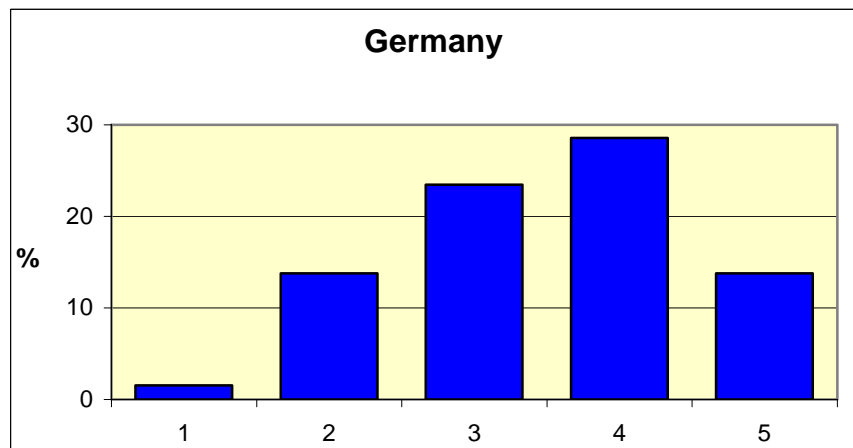


Fig. 11.34 Ranking of "The study programme was efficiently organised" for Germany

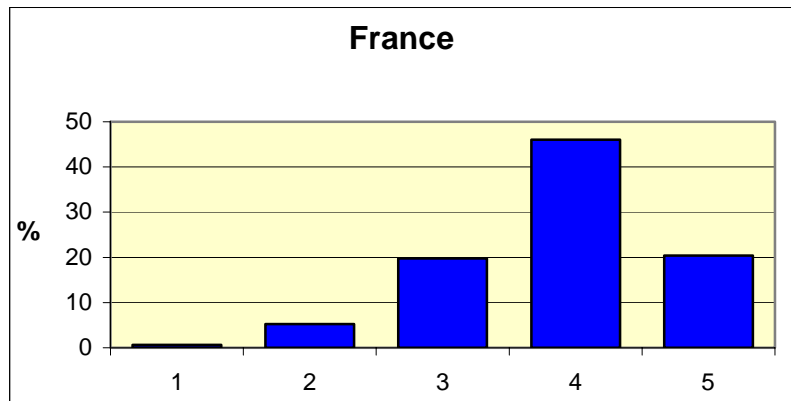


Fig. 11.35 Ranking of "The study programme was efficiently organised" for France

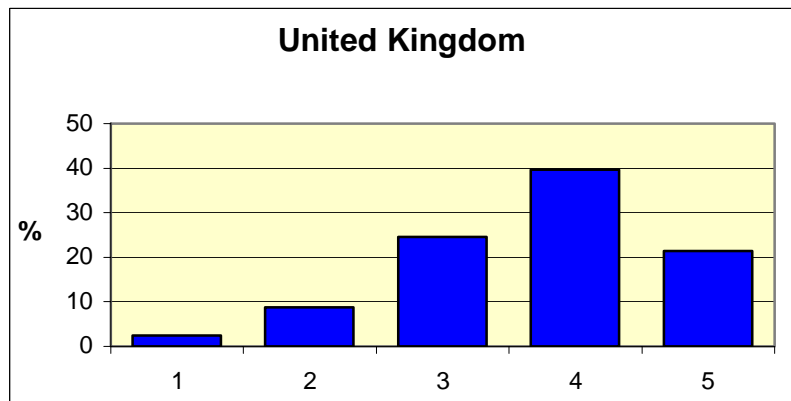


Fig. 11.36 Ranking of "The study programme was efficiently organised" for United Kingdom

