Lifelong Learning Programme

Lifelong Learning Programme

Improving Teaching Effectiveness in Chemical Engineering Education

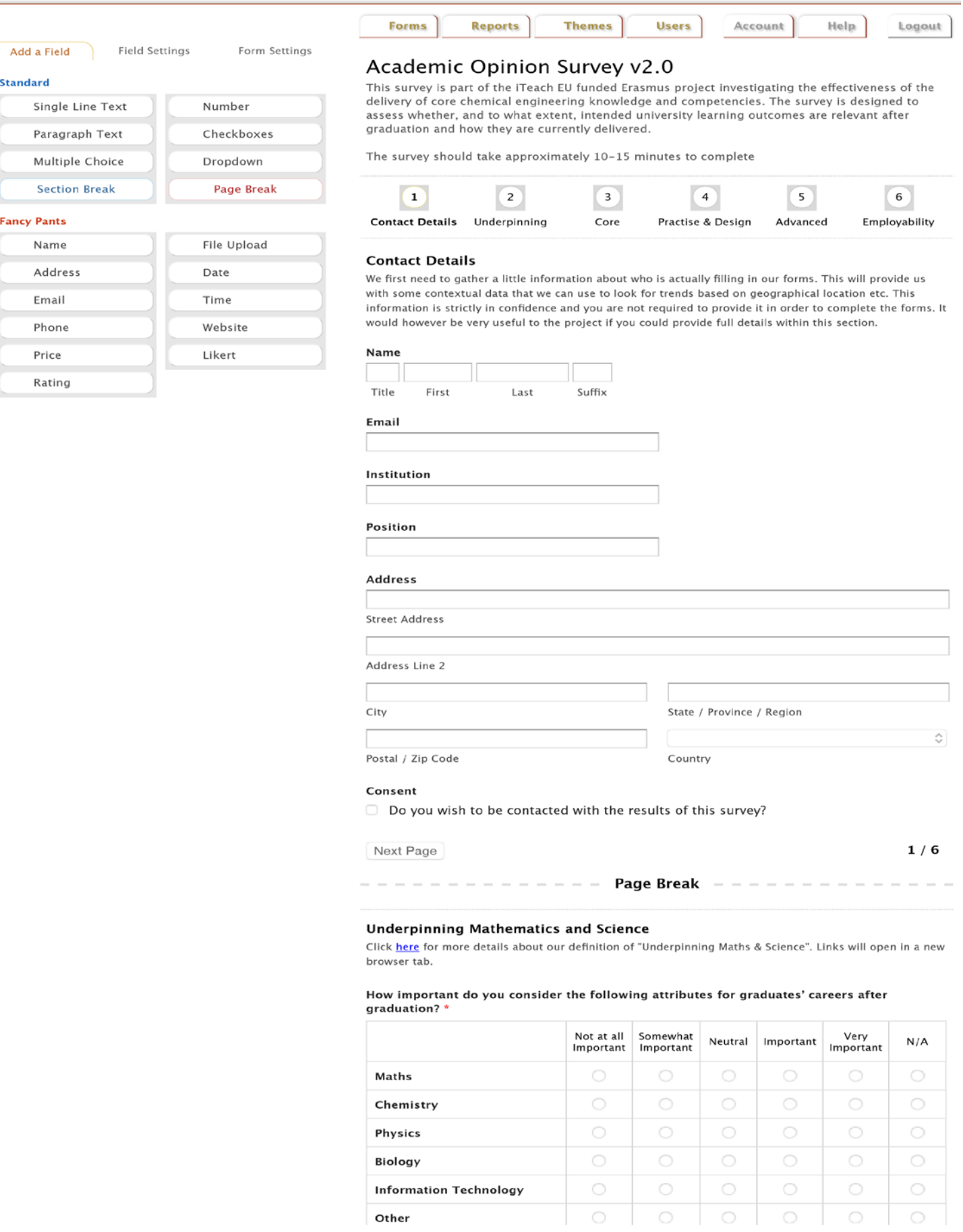
ITEACH

Trends in current learning outcomes and criteria of effectiveness of delivery

Deliverable 2.1

9. Appendices

9.1 Questionnaires issued to each stakeholder group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Academic Opinion Survey v2.0
This survey is part of the iTeach EU funded Erasmus project investigating the effectiveness of the delivery of core chemical engineering knowledge and competencies. The survey is designed to assess whether, and to what extent, intended university learning outcomes are relevant after graduation and how they are currently delivered.
The survey should take approximately 10-15 minutes to complete
1 Contact Details
2 Underpinning
3 Core
4 Practise & Design
5 Advanced
6 Employability
Contact Details
We first need to gather a little information about who is actually filling in our forms. This will provide us with some contextual data that we can use to look for trends based on geographical location etc. This information is strictly in confidence and you are not required to provide it in order to complete the forms. It would however be very useful to the project if you could provide full details within this section.
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Last
Suffix
Email
Institution
Position
Address
Street Address
Address Line 2
City
State / Province / Region
Postal / Zip Code
Country
Consent
Do you wish to be contacted with the results of this survey?
Next Page
1 / 6
Page Break
Underpinning Mathematics and Science
Click here for more details about our definition of "Underpinning Maths & Science". Links will open in a new browser tab.
How important do you consider the following attributes for graduates' careers after graduation? *
Not at all Important
Somewhat Important
Neutral
Important
Very Important
N/A
Maths
Chemistry
Physics
Biology
Information Technology
Other

What is your institution's predominant method of teaching each of these competencies? *

	Lectures	Labs	Tutorials	Case Studies	Problem-based	Other	N/A
Maths	○	○	○	○	○	○	○
Chemistry	○	○	○	○	○	○	○
Physics	○	○	○	○	○	○	○
Biology	○	○	○	○	○	○	○
Information Technology	○	○	○	○	○	○	○
Other	○	○	○	○	○	○	○

Where you have answered "Other", please provide details

How does your institution currently assess the effectiveness of teaching in relation to these competencies? *

Next Page Previous 2 / 6

Page Break

Core Chemical Engineering Knowledge

Click here for more details about our definition of "Core Chemical Engineering Knowledge". Links will open in a new browser tab.

How important do you consider the following attributes for graduates' careers after graduation? *

	Not at all Important	Somewhat Important	Neutral	Important	Very Important	N/A
Fundamentals	○	○	○	○	○	○
Modelling & Quantitative Methods	○	○	○	○	○	○
