

2015 Report

Globally required Abilities: Towards Achieving the University Education Required by Society

December 2016

Tuning Working Group, Education Reform and Promotion Committee
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Executive Summary

This publication presents a summary of the results from a competence survey conducted in the fiscal year 2015. The survey aims to identify competences that Japanese university graduates are expected to acquire before entering the job market. This study investigates how university stakeholders evaluate the importance and the level of achievement of two types of competences: subject-specific competences and generic competences. University stakeholders include students, academics, graduates, and those who work in major Japanese companies (hereon in referred to as employers). The number of valid responses was 1,358. A total of 11 specialized fields of study are analyzed (Physics, Chemistry, Mathematics, Earth Science, Mechanical Engineering, Civil Engineering, Economics, Business, History, Education, and Psychology), and the survey period is from December 2015 to March 2016. The main outcomes of the study are as follows:

Importance and level of achievement

- (1) Graduates are deemed to have acquired the more important subject-specific and generic competences, and all stakeholder groups consider that a sufficient level of achievement has not been reached.
- (2) Academics evaluate the importance and level of achievement of subject-specific competences to a higher level than other participants, while employers evaluate them to a lower level.
- (3) Compared with other stakeholder pairs, employer and university-related participant (academics and students) pairs show the largest gap in the evaluation of the importance and level of achievement of subject-specific competences.
- (4) Academics and employers similarly evaluate important competences for graduates. However, in Economics, for example, some differences are observed between them: academics evaluate competences in English and Mathematics as highly important while employers emphasize more practical competences.

The relationship between competence recognition and the choice of education or career

- (1) Students who consider that their understanding of a field has been deepened via subject-specific education recognize these competences in a similar manner to academics and employers. The same can be confirmed for graduates. This is evident in the recognition of the importance in generic competences.
- (2) In some fields (Mechanical Engineering and Business), students and graduates who work in specialized and technical jobs after graduation recognize subject-specific and generic

competences in a similar manner to academics and employers. This is in contrast to students and graduates who do not hold specialized and technical jobs.

(3) Employers recognize generic competences in a similar manner regardless of job classification, industry, and job content.

(4) Around 80% of employers believe that their companies provide opportunities (“plenty of opportunities” and “some opportunities”) for employees to improve their field-specific and generic abilities and skills.

Recognition of competence among different stakeholders

(1) Students focus a university’s reputation as well as its education and research content when selecting a university, while employers focus on outcomes (the knowledge, capacity, and ability that graduates should have) at the time of recruiting.

(2) All stakeholder groups value the “ability to think” as a competence that graduates should possess. However, students and academics highly value the acquisition of deep specialized knowledge, while employers and graduates focus more on the ability to apply knowledge.

Conclusion

This survey reveals that Japanese university graduates are considered to acquire subject-specific and generic competences that the stakeholders of Japanese universities regard as important. In addition, students who consider that their understanding of a field has been deepened via subject-specific education, recognized subject-specific competences in a similar manner with academics and employers. This is in contrast to students who believe that their level of understanding was not improved. The same tendency is observed for graduates. This indicates that subject-specific education provided by participating universities is heading in the right direction when measured by “competence.” However, this study also suggests the need to improve the current subject-specific education because all stakeholder groups believe that graduates have not fully acquired subject-specific and generic competences. Furthermore, the results show which competences are emphasized or mastered among subject-specific and generic competences. These results can be utilized for educational improvement in each subject area by academics who are responsible for subject-specific education.

Foreword

In recent years, there has been considerable attention on the various competences that students obtain via higher education. The identification of the demand for particular competences by Japanese industries via a competence survey is a step toward improving the university curriculum to ensure that industry requirements are taken into account. Furthermore, such a survey could be the first step to create an internationally compatible university curriculum that would contribute to increase students' international mobilization.

The purpose of this study is to identify what competences Japanese universities are expected to cultivate (e.g., what are the important competences, and what competences are acquired via university education?) from the point of view of university stakeholders. The survey was coordinated by the Tuning Working Group (Tuning WG), which was set up within the Education Promotion Meeting Group. Hitotsubashi University was responsible for the implementation of the survey.

We are grateful for the guidance and help we received from many people during the planning and implementation of the survey. We thank the students, academics, graduates, and employers who took their time to answer the questionnaires. University staff made time in their very busy schedules to participate. In particular, we greatly appreciate the contributions of Professor Tetsuya Mizumoto, the Vice-Chancellor at Tokyo Institute of Technology (Education Management), who organized the requests to companies.

We expect the report to increase university stakeholders' awareness of societal expectations, and to reflect on their education. We hope that the results of this survey will be useful and informative for the further enhancement of higher education in Japan.

The structure of the report is as follows: Chapter 2 describes the outline of the research, Chapter 3 summarizes the results, Chapter 4 details our conclusions and future challenges, and Chapter 5 includes the Appendix. The Appendix consists of a simple summary of the attribute questions, detailed analysis by subject areas or universities, and questionnaires.

1. Survey Overview

Questionnaire participants are as follows:

1. Students who study the target subject areas and belong to the participating universities (mainly undergraduates in their third year of study or above);
2. Academics who study the target subject areas and belong to the participating universities;
3. Graduates who study the target subject areas and belonged to the participating universities (within five years after graduation); and
4. Employers who work in the private sector in which graduates of the participating universities work and studied the target subject areas (mainly within five years after graduation).

Subject areas:

Physics, Chemistry, Mathematics, Earth Science, Mechanical Engineering, Civil Engineering, Economics, Business, History, Education, and Psychology.

Participating universities:

Four universities involved the Tuning WG participated in the survey. Subject areas by each university are as follows:

Chart 1 Subject areas of each participating university

University	Physics	Chemistry	Mathematics	Earth Science	Mechanical Engineering	Civil Engineering
Univ.1				○		
Univ.2	○	○			○	○
Univ.3						
Univ.4	○	○	○	○		
University	Economics	Business	History	Education	Psychology	
Univ.1			○			
Univ.2						
Univ.3	○	○	○	○		
Univ.4	○	○	○	○	○	

Participating companies:

Forty companies joined the survey, and the following companies agreed for their participation to be acknowledged (the order is in Japanese alphabetical order):

Ezaki Glico Co., Noritake Co., Ltd., Mandom Corporation,
Kirin Co., Ltd., Taiyo Holdings Co., Ltd., Chiyoda Corporation,
Tonen General Sekiyu KK, Panasonic Corporation, Hulec Co., Ltd., and Mitsui Ocean Development Co., Ltd.

2.1 Research Methodology:

Participating organizations chose to answer via either paper-based or online (PC or smartphone) questionnaires. In some cases, both methods were selected. Employers could participate in two ways: employers were requested to participate via the human resource department of their companies or employers for other companies answered individually. Graduates who were invited to participate through the university only answered via the online questionnaires. Employers that participated via the human resource department also answered via the online questionnaires.

Language: Japanese and English

There were 1,358 valid responses to the survey. A breakdown of the number of valid responses is shown in the following charts (Charts 2–4).

Chart 2 Number of respondents (by questionnaire type and participant)

	Students	Academics	Graduates	Employers	Total
Online	187	63	267	217	734
Paper	458	55	0	111	624
Total	645	118	267	328	1,358

Chart 3 Number of respondents (by subject area)

	Students	Academics	Graduates	Employers	Total
Physics	15	9	7	11	42
Chemistry	19	4	11	30	64
Mathematics	4	0	16	2	22
Earth Science	73	23	30	3	129
Mechanical Engineering	158	25	1	27	211
Civil Engineering	59	11	0	3	73
Economics	62	17	95	96	270
Business	160	10	50	87	307
History	71	10	15	11	107
Education	18	6	22	15	61
Psychology	5	3	20	14	42
Total	644	118	267	299	1,328
Generic	618	114	243	307	1,282

Chart 4 Number of responses (by subject area, participant, and university)

	Physics				Chemistry			
	Students	Academics	Graduates	Total	Students	Academics	Graduates	Total
Univ. 1	3	2		5				
Univ. 2	9	4		13	11	2		13
Univ. 3								
Univ. 4	3	3	7	13	8	2	11	21
Total	15	9	7	31	19	4	11	34
	Mathematics				Earth Science			
	Students	Academics	Graduates	Total	Students	Academics	Graduates	Total
Univ. 1					65	23	22	110
Univ. 2								
Univ. 3	1		1	2				
Univ. 4	3		15	18	8		8	16
Total	4	0	16	20	73	23	30	126
	Mechanical Engineering				Civil Engineering			
	Students	Academics	Graduates	Total	Students	Academics	Graduates	Total
Univ. 1								
Univ. 2	158	25		183	59	11		70
Univ. 3								
Univ. 4			1	1				
Total	158	25	1	184	59	11		70
	Economics				Business			
	Students	Academics	Graduates	Total	Students	Academics	Graduates	Total
Univ. 1								
Univ. 2								
Univ. 3	59	14	66	139	160	9	33	202
Univ. 4	3	3	29	35		1	17	18
Total	62	17	95	174	160	10	50	220
	History				Education			
	Students	Academics	Graduates	Total	Students	Academics	Graduates	Total
Univ. 1	61	5		66	1			1
Univ. 2								
Univ. 3	7	5	5	17	12	5	11	28
Univ. 4	3		10	13	5	1	11	17
Total	71	10	15	96	18	6	22	46
	Psychology				Generic			
	Students	Academics	Graduates	Total	Students	Academics	Graduates	Total
Univ. 1					126	29	20	175
Univ. 2					234	42		276
Univ. 3			2	2	222	30	109	361
Univ. 4	5	3	18	26	36	13	114	163
Total	5	3	20	28	618	114	243	975

Survey period:

December 2015 to late March 2016

2.2 Survey Content

The questionnaire comprised three categories: 1) subject-specific competences, 2) generic competences, and 3) personal attributes and recognition of university education and employment. The former two asked about the importance and level of achievement of each competence that graduates are to have before employment. A 4-point scale from high to low was used to score the answers. As well as indicating the importance and level of achievement of competences, respondents were asked to indicate, in order of highest to lowest, the five competences that they considered to be most important or achieved from categories 1) and 2).

Some of the questions on subject-specific competences and generic competences were the same as last year, which were based on questionnaires distributed by the Tuning Academy in other regions such as Europe. Furthermore, based on the comments received in response to last year's competency survey, the competences of some subject areas were modified (partly or fully). The following chart shows the source of the questionnaires.

Chart 5 Source of the questionnaires

Subject areas	Physics	Chemistry	Mathematics	Earth Science	Mechanical Engineering	Civil Engineering
Reference	Original	Europe	Original	Original	Africa	China
Subject areas	Economics	Business	History	Education	Psychology	Generic
Reference	Original	Original	Europe	China (Partial)	Latin America	Europe

The number of subject-specific competence varies by subject area, and the number of questions regarding personal attributes and college education also varies by stakeholder group (Chart 6). The questionnaires are included in the Appendix.

Chart 6 Number of competences (by subject and participant)

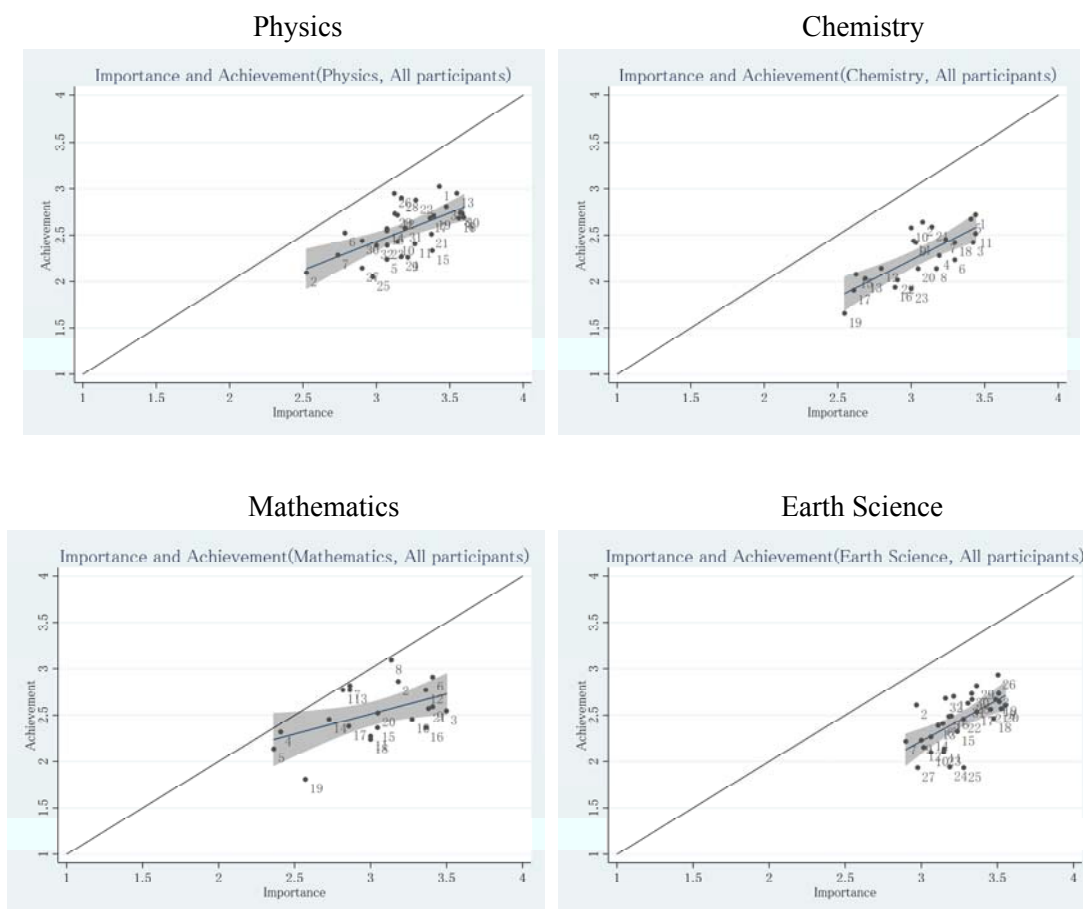
Subject areas	Physics	Chemistry	Mathematics	Earth Science	Mechanical Engineering	Civil Engineering
Number of questions	32	23	21	32	22	27
Subject areas	Economics	Business	History	Education	Psychology	Generic
Number of questions	24	31	27	23	23	31

Participants	Students	Academics	Graduates	Employers
Number of questions	13	14	13	14

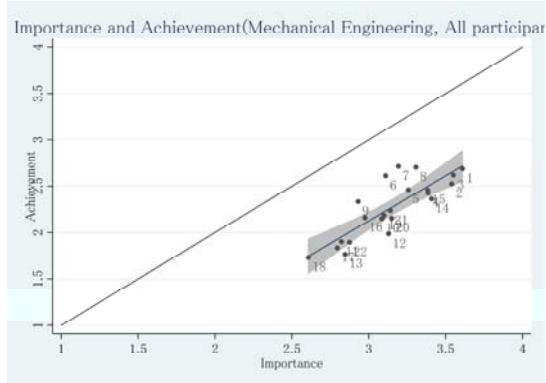
3. Results

Chart 7 shows the scatter diagrams of the average values for importance and level of achievement of each competence by each subject area. There are three main features. The first notable point is that the slope of the regression line grows steadily in all areas, which indicates positive relations between importance and achievement. The second feature is the heterogeneous distribution of the plot by subject area. The distribution between the importance and level of achievement is wide in Economics, History, and Psychology, while the distribution is narrow for Earth science, Civil engineering, and Education. The third feature is that all subject areas and all competences are placed under a diagonal line. When it is assumed that the evaluation scales of importance and level of achievement are the same, the diagonal line suggests the balanced acquisition of competences. Therefore, above the diagonal line indicates “learning excess,” meaning the level of achievement exceeds the level of importance and below the diagonal line indicates “learning shortage,” meaning the level of achievement is below the level of importance.