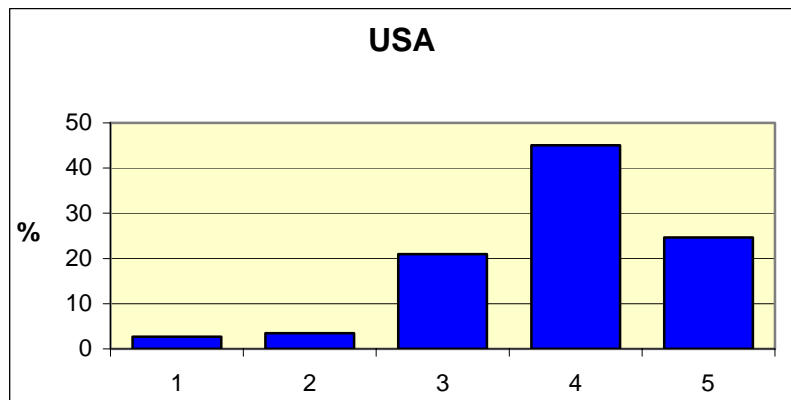


Fig. 11.37 Ranking of "The study programme was efficiently organised" for USA

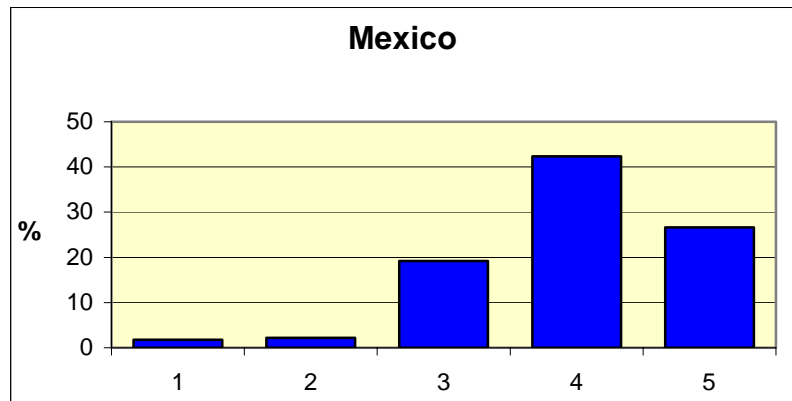


Fig. 11.38 Ranking of "The study programme was efficiently organised" for Mexico

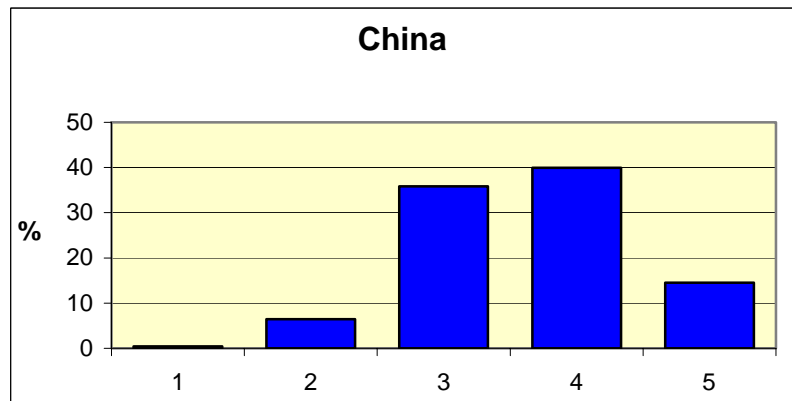


Fig. 11.39 Ranking of "The study programme was efficiently organised" for China

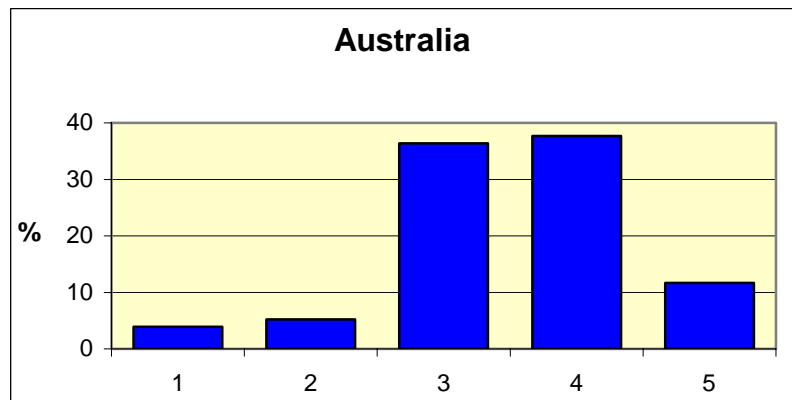


Fig. 11.40 Ranking of "The study programme was efficiently organised" for Australia