Process & Product Technology	○	○	○	○	○	○
Systems	○	○	○	○	○	○
Safety	○	○	○	○	○	○
Sustainability, Economics, Ethics	○	○	○	○	○	○

What is your institution's predominant method of teaching each of these competencies? *

	Lectures	Labs	Tutorials	Case Studies	Problem-based	Other	N/A
Fundamentals	○	○	○	○	○	○	○
Modelling & Quantitative Methods	○	○	○	○	○	○	○
Process & Product Technology	○	○	○	○	○	○	○
Systems	○	○	○	○	○	○	○
Safety	○	○	○	○	○	○	○
Sustainability, Economics, Ethics	○	○	○	○	○	○	○

Where you have answered "Other", please

How does your institution currently assess the effectiveness of teaching in relation to these competencies? *

Next Page Previous 3 / 6

Page Break

Engineering Practice & Design

Click here for more details about our definition of "Engineering Practice & Design". Links will open in a new browser tab.

How important do you consider the following attributes for graduates' careers after graduation? *

	Not at all Important	Somewhat Important	Neutral	Important	Very Important	N/A
Practical	○	○	○	○	○	○
Data Analys	○	○	○	○	○	○
Information	○	○	○	○	○	○
Industrial Quality	○	○	○	○	○	○

How important do you consider the following attributes for graduates' careers after graduation? *

	Not at all Important	Somewhat Important	Neutral	Important	Very Important	N/A
Systems Approach to						
Technical Rigour in						
Awareness of Safety, & Environment						
Awareness of Drive						

What is your predominmethod of teaching each of these *

How does your institution currently assess the effectiveness of teaching in relation to these competencies? *

Advanced Level

Next Page Previous 4 / 6

Click here for more details about our definition of "Advanced level". Links will open in a new browser tab.

How important do you consider the following attributes for graduates' careers after graduation? *

	Not at all Important	Somewhat Important	Neutral	Important	Very Important	N/A
Chemical Engineering Science Depth						
Limitations of Current Engineering Practise						
Awareness of Emerging Technologies						
Design in the Context of Uncertainty						
Innovative/Advanced Design						
Chemical Engineering Science Breadth						

Page Break

What is your institution's predominant method of teaching each of these competencies? *

	Lectures	Labs	Tutorials	Case Studies	Problem-based	Other	N/A
Chemical Engineering Science Depth	○	○	○	○	○	○	○
Limitations of Current Engineering Practise	○	○	○	○	○	○	○
Awareness of Emerging Technologies	○	○	○	○	○	○	○
Design in the Context of Uncertainty	○	○	○	○	○	○	○
Innovative/Advanced Design	○	○	○	○	○	○	○
Chemical Engineering Science Breadth	○	○	○	○	○	○	○

Where you have answered "Other", please provide details

How does your institution currently assess the effectiveness of teaching in relation to these competencies? *

Next Page Previous 5 / 6

Page Break

Employability Competencies

Click here for more details about our definition of "Employability Competencies". Links will open in a new browser tab.