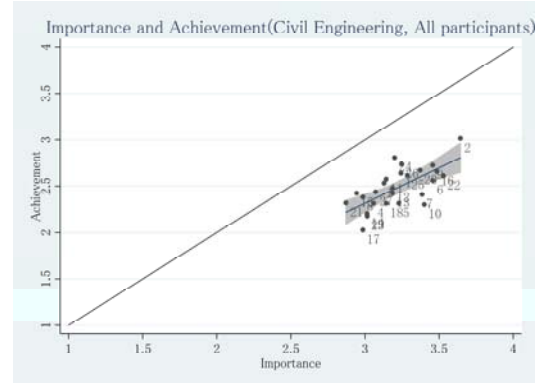
Chart 7 Importance vs. achievement scatter diagram (by subject area and participant)



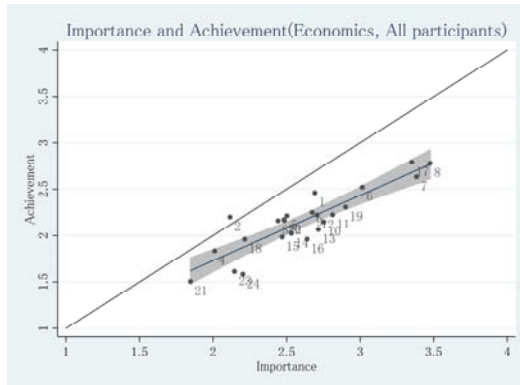
Mechanical Engineering



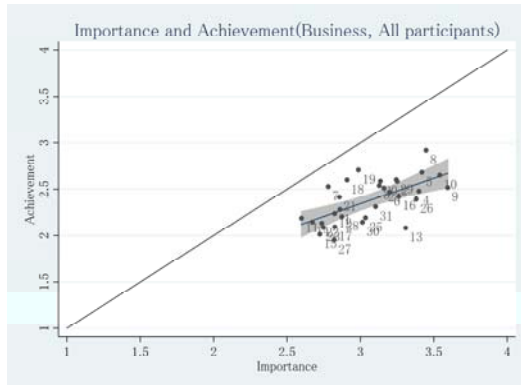
Civil Engineering



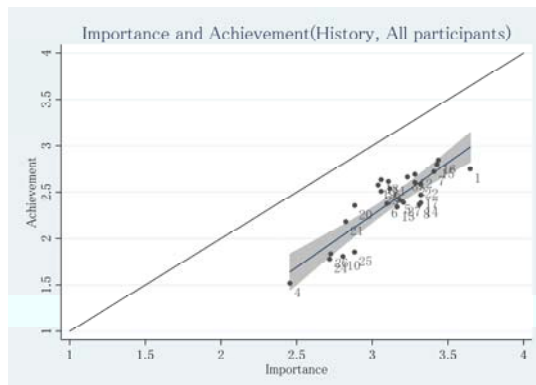
Economics



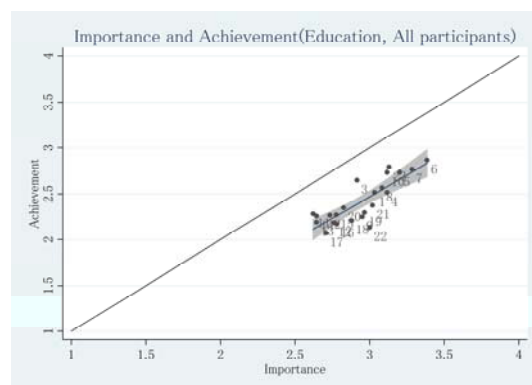
Business



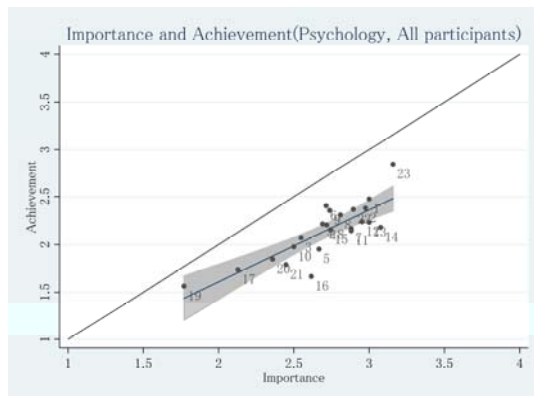
History



Education



Psychology



Generic

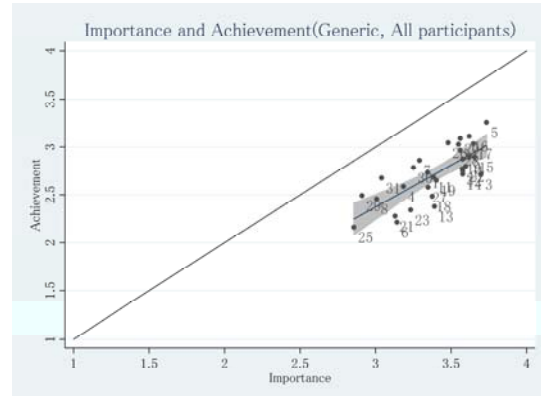
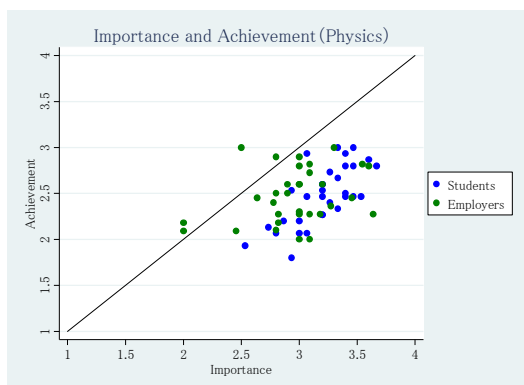


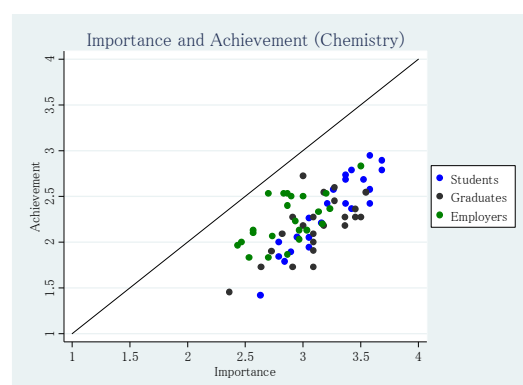
Chart 9 shows the distribution of the average values for importance and level of achievement by subject area and stakeholder group. The result of each stakeholder group varies by subject area, and some distinct features are observed. First, in most subject areas, the answers of one stakeholder group assemble in one place and can be distinguished from other groups. However, in three subject areas, Physics, Earth Science, and Generic, the answers from the stakeholder groups are mixed and it is hard to differentiate the result by each group. Furthermore, the distribution of the subject areas that include employer responses shows that the academics (Chart 9, red dots) tend to assemble in the upper right corner and employers (Chart 9, green dots) tend to assemble to the lower left. This result suggests that academics place a greater value on importance and level of achievement than employers.

Chart 9 Importance vs. achievement scatter diagram (by subject area and participant)

Physics

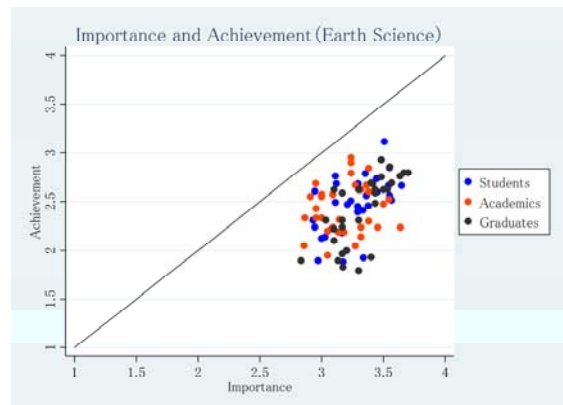
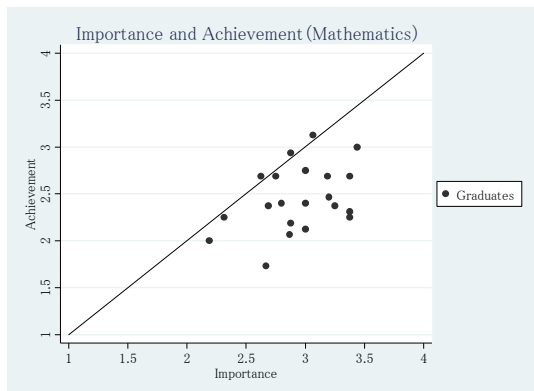