## 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)

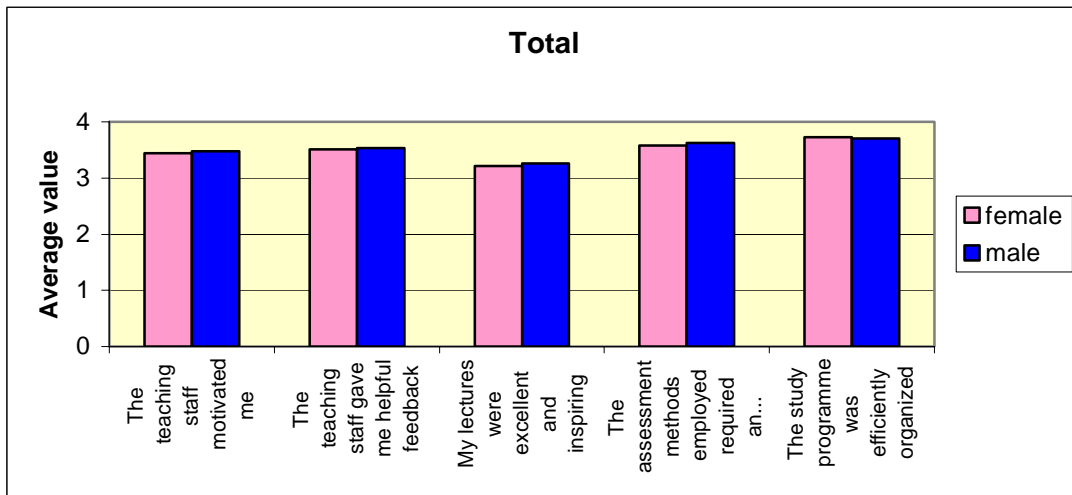


Fig. 11.41: Distribution of Average Values for All Participants

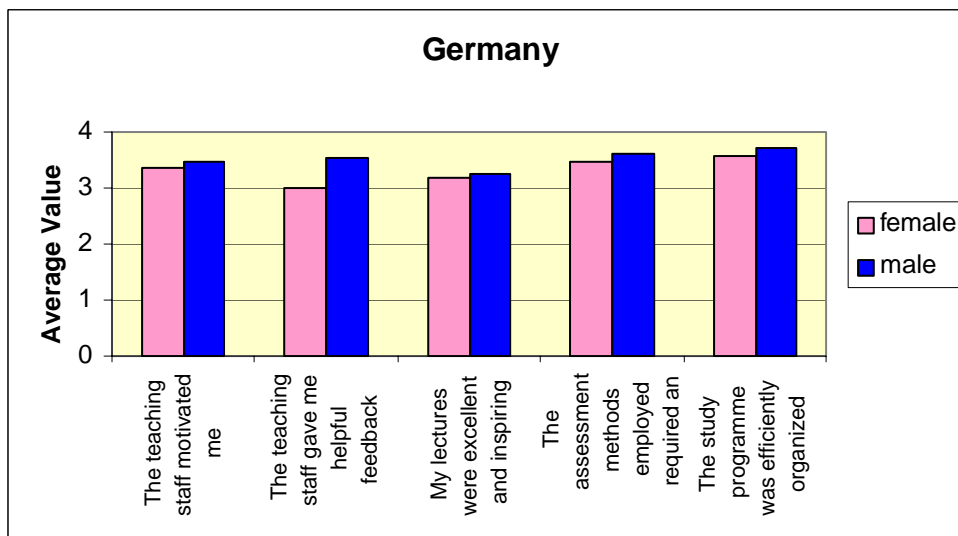


Fig. 11.42: Distribution of Average Values for Germany

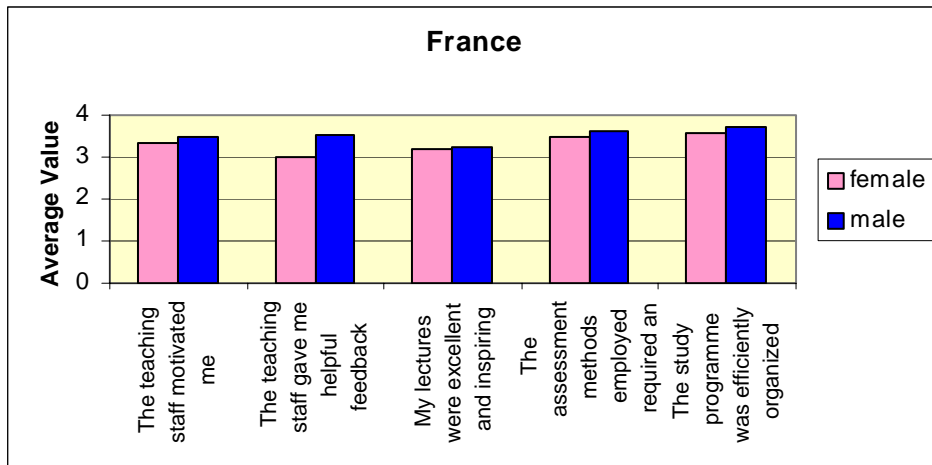


Fig. 11.43: Distribution of Average Values for France

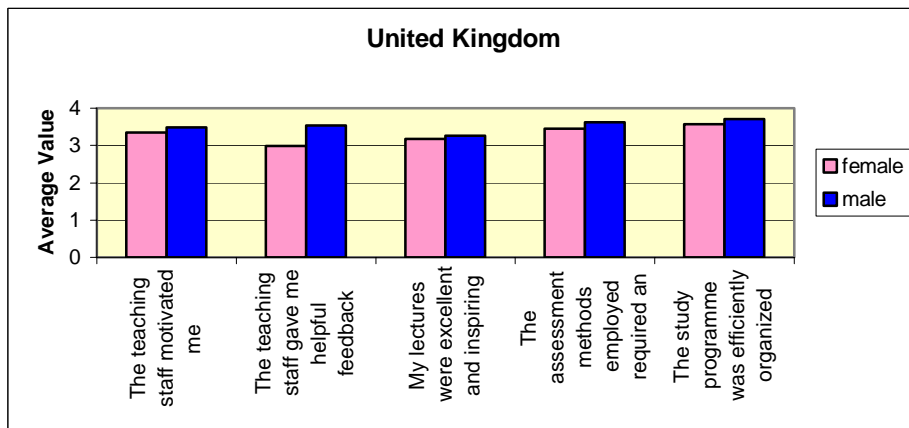


Fig. 11.44: Distribution of Average Values for United Kingdom

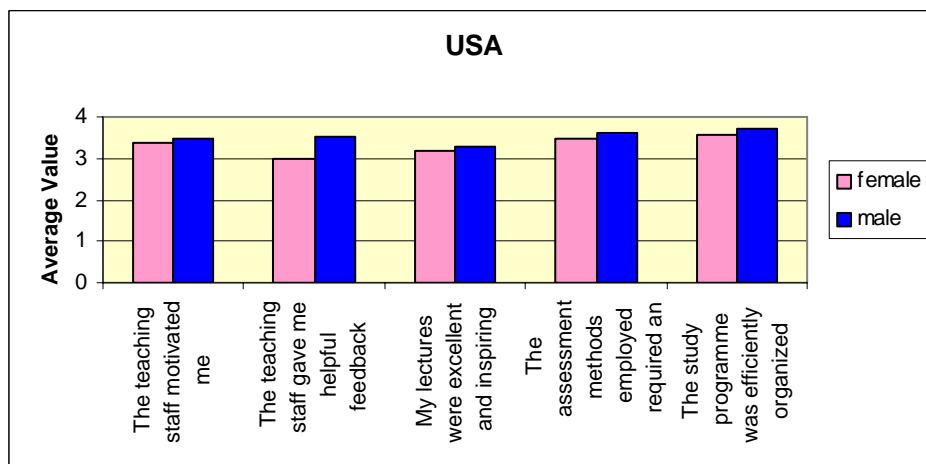


Fig. 11.45: Distribution of Average Values for USA

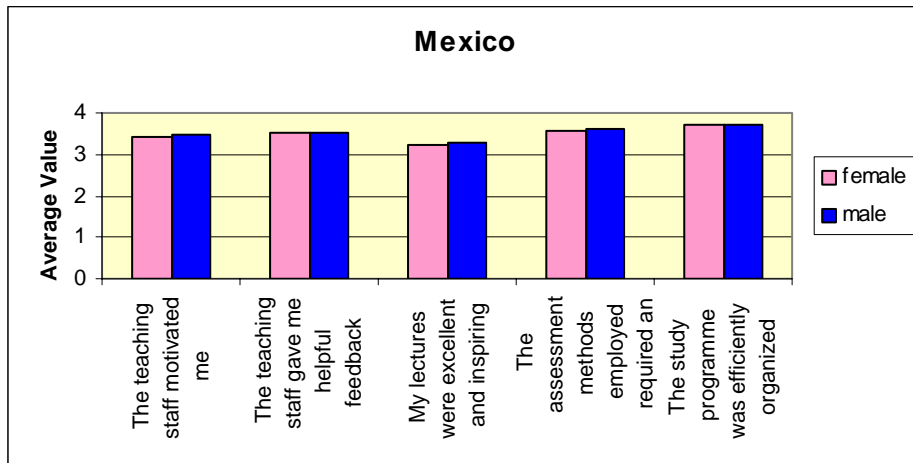