How important do you consider the following attributes for graduates' careers after graduation? *

Communication Skills	○	○	○	○	○	○
Working effectively with others	○	○	○	○	○	○
Leadership Skills	○	○	○	○	○	○
Effective use of Information Technology	○	○	○	○	○	○
Project Planning & Time Management	○	○	○	○	○	○
Continuous Professional Development	○	○	○	○	○	○

6

	Not at all Important	Somewhat Important	Neutral	Important	Very Important	N/A
Problem Solving	○	○	○	○	○	○

What is your institution's predominant method of teaching each of these competencies? *

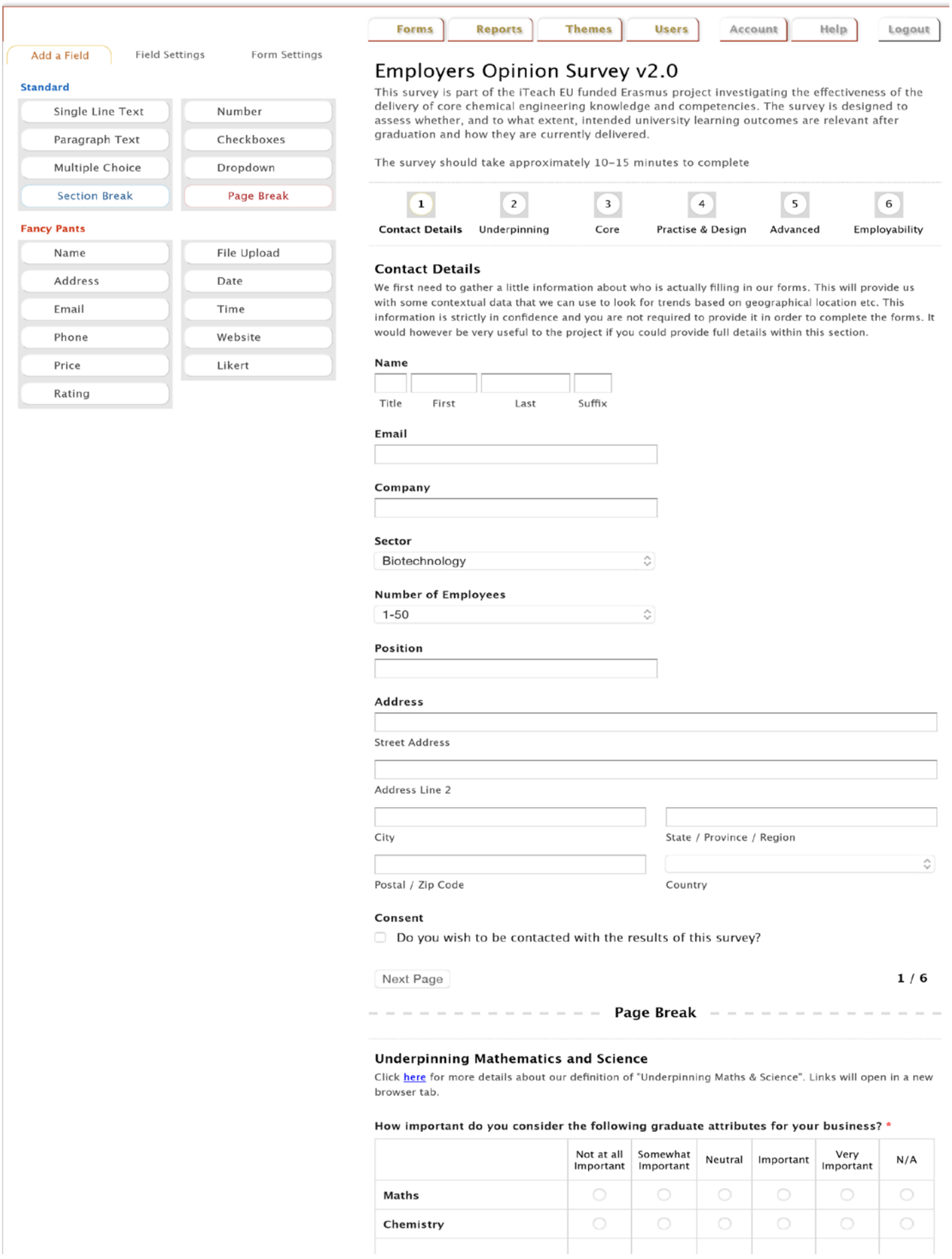
	Lectures	Labs	Tutorials	Case Studies	Problem-based	Other	N/A
Problem Solving Skills	○	○	○	○	○	○	○
Communication Skills	○	○	○	○	○	○	○
Working effectively with others	○	○	○	○	○	○	○
Leadership Skills	○	○	○	○	○	○	○
Effective use of Information Technology	○	○	○	○	○	○	○
Project Planning & Time Management	○	○	○	○	○	○	○
Continuous Professional Development	○	○	○	○	○	○	○