Chemistry

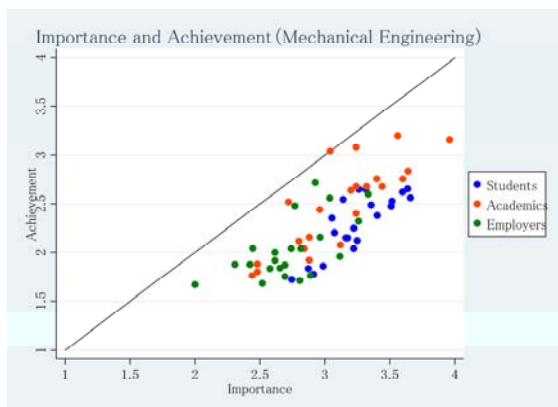


Mathematics

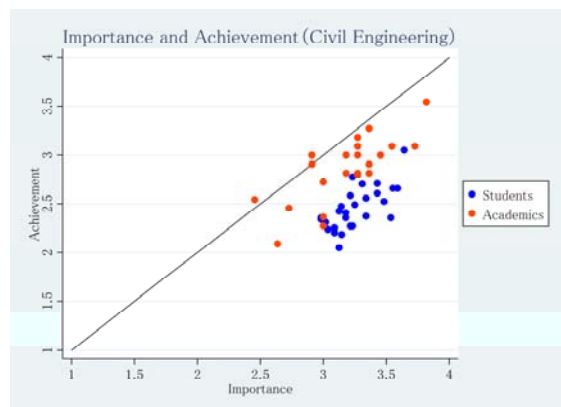
Earth Science



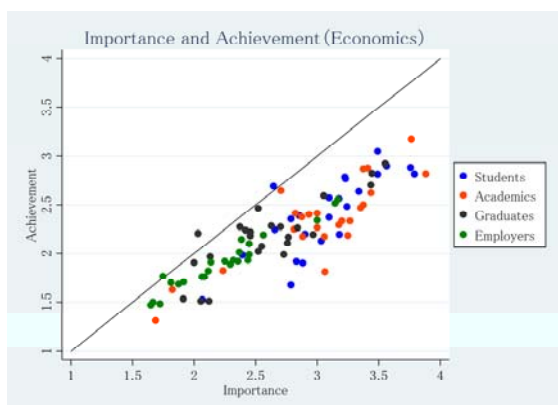
Mechanical Engineering



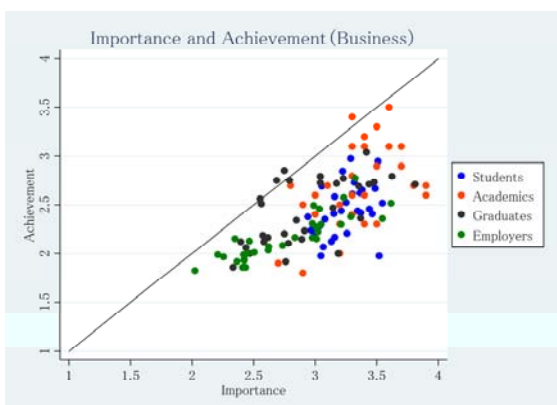
Civil Engineering



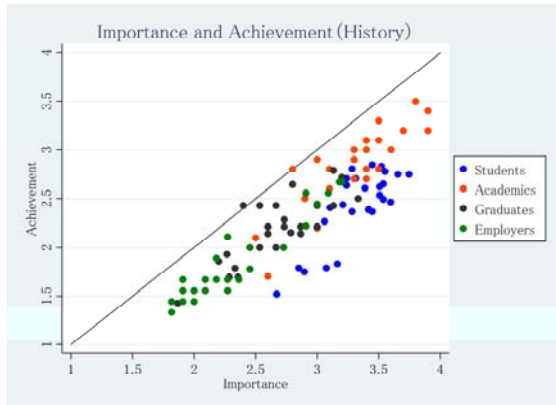
Economics



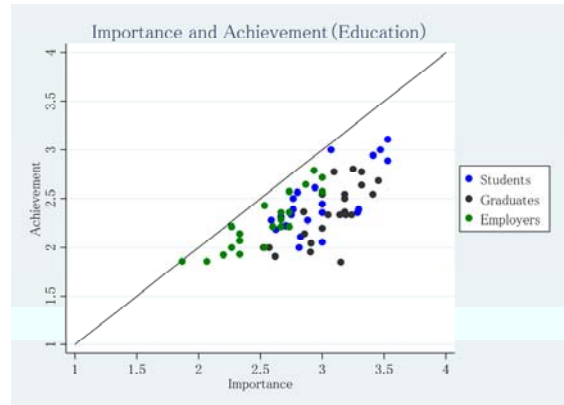
Business



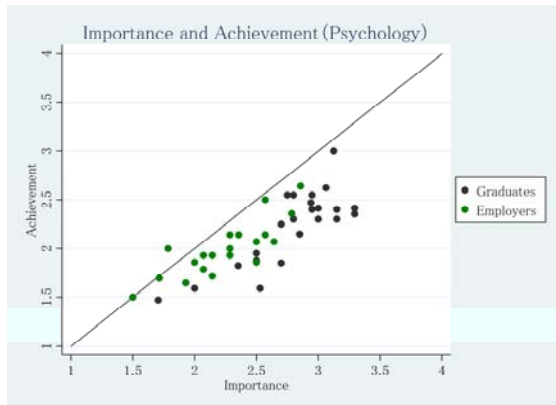
History



Education



Psychology



Generic

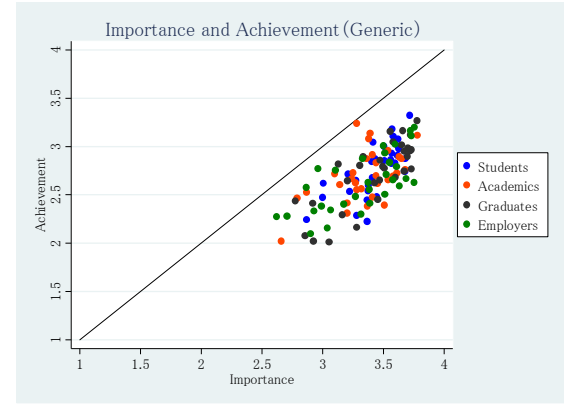


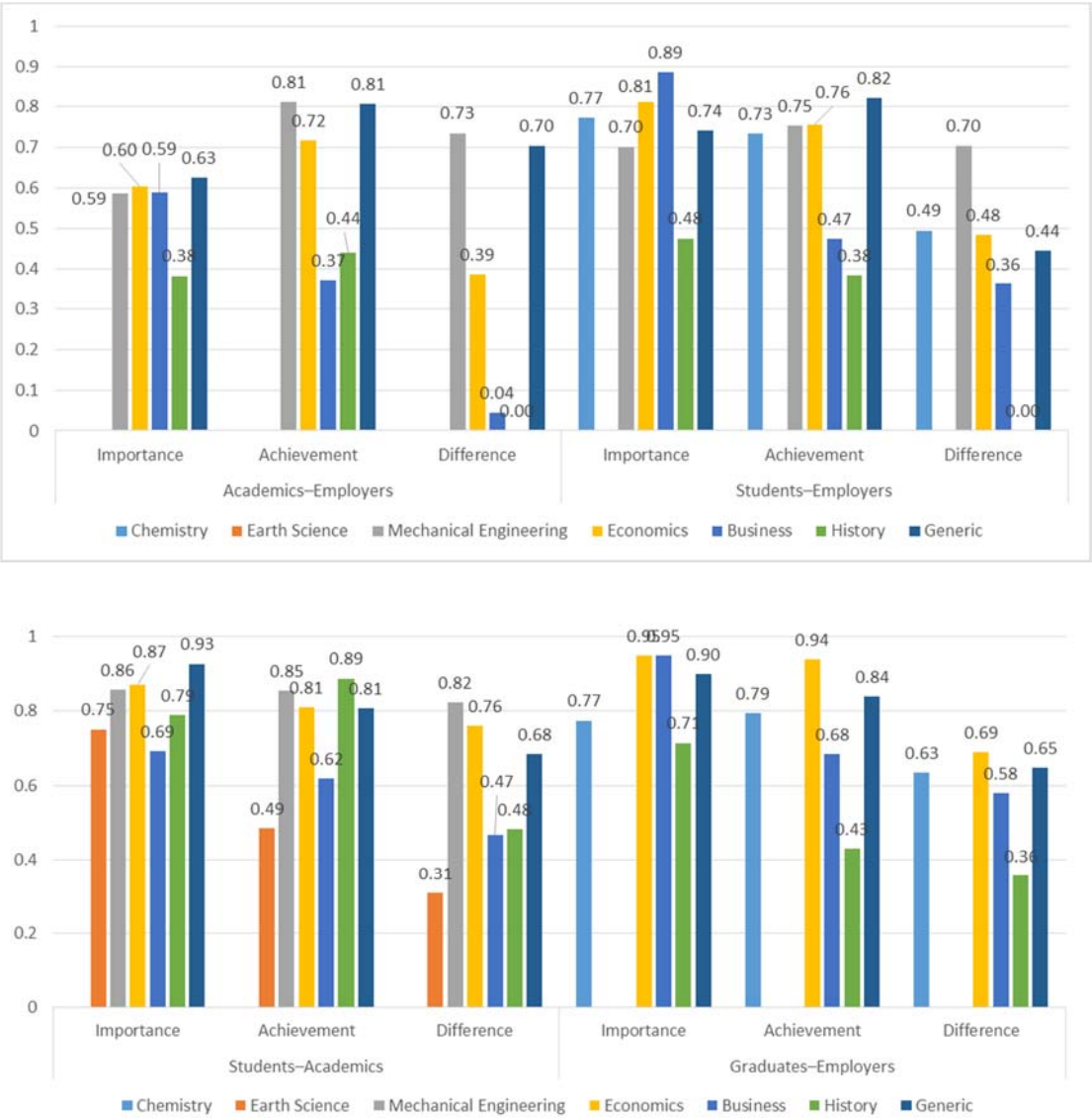
Chart 10 shows the results of the Pearson correlation between the stakeholder groups on importance, level of achievement, and the difference between the two. The difference between the importance and level of achievement is the value obtained by subtracting the value of the level of achievement from the value of the importance for each stakeholder group.

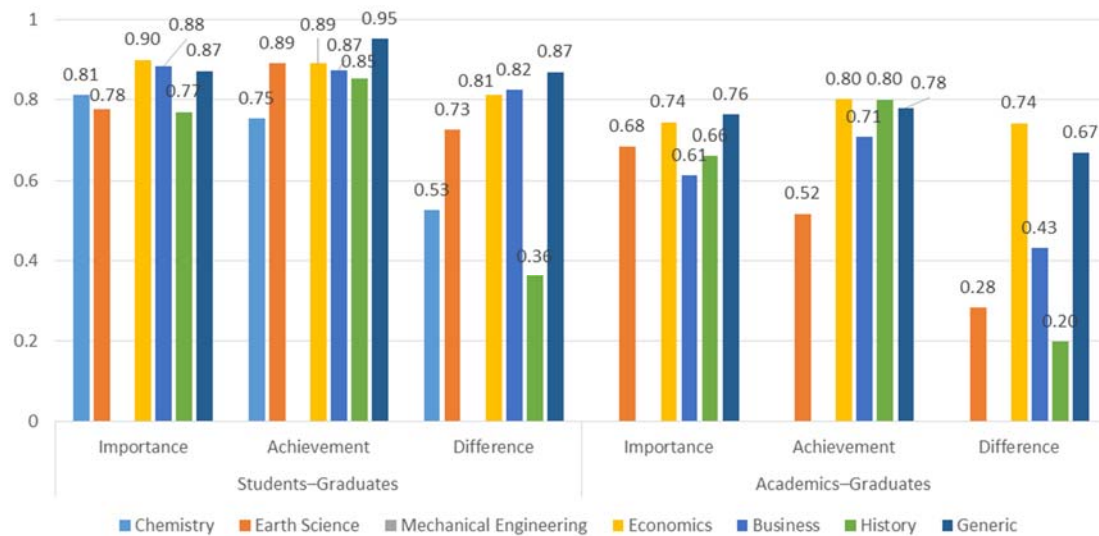
The first noticeable point is a weak correlation between employers and university-related groups (academics and students) on the three indicators: importance, level of achievement, and the difference between the two. When the academics–employers pair and the students–employers pair are compared in all subject areas, academics–employers show a lower correlation on importance. In contrast, the results for the level of achievement and the difference vary by subject area, and there is no consistent relationship.

The analysis reveals that even if the level of importance and achievement is likely to have a certain amount of positive correlation between academics and employers, the difference between importance and the level of achievement can show a negative relationship because

relation between the importance and achievement scores is complex. This could explain why the correlation of the difference is lower than that of importance and level of achievement.

Chart 10 Pearson correlation among participants on importance, level of achievement, and the difference between the two

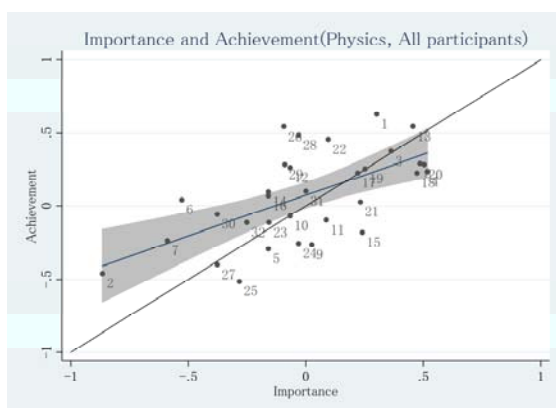




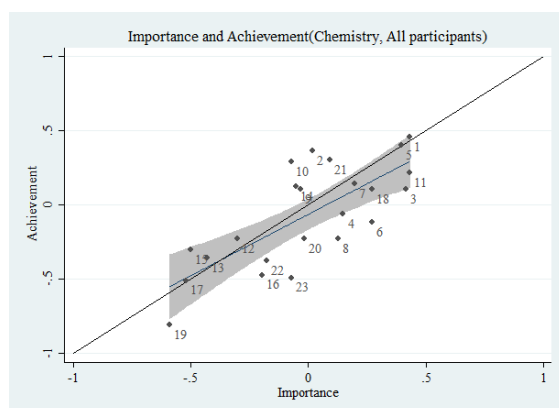
The following chart aims to identify the competences on or above the diagonal line, or the distinct features of each subject area by the standardization of a competence score. The positioning of a competence within each subject area is the same as for Chart 7, but the following section should highlight the relative positioning of competences. The first notable point is that, just as in Chart 7, the slope and the width of the regression line are different. The number of competences placed above the diagonal line (competences that are recognized as achieved within the subject area) is high in Physics, Mathematics, and Business.