Fig. 11.46: Distribution of Average Values for Mexico

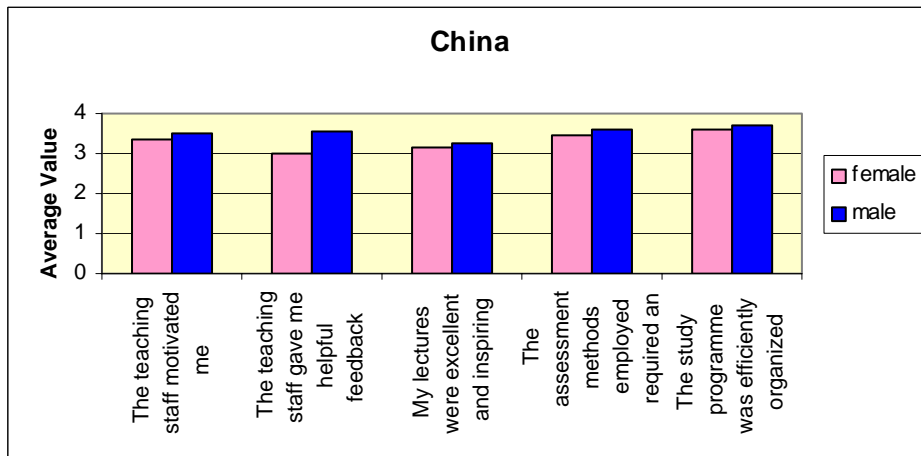


Fig. 11.47: Distribution of Average Values for China

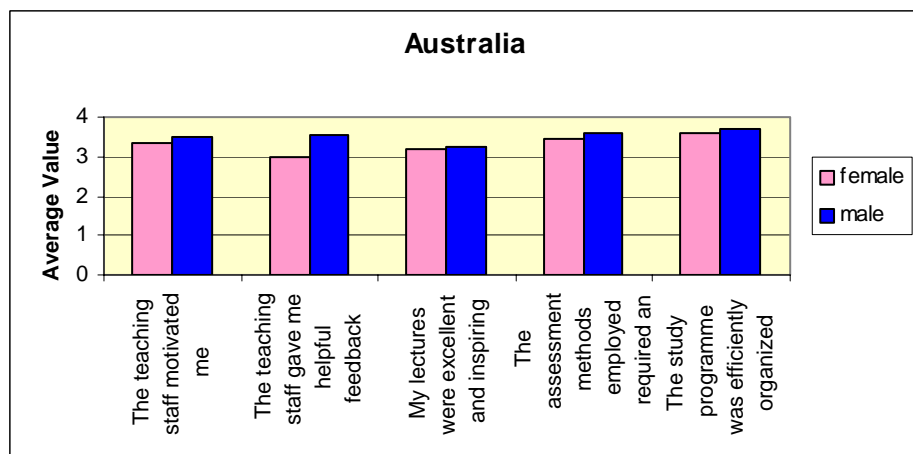


Fig. 11.48: Distribution of Average Values for Australia

## 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.

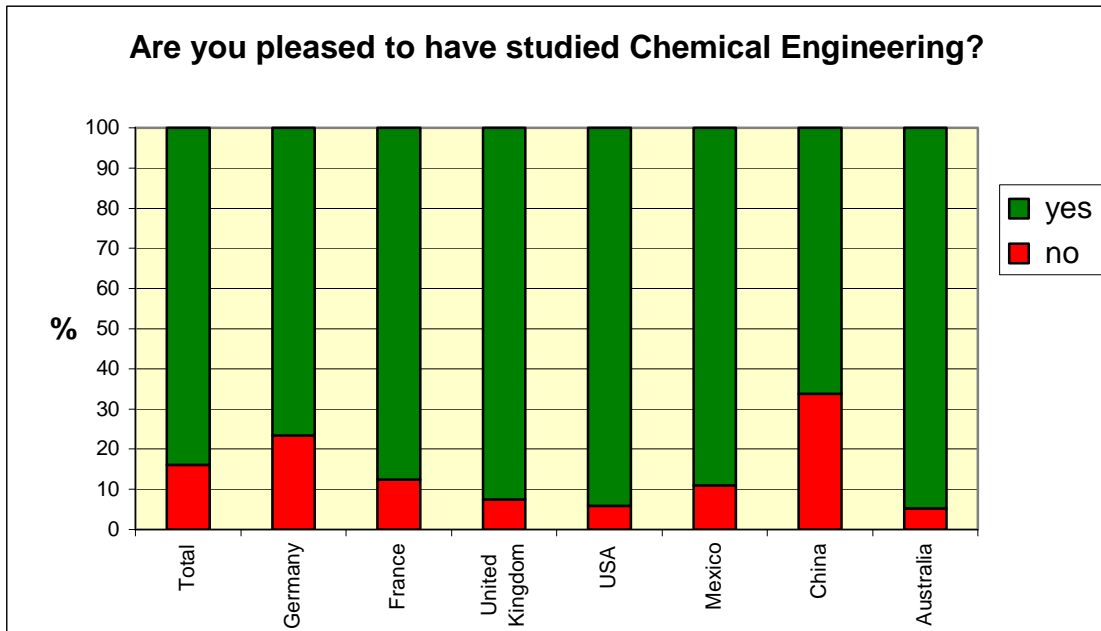


Fig. 12.1: “Are you pleased to have studied Chemical Engineering“?  
Results of the Yes – No Scheme

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.

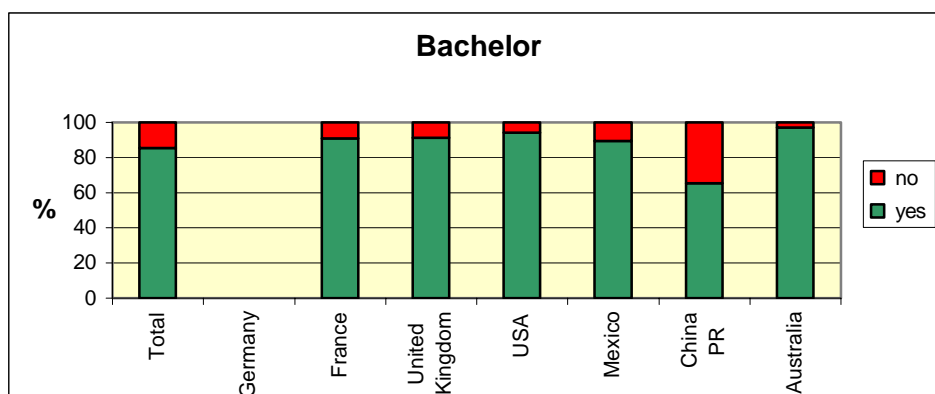


Fig. 12.2: “Are you pleased to have studied Chemical Engineering“?  
Results of the Yes – No Scheme for Bachelor’s Degree  
(only seven answers from Germany)

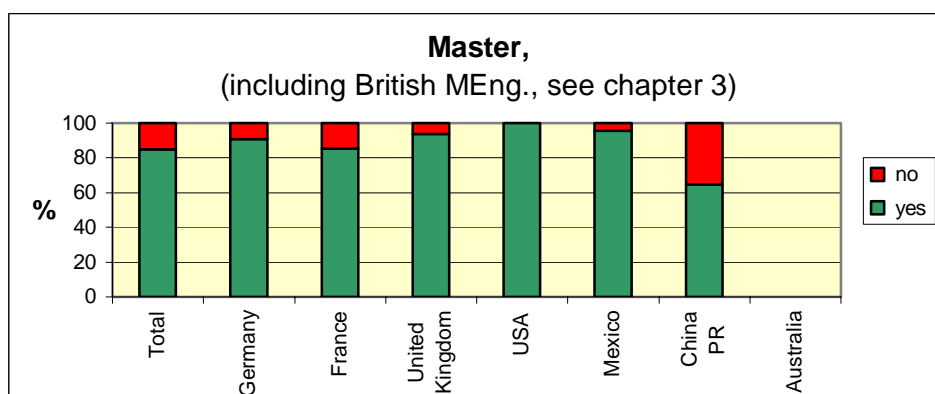


Fig. 12.3: “Are you pleased to have studied Chemical Engineering“?  
Results of the Yes – No Scheme Master’s Degree  
(only one answer from Australia)

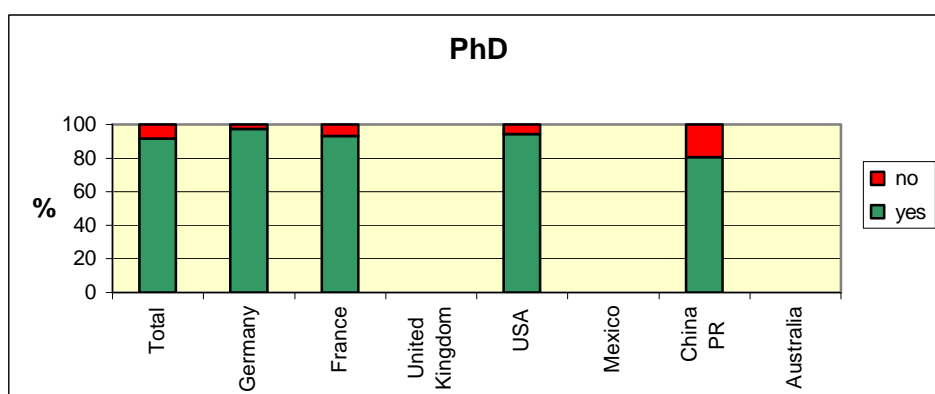


Fig. 12.4: “Are you pleased to have studied Chemical Engineering“?  
Results of the Yes – No Scheme PhD Degree  
(only two answers from United Kingdom, only three answers from Mexico, only four answers from Australia)



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.