Chart 11 Scatter plot using standardized competence scores

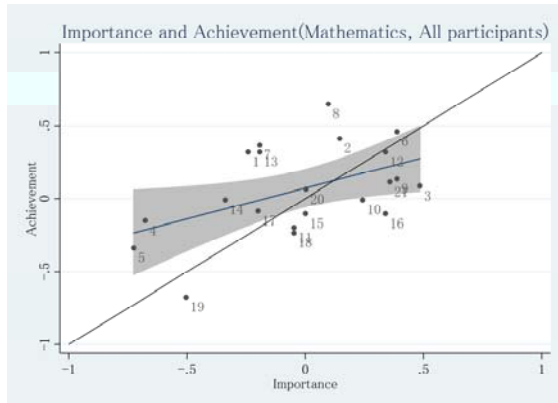
Physics



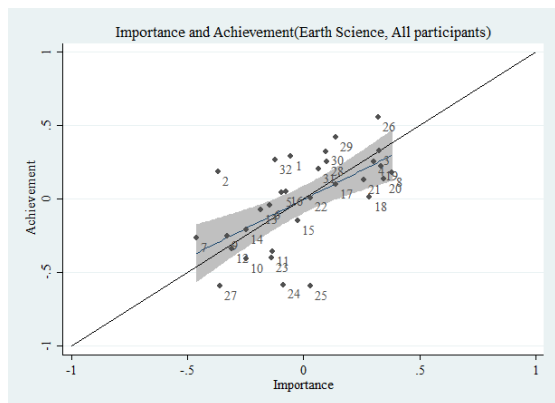
Chemistry



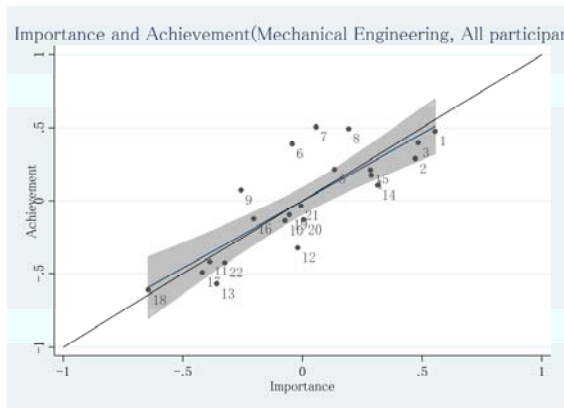
Mathematics



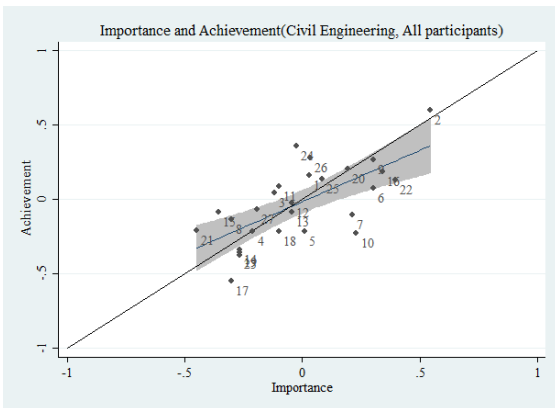
Earth Science



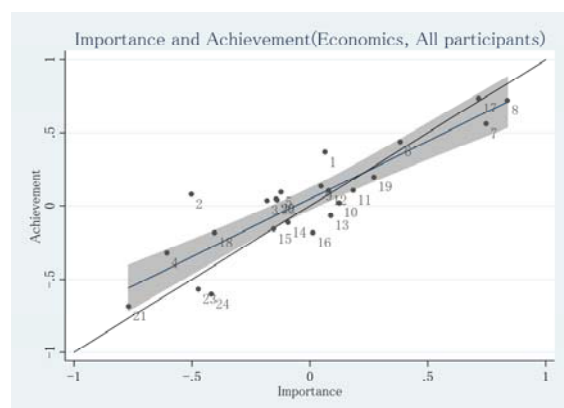
Mechanical Engineering



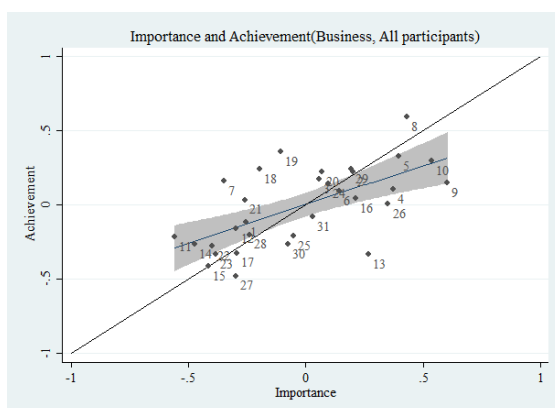
Civil Engineering



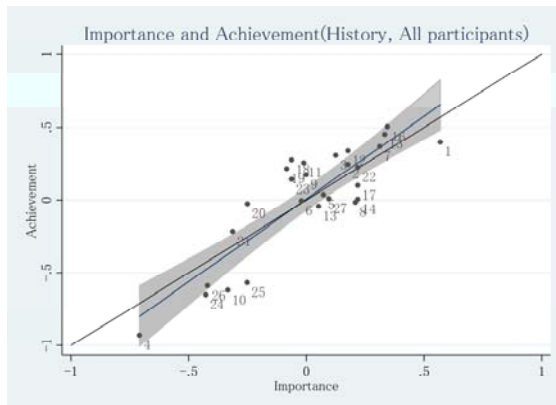
Economics



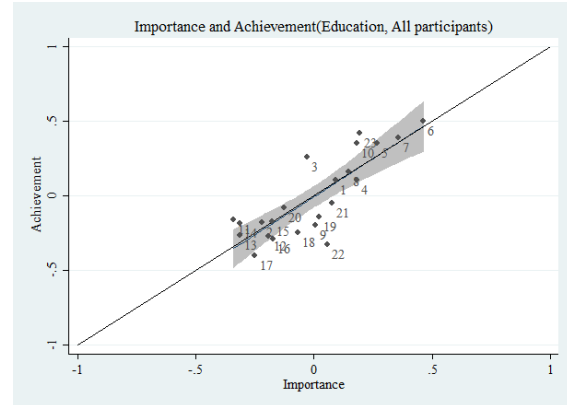
Business



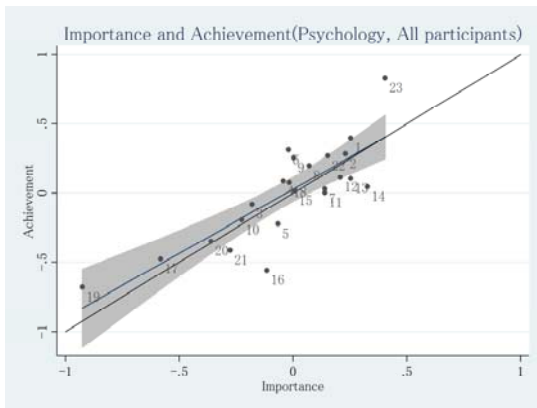
History



Education



Psychology



Generic

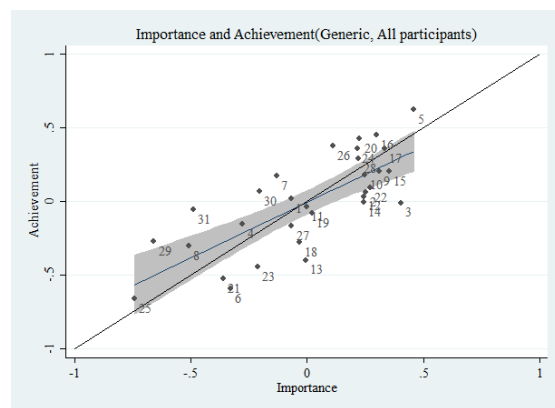


Chart 12 shows the top five competences selected by academics and employers for level of achievement, importance, and the difference between the two. Five subject areas received a sufficient number of responses from both academics and employers (Mechanical Engineering, Economics, Business, History, and Generic); these will be analyzed below.

Mechanical Engineering

There are a number of matching answers for the top competences selected by academics and employers for Mechanical Engineering: two items in importance, four items in level of achievement, and two items in the difference between the two.

Regarding the difference between the importance and level of achievement, certain trends can be seen among employers. First, the answers by academics in three areas include “4. Ability to identify and implement the most appropriate Mechanical Engineering technologies for the context.” Employers’ answers regarding the difference between the importance and level of achievement concerned project-related items.

In contrast, competences solely valued by academics are “2. Ability to create, innovate and contribute to technological development” and “19. Ability to solve unsolved problems.” These competences denote comprehensive ability.

Economics

Among the top five competences for academics and employers in Economics, the same competences were noted as follows: two items in importance, four items in level of achievement, and one item in the difference. The difference between academics and employers is as follows: academics emphasize all three competences that include using English and mathematical ability, while employers emphasize more general and practical competences. For example, among the three competences valued solely by academics, two competences require English ability and one concerns mathematical ability. Moreover, from the four items of the difference between the two, three were related to English. In contrast, employers value more practical content such as critically discussing a financial article or understanding fiscal and financial issues.

Business

Of the top five competences, both academics and employers listed the same four items in the importance category, one in the level of achievement, and one in the difference between the two. The difference between academics and employers is not as clear as for Economics. Of the nine items not shared by both academics and employers, only academics selected two items related to specialized books and English.

History

Academics and employers selected a number of common answers on the recognition of competence. Of the top five competences, both groups selected the same one item in importance, three items in the level of achievement, and one item in the difference between the two. While academics emphasize the command of foreign languages and literature, employers tend to value having a broader perspective such as an application of knowledge from other academic subjects or academic subjects that are not graduates’ specialist fields.

Generic

In the Generic field, because of the high correlation between academics and employers (Chart 10), the top five items were commonly listed by both academics and employers. Each group has different characteristics in the selection of the items. Academics include competences related to knowledge (Q2, Q9), and employers include competences related to interpersonal skills (Q16, Q17).

Of the top five competences that appeared in the difference categories, two competences (“3. Ability to plan and manage time” and “13. Capacity to generate new ideas”) were shared by both academics and employers. Regarding the three items not shared in this category, different competences were selected from importance category by each group. Thus, these competences are considered important but not achieved. Academics listed “2. Ability to apply knowledge in practical situations” and employers chose “15. Ability to make reasoned decisions.”

Chart 12 Top five competences by importance, level of achievement, and difference between the two (for academics and employers)

Mechanical Engineering

Academics

Rank	Competence	Importance	Competence	Achievement	Competence	Diff.
1	1. Apply knowledge of basic and applied sciences of Mechanical Engineering	3.96	8. Describe 3-dimensional machines and systems	3.20	14. Manage safety and risk in mechanical engineering systems	1.04
2	3. Analyze, design, and produce mechanical products and systems	3.64	1. Apply knowledge of basic and applied sciences of Mechanical Engineering	3.16	12. Select, mobilize, and administer resources, tools, and equipment	0.96
3	2. Create innovate and contribute to technological development	3.60	6. Master mathematical and numerical methods in Mechanical Engineering	3.08	2. Create innovate and contribute to technological development	0.84
4	8. Describe 3-dimensional machines and systems	3.56	7. Apply information technologies, software, and tools	3.04	21. Interact with multidisciplinary groups towards developing solutions	0.84
5	19. Solve unsolved problems in Mechanical Engineering	3.44	3. Analyze, design, and produce mechanical products and systems	2.84	1. Apply knowledge of basic and applied sciences of Mechanical Engineering	0.80

Employers

Rank	Competence	Importance	Competence	Achievement	Competence	Diff.
1	1. Apply knowledge of the basic and applied sciences of Mechanical Engineering	3.33	7. Apply information technologies, software, and tools	2.72	14. Manage safety and risk in mechanical engineering systems	1.16
2	4. Identify and implement the most appropriate engineering technologies	3.26	1. Apply knowledge of basic and applied sciences of Mechanical Engineering	2.60	12. Select, mobilize, and administer resources, tools, and equipment	1.13
3	14. Manage safety and risk in mechanical engineering systems	3.12	8. Describe 3-dimensional machines and systems	2.56	13. Integrate legal, economic, and financial aspects in decision making	1.10
4	8. Describe 3-dimensional machines and systems	3.04	6. Master mathematical and numerical methods in Mechanical Engineering	2.48	15. Ability to plan and execute mechanical engineering projects	0.94
5	3. Analyze, design, and produce mechanical products and systems	2.96	4. Identify and implement appropriate engineering technology	2.32	4. Identify and implement appropriate engineering technology	0.94

Economics

Academics

Rank	Competence	Importance	Competence	Achievement	Competence	Diff.
1	7. Understand economic statistics and interpret them appropriately	3.88	8. Collect relevant data and process the data into charts and diagrams	3.18	23. Write an academic paper in English	1.25
2	8. Collect relevant data and process the data into charts and diagrams	3.76	1. Explain economic models using mathematical formulae and diagram	2.88	24. Give presentations and engage in discussions in English	1.06
3	19. Understand economic articles in English	3.44	17. Understand economic articles in newspapers and magazines	2.88	7. Understand economic statistics and interpret them appropriately	1.06
4	1. Explain economic models using mathematical formulae and diagram	3.41	7. Understand economic statistics and interpret them appropriately	2.82	10. Understand and discuss fiscal issues	0.93
5	17. Understand economic articles in newspapers and magazines	3.38	2. Understand mathematical solution methods	2.65	6. Explain economic theory in an understandable way	0.88

Employers

Rank	Competence	Importance	Competence	Achievement	Competence	Diff.
1	17.Understand economic articles in newspapers and magazines	3.17	17.Understand economic articles in newspapers and magazines	2.56	7.Understand economic statistics and interpret them appropriately	0.66
2	8.Collect relevant data and process the data into charts and diagrams	3.15	8.Collect relevant data and process the data into charts and diagrams	2.52	8.Collect relevant data and process the data into charts and diagrams	0.63
3	7.Understand economic statistics and interpret them appropriately	3.00	7.Understand economic statistics and interpret them appropriately	2.34	17.Understand economic articles in newspapers and magazines	0.61
4	6.Explain economic theory in an understandable way	2.56	6.Explain economic theory in an understandable way	2.19	10.Understand and discuss fiscal issues	0.50
5	5.Understand the background of economic concepts	2.45	1.Explain economic models using mathematical formulae and diagram	2.15	11. Understand and discuss financial markets	0.46

Business

Academics

Rank	Competence	Importance	Competence	Achievement	Competence	Diff.
1	4. Understand and explain business-related events and trends	3.90	19. Examine marketing phenomena using basic marketing concepts	3.50	5. Collect appropriate data and present data in graphs or charts	1.30
2	5. Collect appropriate data and present data in graphs or charts	3.90	18. Examine business behavior based on a basic framework	3.40	13. Discuss business issues in English	1.20
3	6. Place phenomena-related to business into a box and arrow diagram	3.80	3. Explain basic business terms	3.30	30. Identify the impact of macro- and microeconomic elements	1.20
4	8. Understand specialized economic newspapers	3.70	2. Explain the meaning of basic financial ratios related to business	3.20	4. Understand and explain business-related events and trends	1.20
5	9. Identify problems, and then develop and suggest new ideas	3.70	7. Understand academic material in business and in economics	3.10	6. Place phenomena-related to business into a box and arrow diagram	1.10

Employers

Rank	Competence	Importance	Competence	Achievement	Competence	Diff.
1	10. Organize a work plan by considering future events	3.62	8. Understand specialized economic newspapers	2.78	9. Notice problems, come up with and suggest new ideas	1.19
2	9. Notice problems, come up with and suggest new ideas	3.55	5.Collect appropriate data and present them in graphs or charts	2.58	10. Organize a work plan by considering future events	1.10
3	8. Understand specialized economic newspapers	3.33	10. Organize a work plan by considering future events	2.52	4. Understand and explain business-related events & trends	0.91
4	4. Understand and explain business-related events & trends	3.29	3.Explain basic business terms	2.49	26.Analyze and structure a problem of an enterprise and design a solution	0.91
5	5.Collect appropriate data and present them in graphs or charts	3.23	29.Identify the functional areas of an organization and their relations	2.46	16.Point out the financial characteristics and problems	0.86

History

Academics

Rank	Competence	Importance	Competence	Achievement	Competence	Diff.
1	1. Think critically about the relationship between current events and the past	3.90	15. Awareness of the differences in historical outlooks in various periods	3.50	4. Communicate orally in foreign languages using historical terminology	0.90
2	12. Write in one's own language using various types of historical writing	3.90	12. Write in one's own language using various types of historical writing	3.40	10. Read and summarize historical texts in one's own language	0.80
3	15. Awareness of the differences in historical outlooks in various periods	3.80	16. Awareness of current issues and themes of in historical debate	3.30	1. Think critically about the relationship between current events and the past	0.70
4	2. Comment, annotate, or edit texts and documents correctly	3.70	1. Think critically about the relationship between current events and the past	3.20	6. Give a narrative form to research results	0.70
5	3. Communicate orally in one's own language using historical terminology	3.60	2. Comment, annotate, or edit texts and documents correctly	3.20	14. Link the methods and issues of different branches of historical research	0.70

Employers

Rank	Competence	Importance	Competence	Achievement	Competence	Diff.
1	1. Think critically about the relationship between current events and the past	3.20	1. Think critically about the relationship between current events and the past	2.67	11. Use computer and internet resources and techniques elaborating historical data	0.73
2	16. Awareness of current issues and themes in a historical debate	3.18	16. Awareness of current issues and themes in a historical debate	2.67	3. Communicate orally in one's own language using historical terminology	0.72
3	14. Link the methods and issues of different branches of historical research	3.09	14. Link the methods and issues of different branches of historical research	2.56	24. Design, organize, and develop historical research projects	0.70
4	27. Apply historical education techniques and methods	3.00	15. Awareness of the differences in historical outlooks in various periods	2.56	22. Use specific tools to study historical documents	0.69
5	15. Awareness of the differences in historical outlooks in various periods	2.91	27. Apply historical education techniques and methods	2.44	8. Organize complex historical information in a coherent form	0.68

Generic

Academics

Rank	Competence	Importance	Competence	Achievement	Competence	Diff.
1	5. Communicate in one's native language	3.78	7. ICT skills	3.24	13. Generate new ideas	1.11
2	2. Apply knowledge in practical situations	3.68	17. Interpersonal and interaction skills	3.14	6. Communicate in a second language	0.98
3	9. Learn and stay up-to-date with learning	3.65	5. Communicate in one's native language	3.11	11. Be critical and self-critical	0.93
4	15. Make reasoned decisions	3.63	16. Work in a team	3.08	2. Apply knowledge in practical situations	0.92
5	14. Identify, describe, and resolve problems	3.61	10. Search for, process, and analyse information	2.96	23. Design and manage projects	0.89

Employers

Rank	Competence	Importance	Competence	Achievement	Competence	Diff.
1	16. Work in a team	3.76	16. Work in a team	3.20	3. Plan and manage time	1.13
2	3. Plan and manage time	3.75	5. Communicate in one's native language	3.16	22. Work autonomously	1.04
3	17. Interpersonal and interaction skills	3.73	17. Interpersonal and interaction skills	3.11	15. Make reasoned decisions	1.02
4	5. Communicate in one's native language	3.72	26. Act on the basis of ethical reasoning	3.02	13. Generate new ideas	1.01
5	15. Make reasoned decisions	3.69	24. Commitment to safety	3.01	14. Identify, describe, and resolve problems	1.01