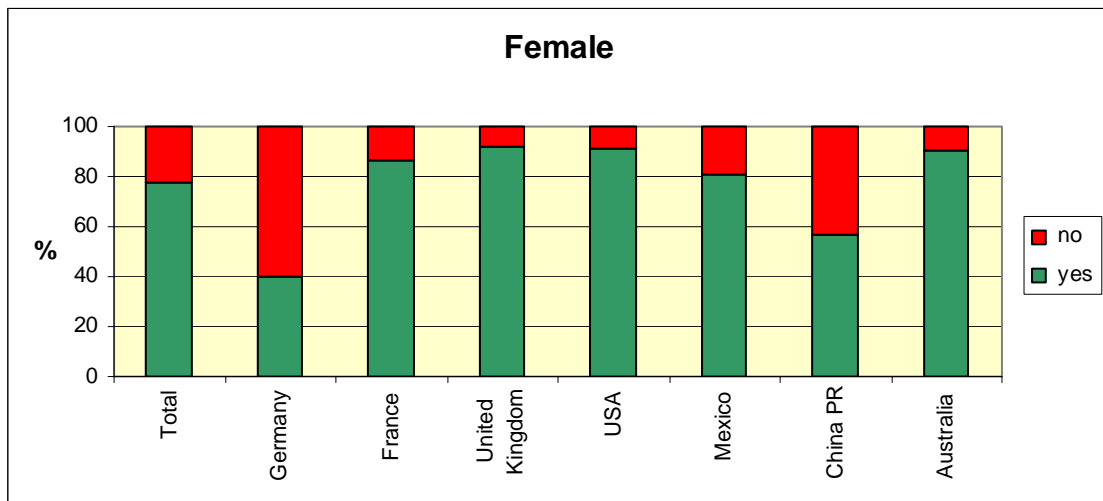


Fig. 12.5: "Are you pleased to have studied Chemical Engineering"?  
Results of the Yes – No Scheme, Females

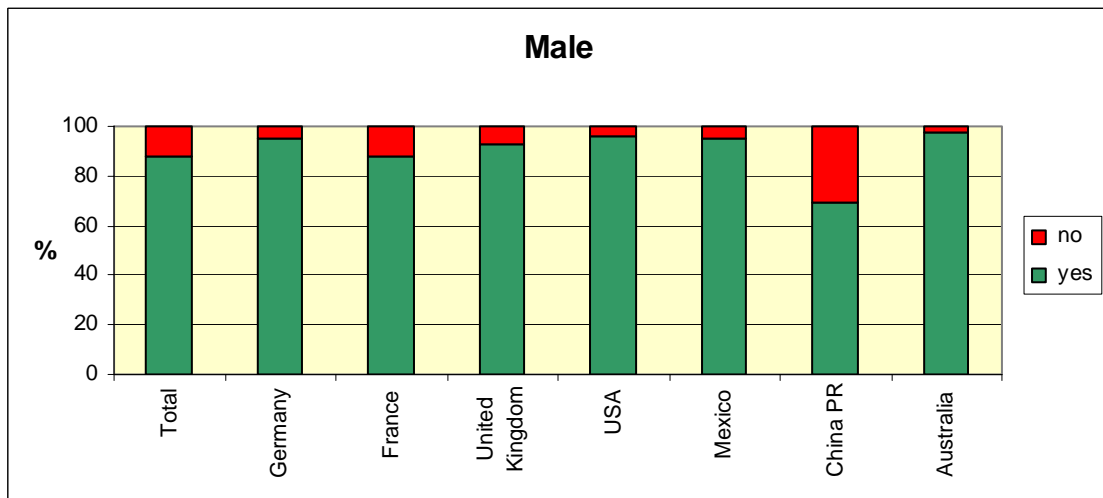


Fig. 12.6: "Are you pleased to have studied Chemical Engineering"?  
Results of the Yes – No Scheme, Males

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.

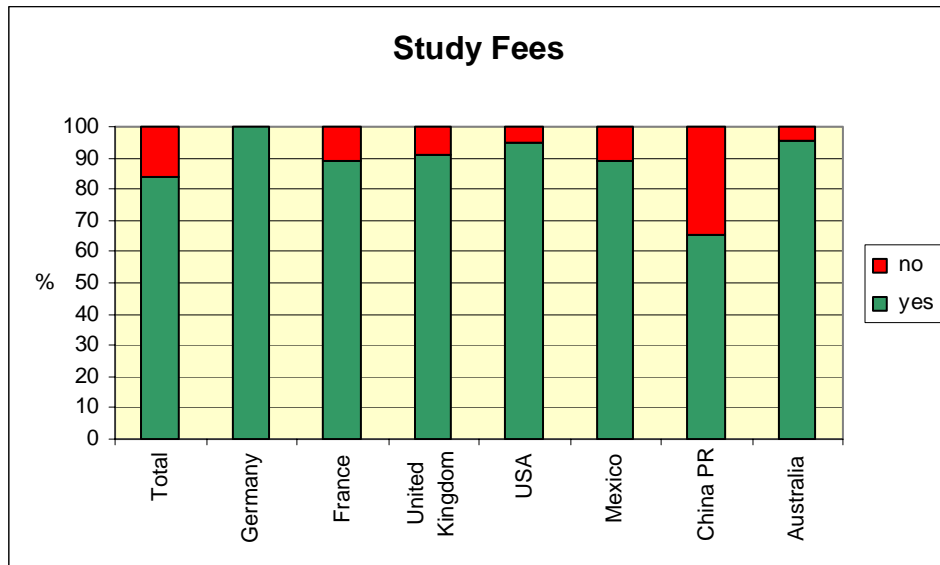


Fig. 12.7: "Are you pleased to have studied Chemical Engineering?"  
Results of the Yes – No Scheme, Participants who had to pay fees

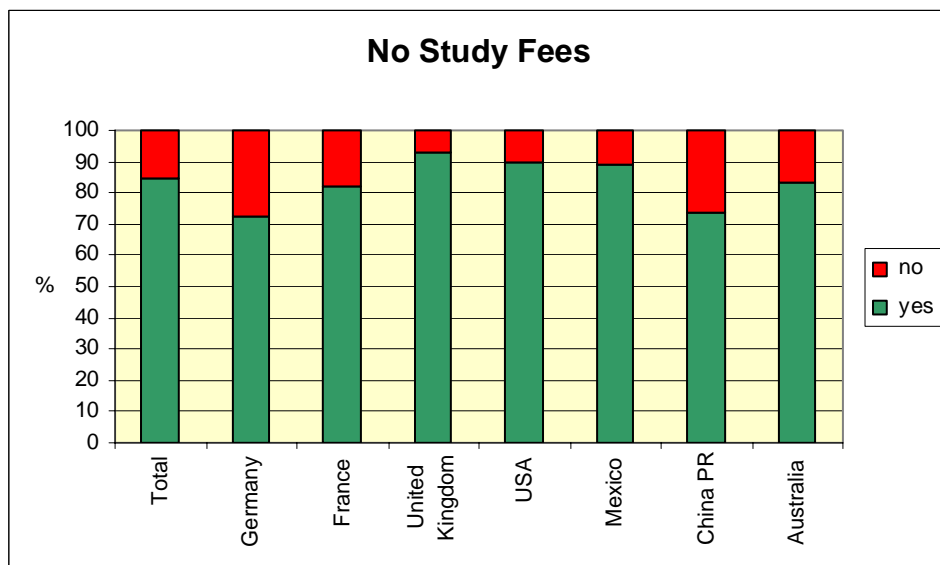


Fig. 12.8: "Are you pleased to have studied Chemical Engineering?"  
Results of the Yes – No Scheme, Participants who had to pay no fees

**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**

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

**List of Countries and Number of Responses**

Country	Number of Responses	Country	Number of Responses
China PR	483	Guinea	1
United States of America	406	Honduras	1
United Kingdom	252	Hungary	1
Mexico	229	Kuwait	1
Germany	196	Latvia	1
France	152	Macao	1
Australia	77	Mongolia	1
New Zealand	59	Netherlands	1
Japan	45	Oman	1
South Africa	32	Saudi Arabia	1
Ireland	28	Singapore	1
Slovenia	25	Sri Lanka	1
India	24	Thailand	1
Poland	16	Trinidad and Tobago	1
Malaysia	13	Turkey	1
Sweden	12		
Nigeria	8		
Canada	7	Total Number of Countries:	<b>63</b>
Hong Kong	7		
Spain	7	Total Number of Participants:	<b>2,158</b>
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		

**WCEC Study**  
**“How Does Chemical Engineering Education Meet**  
**the Requirements of Employment?”**

**List of Universities and Institutes**

**Argentina:**

Instituto Tecnológico 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 Technology

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  
Hebei 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 Supérieure 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 Jérôme 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  
Tokushima 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 Tecnológico de  
Cuitlahuac Universidad Tecnológica de Mexico  
Durango Instituto Tecnológico de  
Facultad de Química, Universidad Nacional Autónoma de México Mexico City  
Guadalajara Universidad de  
Guanajuato, Universidad de  
Iberoamericana Universidad  
Instituto Politécnico Nacional.  
Chihuahua, Intituto Tecnológico de  
Madero, Instituto Tecnológico de Ciudad.  
Matamoros Instituto Tecnológico 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 Institute 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  
Illinois 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 University  
West Virginia University  
Widener University  
Wisconsin University  
Worcester Polytechnic Institute  
Wyoming University

**Venezuela**

Universidad Simon Bolivar

**Zimbabwe**

National University of Science and Technology

**WCEC Study**  
**“How Does Chemical Engineering Education Meet**  
**the Requirements of Employment?”**

**List of Societies and Institutions**

**Argentina**

AGITBA (Asociación de Graduados del ITBA)  
Asociacion 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