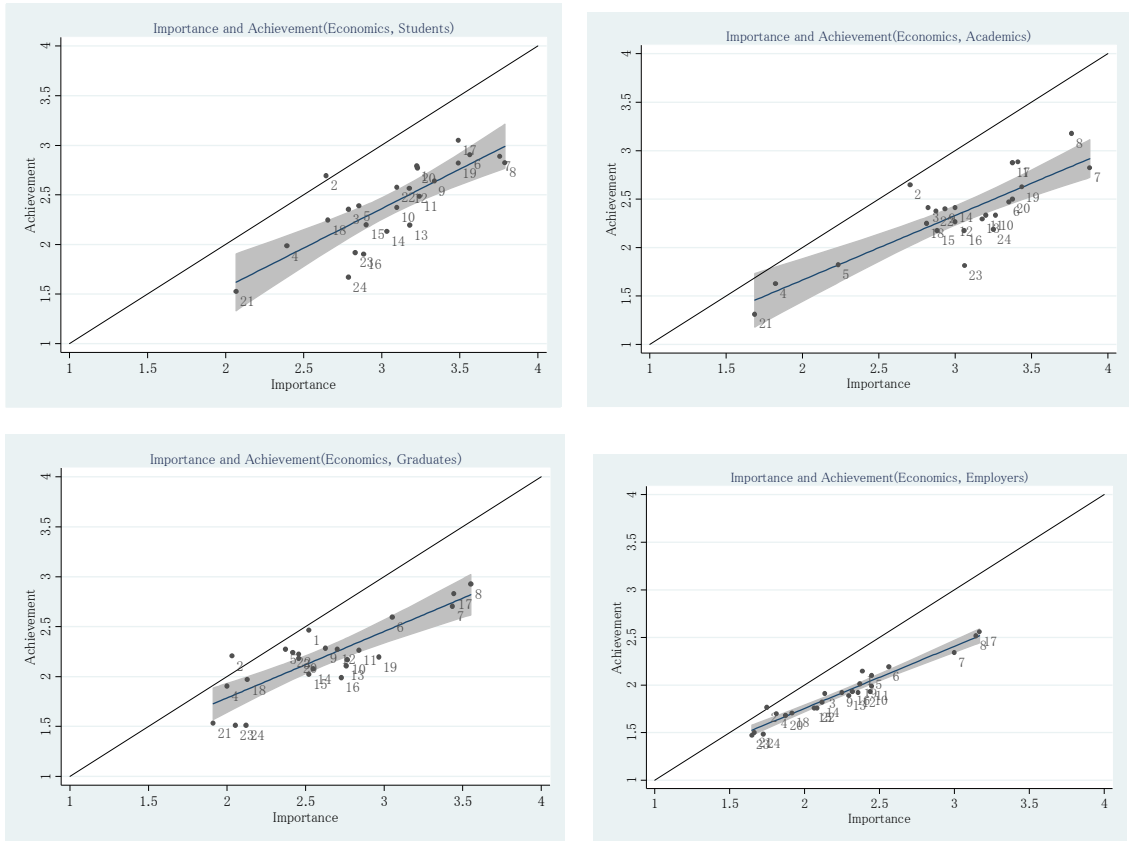
Here, two subject areas, Economics and Business, are selected for analysis because the number of responses from each stakeholder group reached a sufficient level. The following provides an overview of the positioning and content of competences by each stakeholder group from the scatter diagram.

Regardless of stakeholder group, almost all the competences are placed under the diagonal line. However, there are some exceptions. For example, three stakeholder groups (students, graduates, and employers) place “2. Understand mathematical solution methods used in economics” above the diagonal line, and academics place it very close to the diagonal line. Graduates place “1. Understand economic models and explain them using mathematical formulae and diagrams” very close to the diagonal line.

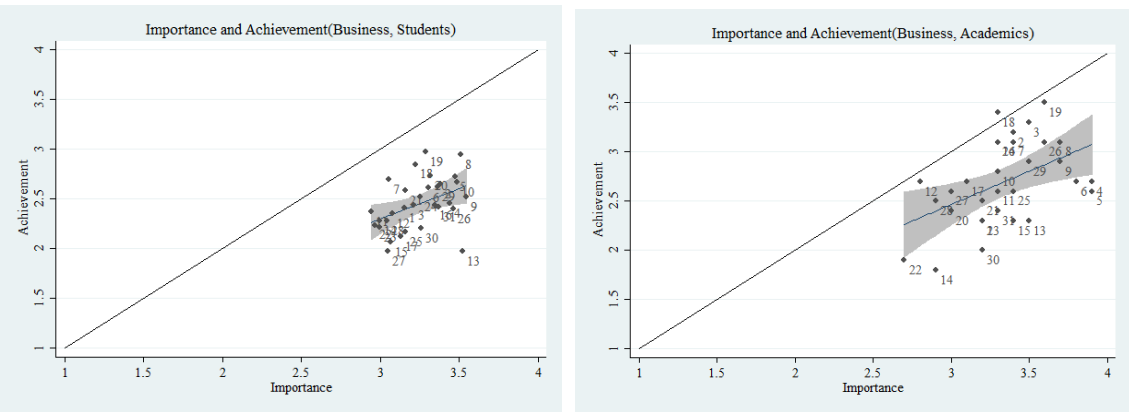
The results for Business show that the recognition distribution differs among stakeholder groups. Students recognize all the competences within a narrow interval from about 3 to 3.5 for importance, and the interval widens for these groups in the following order: academics, graduates, and employers. Like Economics, many of the competences are positioned under the diagonal line, although some exceptions are found.

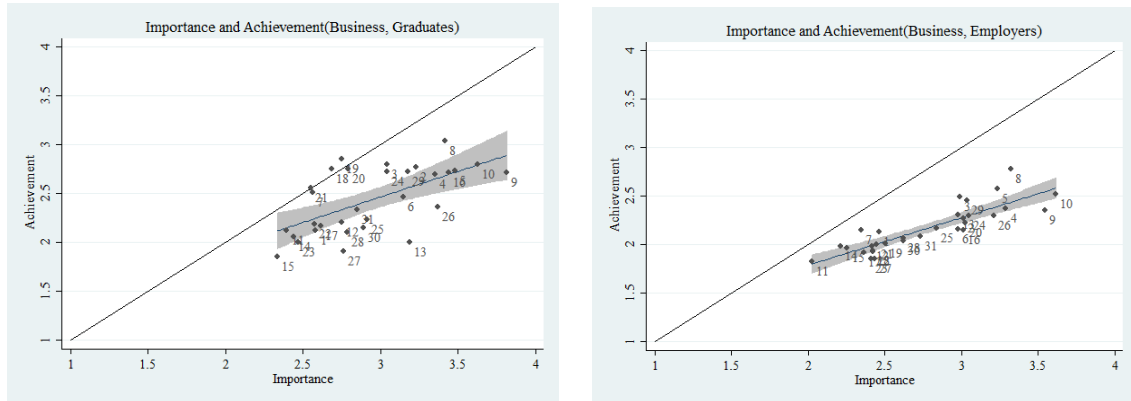
Chart 13 Importance v. achievement: scatter diagram of Economics and Business (by subject area)

Economics



Business





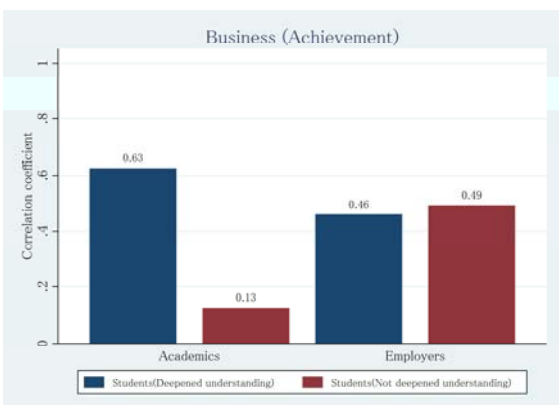
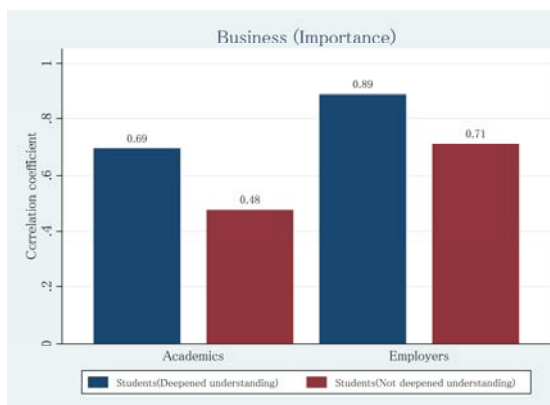
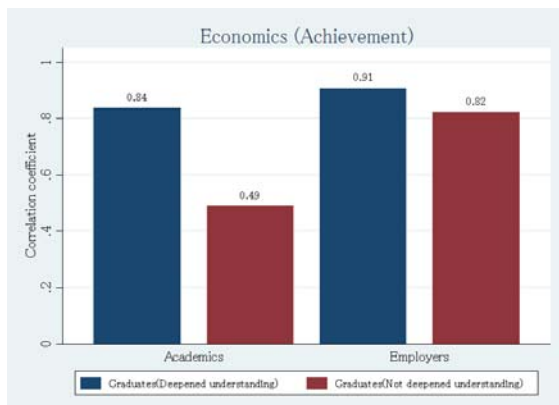
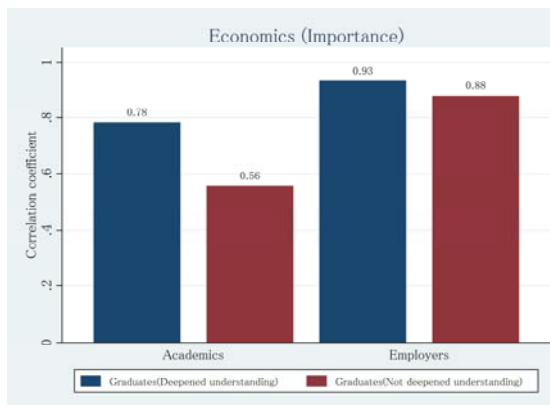
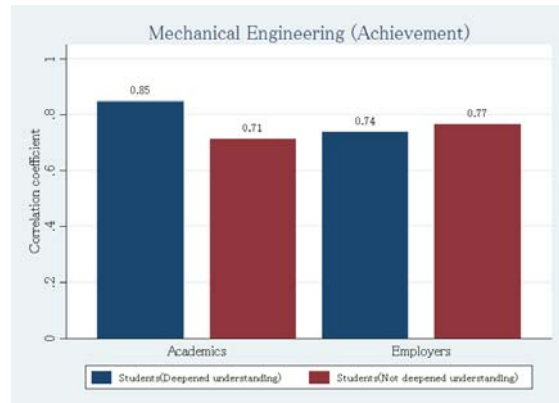
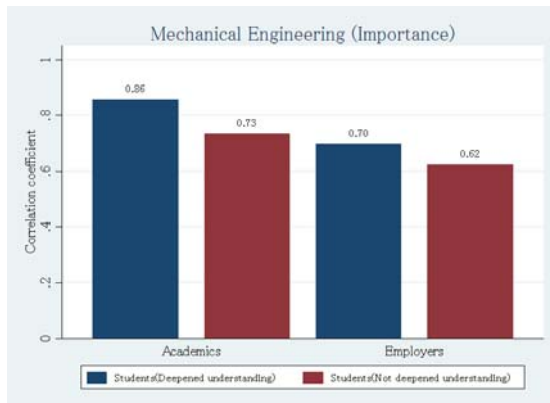
This section shows the relationship between competence recognition and the respondents' attributes and education. Some attributes did not reach the minimum number required for adequate analysis, and thus the following only shows the analysis for cases of more than 10 people.

We asked students and graduates whether subject-specific education deepened their understanding of a subject area. The response was divided into two groups: those who answered their understanding was deepened ("significantly deepened" and "deepened"), and those who answered that their understanding was not deepened. Using the survey data, we compared the Pearson correlation of students and graduates to academics and employers. The results are shown in Chart 14. Regarding subject-specific competences, students and graduates who answered that their understanding of a particular subject area has deepened show a higher correlation with academics and employers compared with students and graduates who answered the opposite.

The result of Generic competences also shows a similar result: students and graduates who deepened their understanding of a subject areas via subject-specific education recognize competences more similarly to academics and employers than those who did not deepen their understanding. Thus, the results for importance show a great affinity with academics and employers while the level of achievement only shows a slight similarity.