## How Does Chemical Engineering Education Meet the Requirements of Employment?

### Questionnaire

#### 1. Where and how long did you study Chemical Engineering?

My home country	<input type="text" value="Germany"/>
Country(ies) of my studies	<input style="width: 100%; height: 40px;" type="text"/>
Universities	<input style="width: 100%; height: 40px;" type="text"/>
Study time (years)	<input style="width: 40px;" type="text"/>

#### 2. Did you pay fees for your studies?

<input type="checkbox"/> yes <input type="checkbox"/> no	
if 'yes' how much. appr. in US \$	<input style="width: 100%;" type="text"/>

#### 3. What are your university degrees? - Year degree awarded?

	Year degree awarded:	Discipline
<input type="checkbox"/> Bachelor	<input style="width: 40px;" type="text"/>	<input style="width: 100%;" type="text"/>
<input type="checkbox"/> Master	<input style="width: 40px;" type="text"/>	<input style="width: 100%;" type="text"/>
<input type="checkbox"/> Ph.D.	<input style="width: 40px;" type="text"/>	<input style="width: 100%;" type="text"/>
<input type="checkbox"/> Others, (please identify):	<input style="width: 40px;" type="text"/>	<input style="width: 100%;" type="text"/>
	<input style="width: 40px;" type="text"/>	<input style="width: 100%;" type="text"/>
	<input style="width: 40px;" type="text"/>	<input style="width: 100%;" type="text"/>
	<input style="width: 40px;" type="text"/>	<input style="width: 100%;" type="text"/>

#### 4. Date of birth

Date of birth	<input style="width: 40px;" type="text"/> <input style="width: 40px;" type="text"/> <input style="width: 40px;" type="text"/>
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**5. To which professional societies do you belong?**

Name of Society	Country
<input type="text"/>	-- please select -- <input type="button" value="v"/>
<input type="text"/>	-- please select -- <input type="button" value="v"/>
<input type="text"/>	-- please select -- <input type="button" value="v"/>
<input type="text"/>	-- please select -- <input type="button" value="v"/>
<input type="text"/>	-- please select -- <input type="button" value="v"/>

**6. Gender**

Female     Male

**7. Employment Status**

<input type="checkbox"/> Full-time permanent	<input type="checkbox"/> Full-time temporary
<input type="checkbox"/> Part-time permanent	<input type="checkbox"/> Part-time temporary
<input type="checkbox"/> Postdoc	<input type="checkbox"/> Self-employed
<input type="checkbox"/> Career break	<input type="checkbox"/> 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?**

<input type="checkbox"/> Chemical process industry	<input type="checkbox"/> Petrochemical industry
<input type="checkbox"/> Oil and Gas	<input type="checkbox"/> Mining and Metallurgy
<input type="checkbox"/> Processes Plant Contracting and Design	<input type="checkbox"/> Process equipment manufacturing
<input type="checkbox"/> Pharmaceutical industry	<input type="checkbox"/> Cosmetics
<input type="checkbox"/> Food and Drink industry	<input type="checkbox"/> Pulp and Paper
<input type="checkbox"/> Biotechnology	<input type="checkbox"/> Information technology

Annex 4

<input type="checkbox"/> Electronic industry	<input type="checkbox"/> Materials incl. Polymers
<input type="checkbox"/> Construction Materials	<input type="checkbox"/> Government
<input type="checkbox"/> University	<input type="checkbox"/> Research Institute
<input type="checkbox"/> Consulting	<input type="checkbox"/> Finance/Banking/Insurance
<input type="checkbox"/> Water	<input type="checkbox"/> Safety and Environment
<input type="checkbox"/> Energy <input type="text"/>	<input type="checkbox"/> Others, please identify: <input type="text"/>

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	<input type="text"/>	<input type="text"/>
Importance of a broad and general education	<input type="text"/>	<input type="text"/>
Appreciation of an interdisciplinary approach	<input type="text"/>	<input type="text"/>
Appreciation of the potential of research	<input type="text"/>	<input type="text"/>
Ability to work effectively as a member of a team	<input type="text"/>	<input type="text"/>
Ability to be a leader	<input type="text"/>	<input type="text"/>
Ability to gather information	<input type="text"/>	<input type="text"/>
Ability to analyse information	<input type="text"/>	<input type="text"/>
Competence in information technology	<input type="text"/>	<input type="text"/>
Critical thinking	<input type="text"/>	<input type="text"/>
Ability to use a systematic approach to process and product design	<input type="text"/>	<input type="text"/>
Ability to communicate effectively	<input type="text"/>	<input type="text"/>
Foreign languages	<input type="text"/>	<input type="text"/>
Understanding of cultural diversity	<input type="text"/>	<input type="text"/>
Ability to identify and formulate problems	<input type="text"/>	<input type="text"/>
Ability to solve problems	<input type="text"/>	<input type="text"/>
Management skills	<input type="text"/>	<input type="text"/>
Understanding of fundamental principles of financial analysis	<input type="text"/>	<input type="text"/>

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

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	<input type="text"/>
The teaching staff normally gave me helpful feedback	<input type="text"/>
My lectures were excellent and inspiring	<input type="text"/>
The assessment methods employed required an indepth understanding of the course content	<input type="text"/>
The study programme was efficiently organized	<input type="text"/>

12. Are you pleased to have studied Chemical Engineering?	
<input type="checkbox"/> yes	<input type="checkbox"/> no

## Non-obligatory Part

Your present annual salary (in US \$)	<input type="text"/>
Country of your employment	-- please select -- <input type="text"/>