Chart 14 Correlation between the competence recognition of students differentiated by the depth of understanding of their subject areas and academics and employers

[Subject Specific Competences]



[Generic Competences]

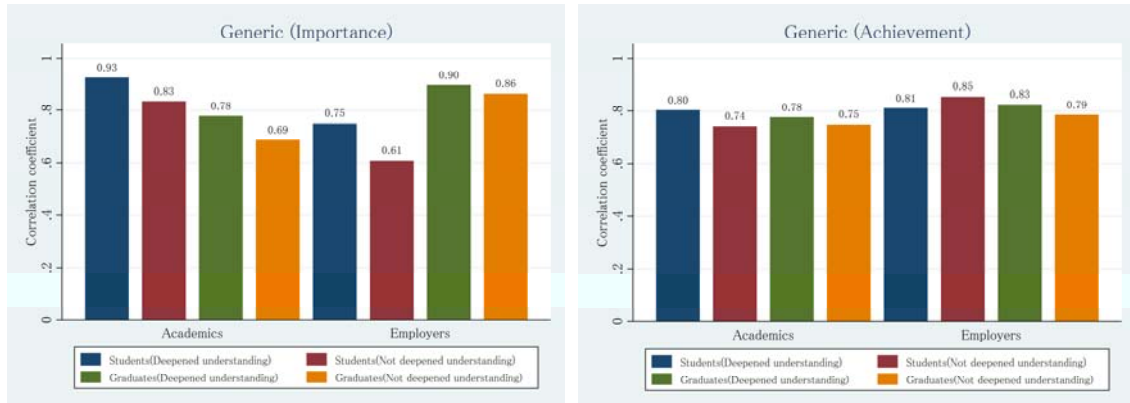
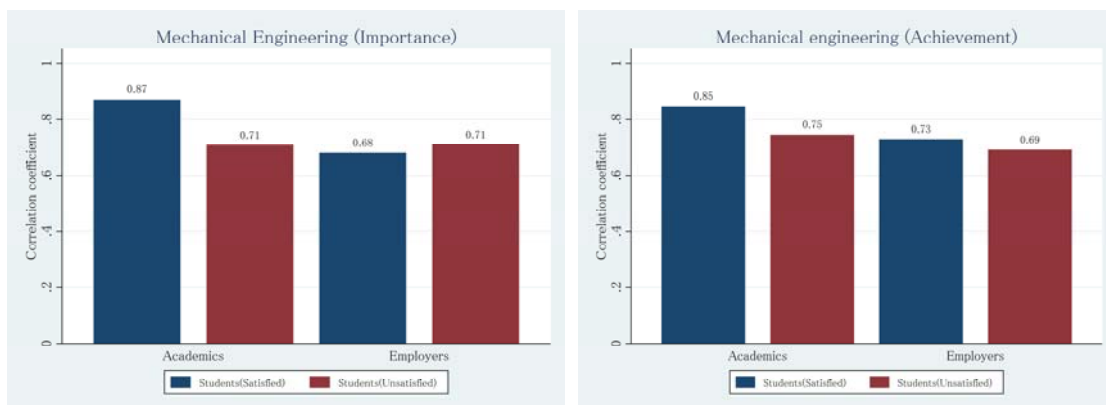


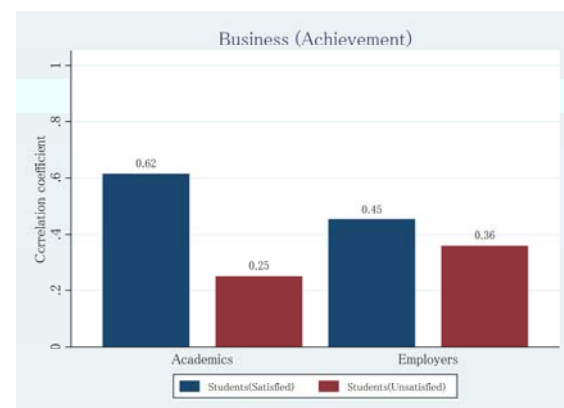
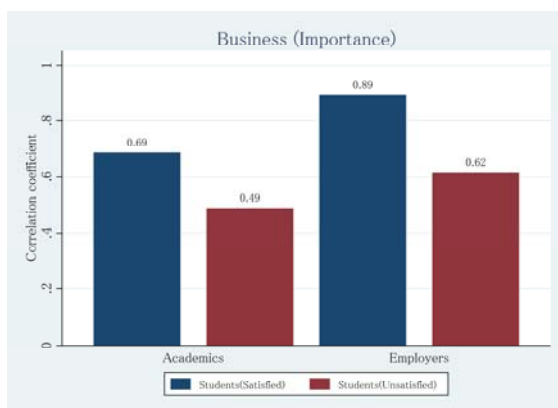
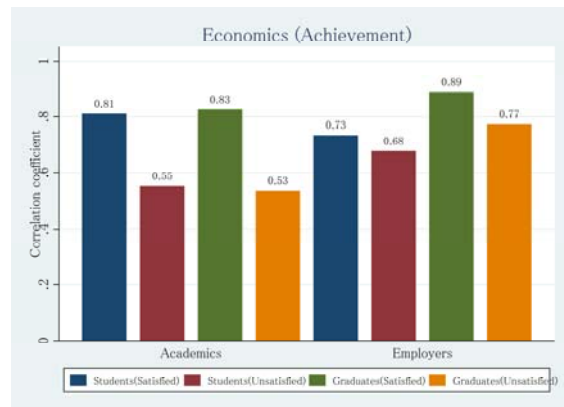
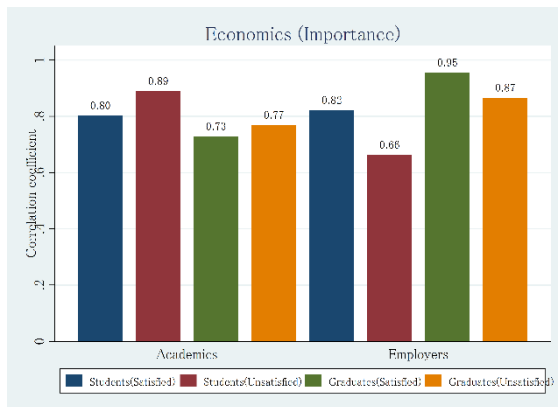
Chart 15 shows several different correlations: the correlation between students and graduates who are satisfied with their subject specific education (those who answered “very satisfied” or “satisfied”) and academics and employers, and the correlation between students and graduates who are not satisfied with their subject-specific education and academics and employers.

According to the results by subject area, in Mechanical Engineering, students who are satisfied with their education show a closer correlation to academics by 0.1 to 0.16 points in both the importance and the level of achievement than those who are not satisfied. However, the correlation with employers is quite small. In Economics, regarding the question of the level of achievement, students and graduates who are satisfied with their education show a closer correlation to academics and employers than those who are not satisfied. In contrast, the answer for importance shows little difference.

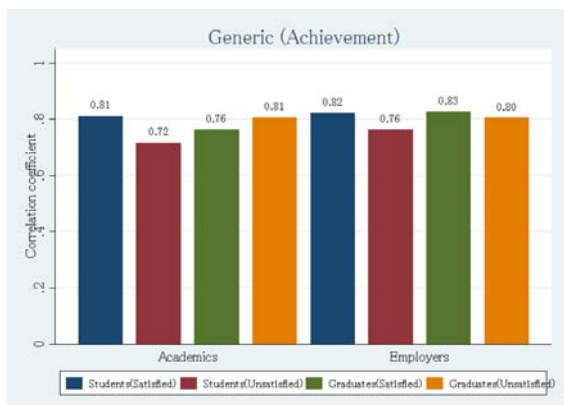
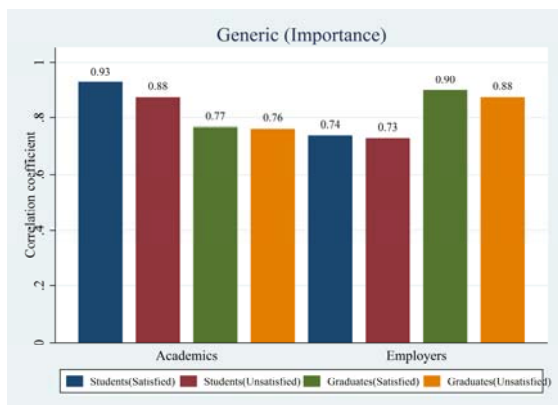
Chart 15 Correlation between the competence recognition of students differentiated by their satisfaction with subject-specific education and academics and employers

[Subject specific Competences]





[Generic Competences]

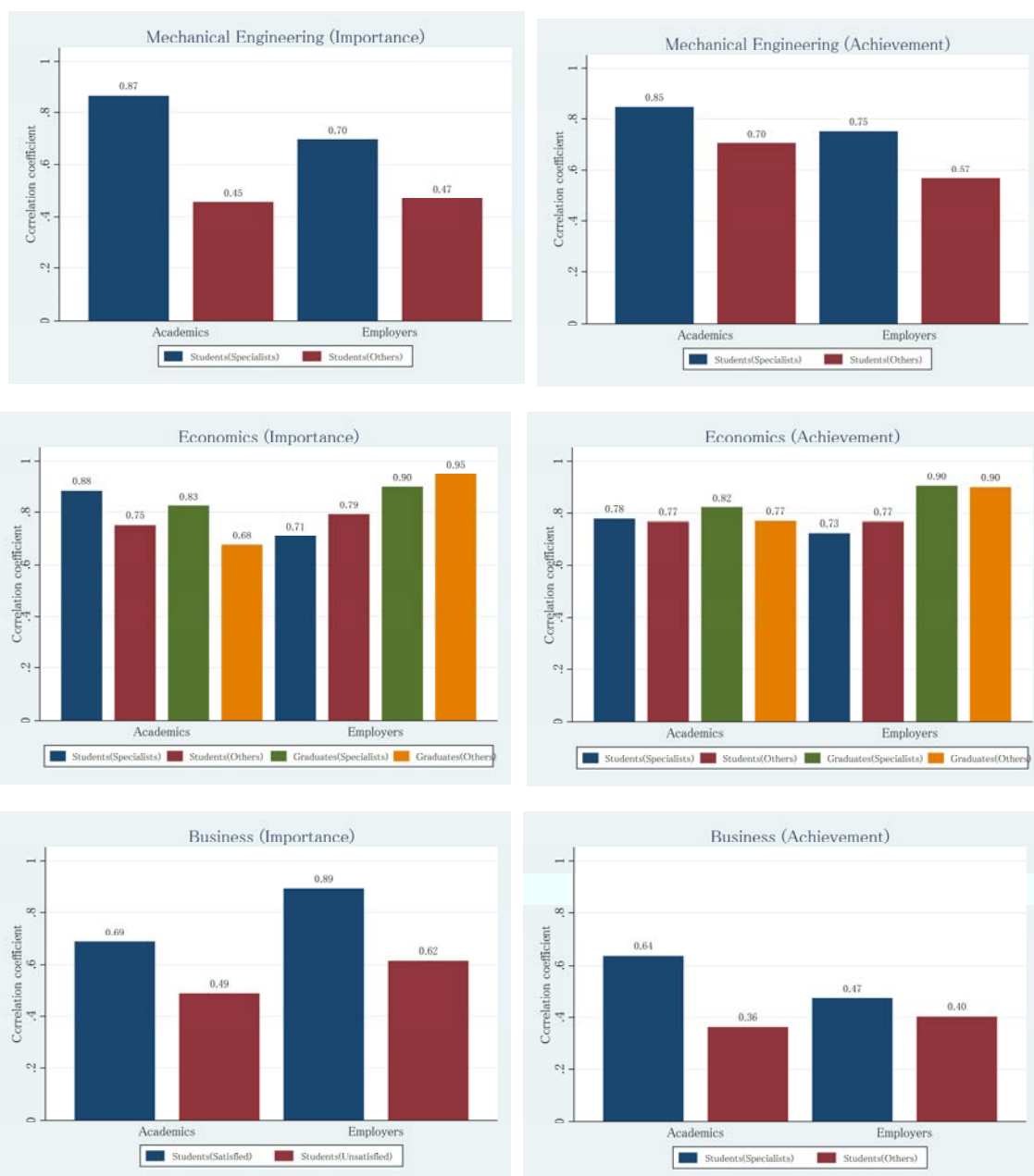


First, students were divided into two groups (whether they wish to work at specialized and technical jobs after graduation) and graduates were divided into two groups (whether they are currently working at specialized and technical jobs). Next, the correlation of competence recognition of academics and employers in four subject areas (Mechanical Engineering, Economics, Business, and History) are compared. The results are shown in Chart 16. According to the results for subject-specific competences, students who would like to work in specialized

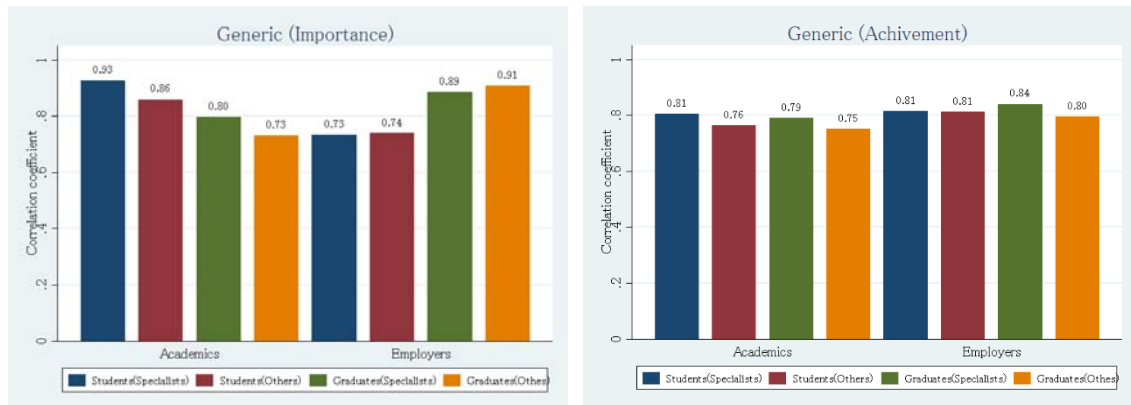
and technical positions show a closer correlation to academics and employers than students who do not wish to. Similarly, graduates who currently hold specialized and technical jobs show a closer relation to academics and employers than graduates who do not work at such jobs.

Chart 16 Correlation between the competence recognition of students/graduates differentiated by whether they wish to work or work in specialized and technical jobs and academics and employers

[Subject specific competences]



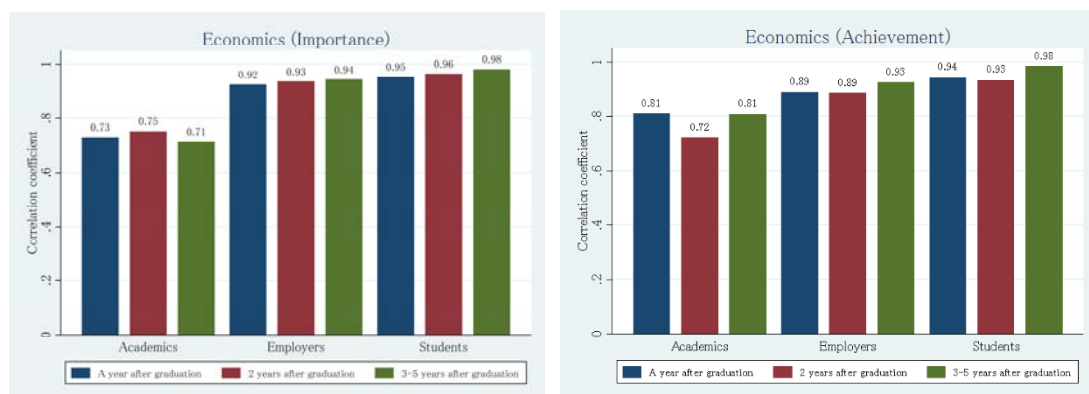
[Generic Competences]

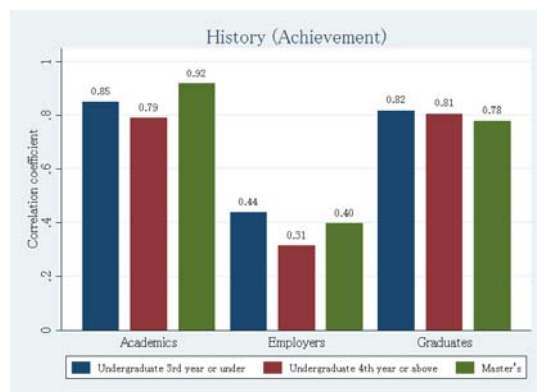
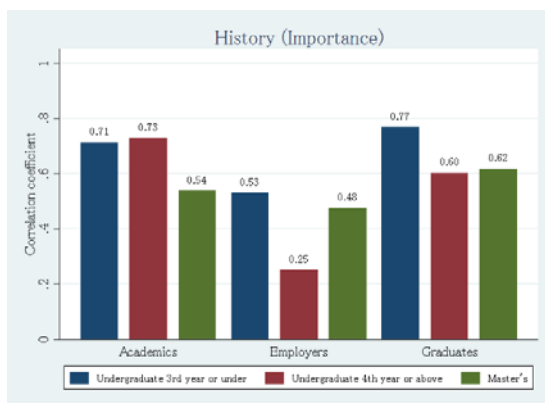
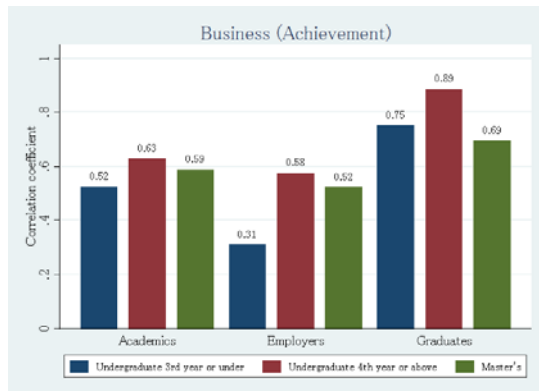


The correlation between the competence recognition of students and academics is not influenced by the period of study at university. Similarly, the correlation between the competence recognition of graduates and employers is not influenced by the number of years after graduation.

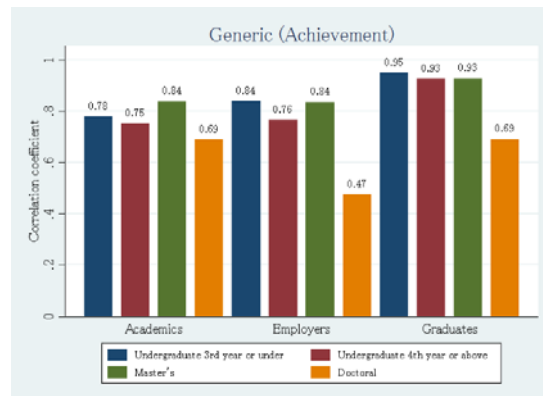
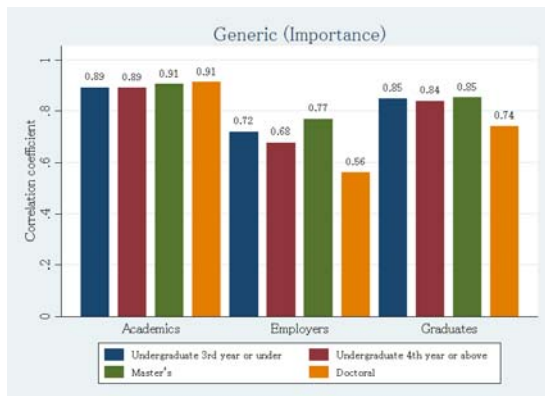
Chart 17 Correlation between the competence recognition of students/graduates differentiated by their years of study/after graduation and academics and employers

[Subject Specific Competences]





[Generic Competences]



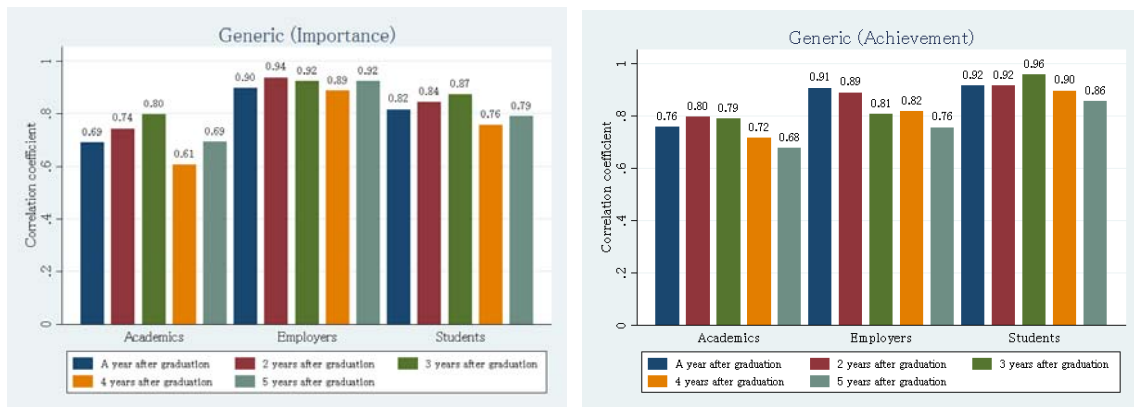


Chart 18 Generic competence recognition (by grade and degree)

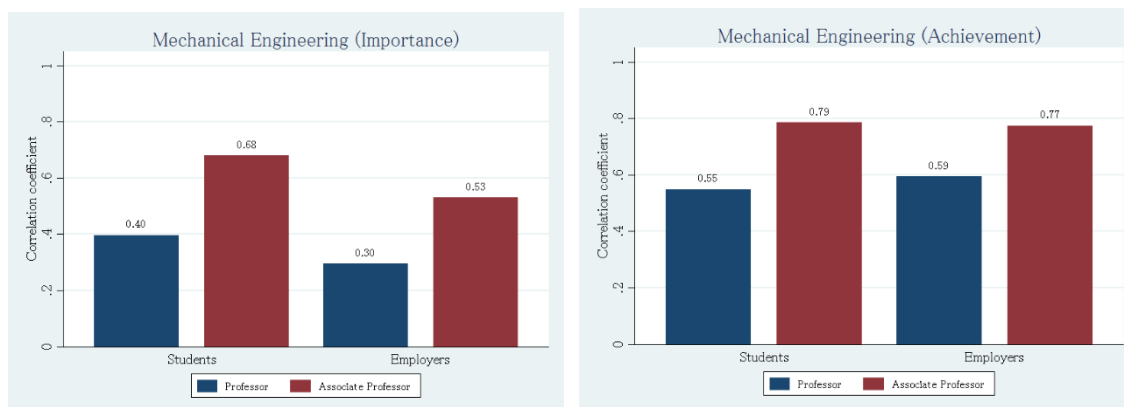
	Undergraduate 3rd year or under	Undergraduate 4th year or above	Master's	Doctoral
Undergraduate 3rd year or under	1			
Undergraduate 4th year or above	0.92	1		
Master's	0.94	0.91	1	
Doctoral	0.88	0.80	0.86	1

	Undergraduate 3rd year or under	Undergraduate 4th year or above	Master's	Doctoral
Undergraduate 3rd year or under	1			
Undergraduate 4th year or above	0.96	1		
Master's	0.96	0.93	1	
Doctoral	0.67	0.72	0.75	1

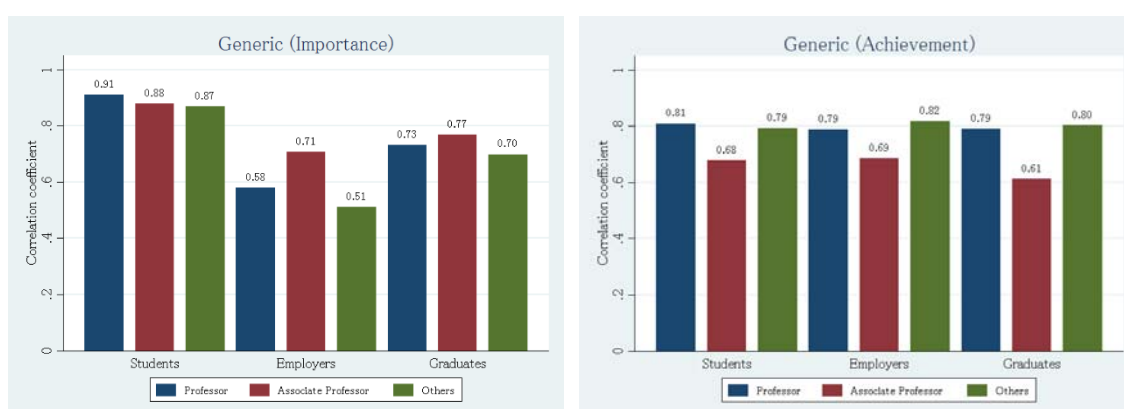
In Mechanical Engineering, the competence recognition of associate professors is closer to that of students and employers than professors. Regarding Generic competence recognition, little difference is found among academics with different job classifications.

Chart 19 Correlation between competence recognition of academics by job classification and other participants

[Subject specific Competences]



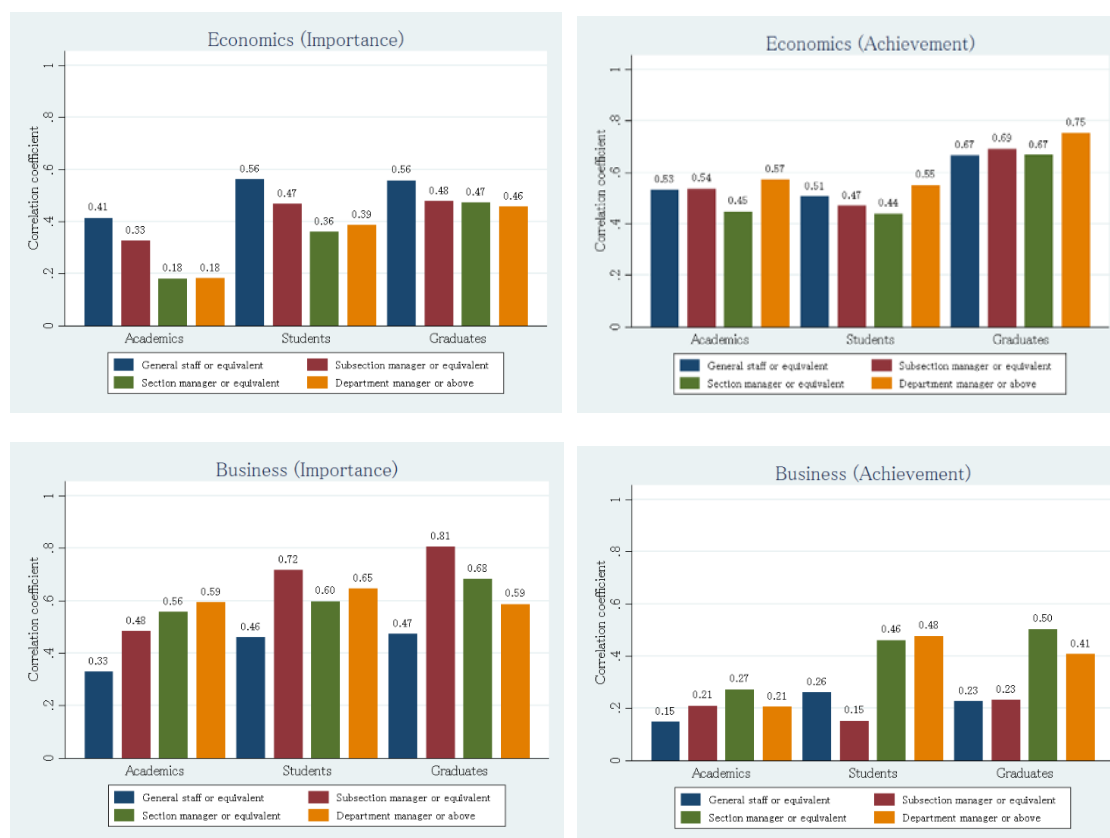
[Generic Competences]



The correlation of competence recognition by different job classifications is shown in Chart 20. There is a difference between job levels regarding the recognition of the importance of subject-specific competences. In Economics, recognition by young workers (general employees, assistant managers) shows a higher correlation with academics and students compared with managers, directors, or above. In Business, unlike Economics, the correlation between managers, directors, or above and other stakeholder groups is higher than for the group holding lower-level jobs, save for some exceptions.

Chart 20 Correlation between the competence recognition of employers by job level and other stakeholder groups

[Subject specific Competences]



[Generic Competences]

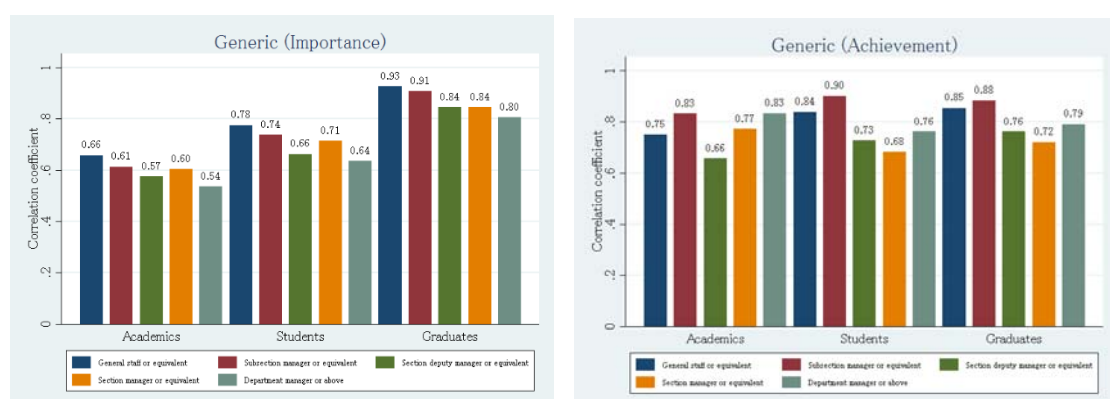


Chart 21 Correlation among the competence recognition of employers with different job levels

Generic Competences Importance

	General staff or equivalent	Subsection manager or equivalent	Section deputy manager or equivalent	Section manager or equivalent	Department manager or above
General staff or equivalent	1				
Subsection manager or equivalent	0.96	1			
Section deputy manager or equivalent	0.96	0.94	1		
Section manager or equivalent	0.94	0.90	0.90	1	
Department manager or above	0.92	0.90	0.93	0.90	1

Generic Competences Achievement

	General staff or equivalent	Subsection manager or equivalent	Section deputy manager or equivalent	Section manager or equivalent	Department manager or above
General staff or equivalent	1				
Subsection manager or equivalent	0.94	1			
Section deputy manager or equivalent	0.91	0.87	1		
Section manager or equivalent	0.92	0.87	0.89	1	
Department manager or above	0.90	0.89	0.85	0.93	1

More than 60% of new employees consider that their work content does not match their study area at university. Specifically, less than 15% of employers regard the majority (over 60%) of new employees are assigned work that matches their field of specialization. Furthermore, 63% of companies answered that less than half of the new employees (40% or less) are assigned work that matches their specialization (Chart 22).

Chart 22 The proportion of new employees whose field of specialization at university matches that of their job

The proportion of new employees whose field of specialization at university matches that of their job	Number of employees	Percentage
80% and above	14	5.0%
60%–79%	26	9.3%
40%–59%	63	22.6%
20%–39%	71	25.4%
Less than 20%	105	37.6%
Total	279	100.0%

When employers are asked about opportunities for employees to improve generic abilities and skills at their companies, approximately 80% answered that opportunities are provided at their companies (“plenty of opportunities” and “some opportunities”) (subject-specific competences 76.6%, Generic competences 85.9%) (Chart 23).

Chart 23 Opportunities for employees to improve field-specific abilities and skills

	Opportunities for employees to improve field-specific abilities and skills	Percentage	Opportunities for employees to improve generic abilities and skills	Percentage
Plenty of opportunities	97	34.4%	118	41.7%
Some opportunities	119	42.2%	125	44.2%
Cannot say either way	41	14.5%	27	9.5%
Limited opportunities	24	8.5%	11	3.9%
No opportunities	1	0.4%	2	0.7%
Total	282	100.0%	283	100.0%

While students focus on universities’ reputations when selecting a university, employers focus on outcomes (such as the knowledge, qualities, and abilities that should be acquired before graduation) at the time of employing new employees.

Students and graduates were asked to provide the top three criteria when choosing university. In addition, graduates were also asked to choose competences that are useful in employment. Employers were asked to choose important competences upon employing students. The results are shown in Chart 25. To facilitate a comparison between stakeholders, Chart 24 shows the weighted results as follows: the first position scores three points, the second position scores two points, and the third position scores one point. In Chart 24, students and graduates show a similar tendency regarding the selection criteria when selecting a university.

From these results, it can be concluded that students and graduates place a greater emphasis on education and research content and reputation when selecting a university. In contrast, employers place a greater value on the knowledge, qualities, and abilities that should be acquired before graduation.

Chart 24 Important points when selecting a university or employing students (weighted evaluation)

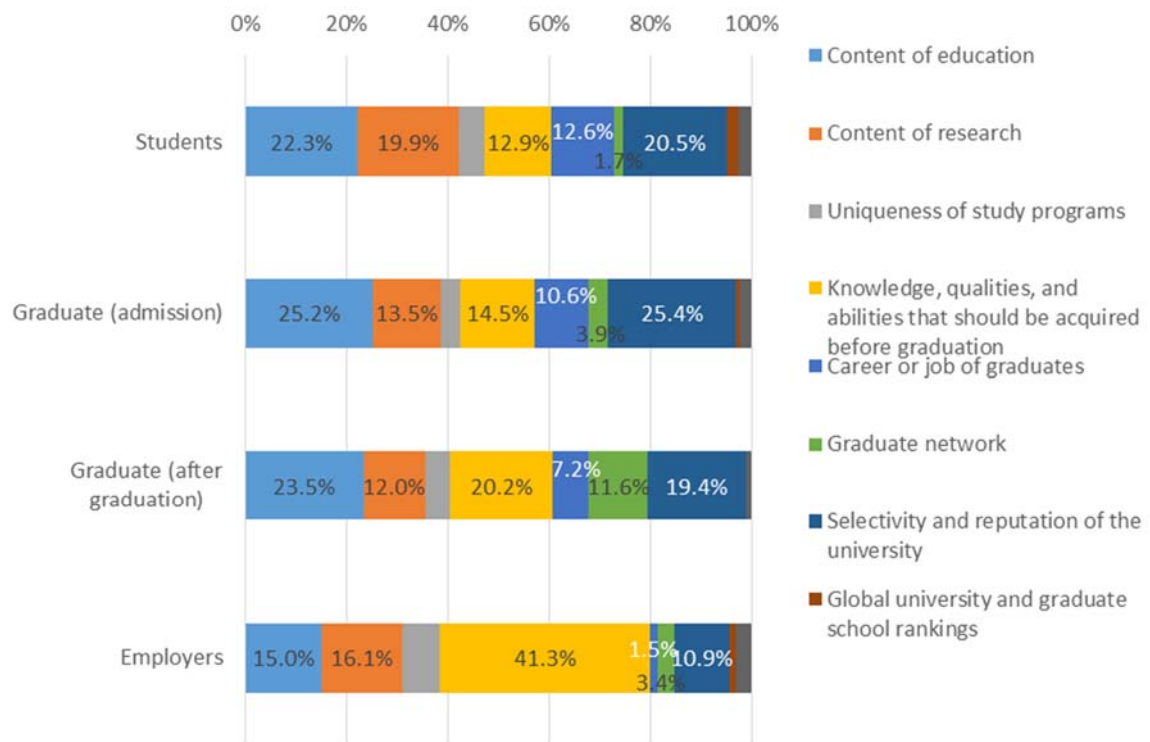


Chart 25 Important points when selecting a university or recruiting a student

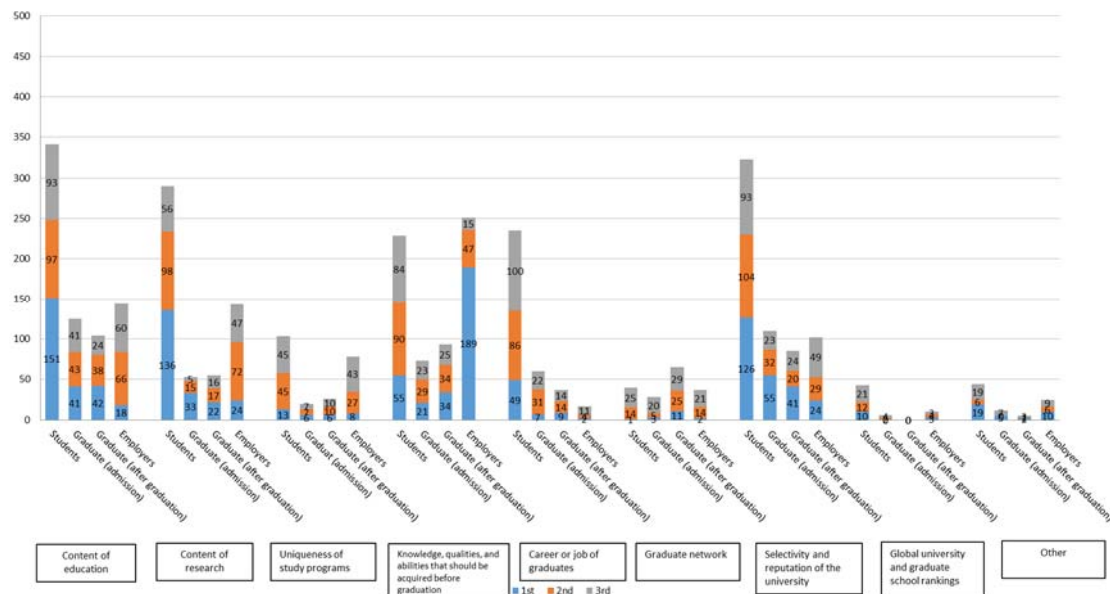


Chart 26 shows that all four stakeholder groups chose “thinking ability” as a priority. However, the ratio varies among stakeholders: 39.8% for employers and 27.8% for students. There was a considerable difference among stakeholders for “deep expertise”.

While students and academics find deep specialized knowledge important because students are in the learning process of specialized knowledge and the job of academics is to teach specialized knowledge, employers and graduates focus more on the application, as their careers require that they have other abilities besides specialized knowledge.

Chart 26 Abilities that graduates should acquire from university education (weighted evaluation)

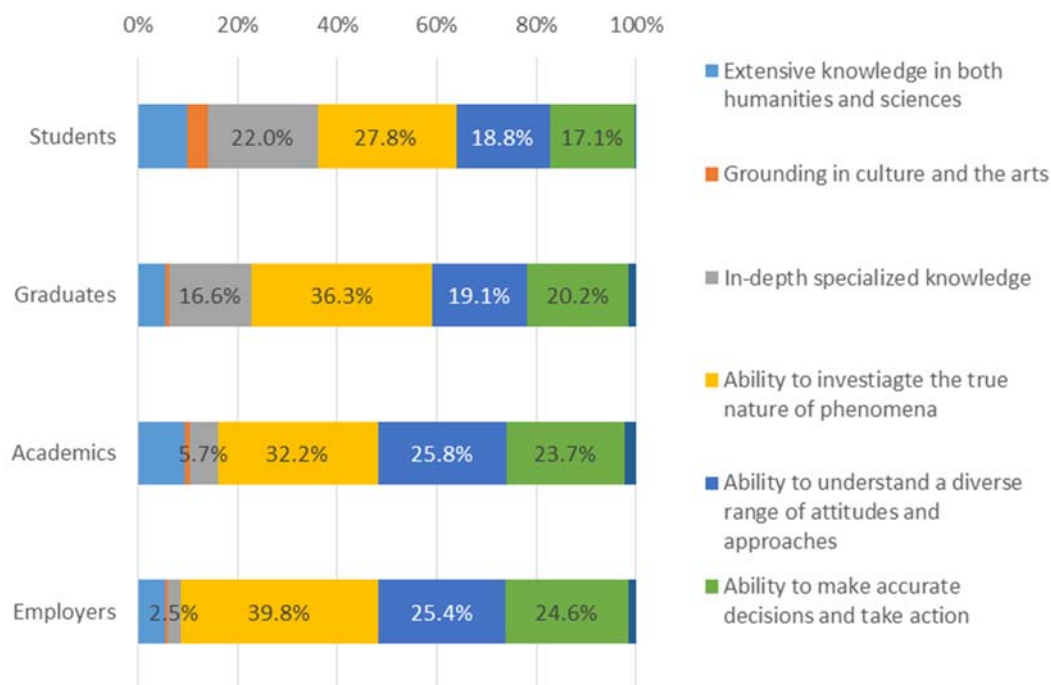
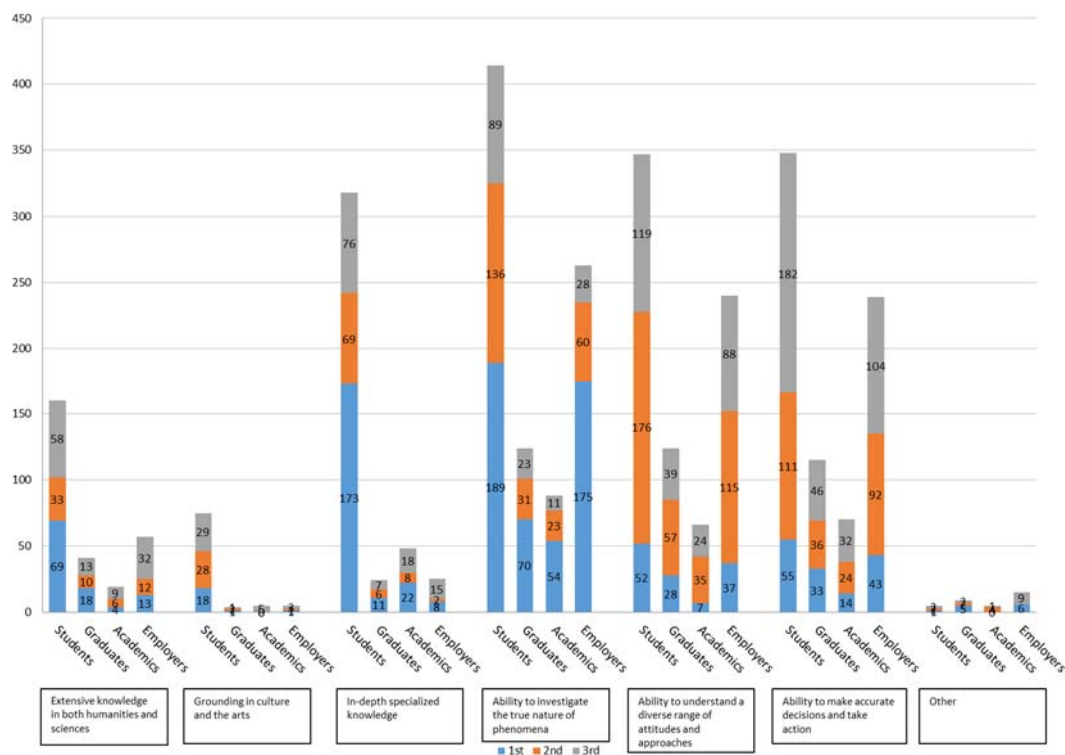


Chart 27 Abilities that graduates should acquire from university education



4. Conclusions and Future Challenges

This survey sought the views of varied university stakeholder groups to determine those competences that should be acquired by Japanese students before graduation. From our results, it became clear that graduates have acquired competences that are considered important in specialized areas. In addition, students and graduates who have deepened their understanding of subject areas via subject-specific education recognize competences more similarly to academics and employers than those who have not. This tendency also applies to graduates. A similar tendency is shown in the importance of generic competences. This indicates that the subject-specific education provided by participating universities is heading in the right direction when measured by “competence.”

However, this study also suggests the need to improve Japan’s current subject-specific education. All stakeholders believe that graduates have not fully acquired the necessary subject-specific and generic competences. In addition, the results of the survey reveal a divergence between employers and academics, with employers placing a lower value on the acquisition of subject-specific competences. This discrepancy between employers and academics has been reported in a number of international surveys. The results of this survey show that a similar tendency is confirmed in Japan.

The findings identify in detail the subject-specific competences that are considered important and whether they have been acquired. These results can be used as a guide for university academics to improve education in each subject area. Moreover, the results show that employers consider there are opportunities for employees to improve both generic and subject-specific competences. It has been pointed out that the reason behind the increasing interest and debate on the acquisition of generic competence is the reduced opportunities within Japanese companies to train new employees. Although it depends on the perceptions of the “opportunity,” the premise that it is possible to continuously enhance competences gives an indication of what university education could offer.

The survey results present a heterogeneous recognition of competences by stakeholders as well as an analysis of individual and specific competences. As a result, it is clear that employers place a strong emphasis on competences as educational outcomes at the time of employment. Furthermore, students and graduates state that the reputation of a university and the university’s educational process are important in the selection of a university. Regarding those competences that university graduates are expected to attain while at university, all four stakeholder groups chose “thinking ability.” While students and academics find strong subject-specific knowledge important, employers and graduates focus more on the application of that knowledge. This result suggests the need for educational improvement that recognizes these different demands.

This survey could be improved for future use. Feedback from some participants via the comment section of the questionnaire stated that there were too many questions, it was difficult to answer relying actual situations, and there were comments about the content of competences. Based on these comments, the questionnaire should be modified for future use. In addition, there is a need to ensure an appropriate number of participants for statistical analysis. However, what is most important is the utilization of the survey results. The organizers hope not only to publish the survey report but to contribute to the improvement of Japanese education via the results of the survey.