Where you have answered "Other", please provide details

How does your institution currently assess the effectiveness of teaching in relation to these competencies? *

Previous

6 / 6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Employers Opinion Survey v2.0
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The survey should take approximately 10–15 minutes to complete
1 Contact Details
2 Underpinning
3 Core
4 Practise & Design
5 Advanced
6 Employability
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We first need to gather a little information about who is actually filling in our forms. This will provide us with some contextual data that we can use to look for trends based on geographical location etc. This information is strictly in confidence and you are not required to provide it in order to complete the forms. It would however be very useful to the project if you could provide full details within this section.
Name
Title
First
Last
Suffix
Email
Company
Sector
Biotechnology
Number of Employees
1-50
Position
Address
Street Address
Address Line 2
City
State / Province / Region
Postal / Zip Code
Country
Consent
Do you wish to be contacted with the results of this survey?
Next Page
1 / 6
Page Break
Underpinning Mathematics and Science
Click here for more details about our definition of "Underpinning Maths & Science". Links will open in a new browser tab.
How important do you consider the following graduate attributes for your business? *
Not at all Important
Somewhat Important
Neutral
Important
Very Important
N/A
Maths
Chemistry

Physics						
Biology						
Information Technology						
Other						

According to your experience, how would you rate recent university graduates on each of these competencies? *

	Not at all Competent	Somewhat Competent	Neutral	Competent	Very Competent	N/A
Maths						
Chemistry						
Physics						
Biology						
Information Technology						
Other						

Where you have answered "Other", please provide details

How do you currently assess university graduates' competencies? *

Next Page Previous 2 / 6

Page Break

Core Chemical Engineering Knowledge

Click here for more details about our definition of "Core Chemical Engineering Knowledge". Links will open in a new browser tab.

How important do you consider the following graduate attributes for your business? *

	Not at all Important	Somewhat Important	Neutral	Important	Very Important	N/A
Fundamentals	○	○	○	○	○	○
Modelling & Quantitative Methods	○	○	○	○	○	○
Process & Product Technology	○	○	○	○	○	○
Systems	○	○	○	○	○	○
Safety	○	○	○	○	○	○
Sustainability, Economics, Ethics	○	○	○	○	○	○

According to your experience, how would you rate recent university graduates on each of these competencies? *

	Not at all Competent	Somewhat Competent	Neutral	Competent	Very Competent	N/A
Fundament	○	○	○	○	○	○
Modelling & Metho	○	○	○	○	○	○
Process & Technolo	○	○	○	○	○	○
Syste	○	○	○	○	○	○
Safe	○	○	○	○	○	○
Sustainabil Economics,	○	○	○	○	○	○

How do you currently assess university graduates' *

Next Page Previous 3 / 6

Page Break

Engineering Practice & Design

Click here for more details about our definition of "Engineering Practice & Design". Links will open in a new browser tab.

According to your experience, how would you rate recent university graduates on each of these competencies? *

	Not at all Competent	Somewhat Competent	Neutral	Competent	Very Competent	N/A
Practical						
Data Analys						
Information						
Industrial Quality						

According to your experience, how would you rate recent university graduates on each of these competencies? *

	Not at all Competent	Somewhat Competent	Neutral	Competent	Very Competent	N/A
Systems Approach to Design						
Technical Rigour in Design						
Awareness of Safety, Health & Environment Issues						
Awareness of Business Drivers						

How do you currently assess university graduates' competencies? *

Next Page Previous 4 / 6

Page Break

Advanced Level

Click here for more details about our definition of "Advanced level". Links will open in a new browser tab.

How important do you consider the following graduate attributes for your business? *

How important do you consider the following graduate attributes for your business? *

	Not at all Important	Somewhat Important	Neutral	Important	Very Important	N/A
Chemical Engineering Science Depth						
Limitations of Current Engineering Practise						
Awareness of Emerging Technologies						
Design in the Context of Uncertainty						
Innovative/Advanced Design						
Chemical Engineering Science Breadth						

How do you currently assess university graduates' competencies? *

Next Page Previous 5 / 6

Page Break

Employability Competencies

Click here for more details about our definition of "Employability Competencies". Links will open in a new browser tab.

How important do you consider the following graduate attributes for your business? *

	Not at all Important	Somewhat Important	Neutral	Important	Very Important	N/A
Problem Solving Skills						
Communication Skills						
Working effectively with others						
Leadership Skills						
Effective use of Information Technology						
Project Planning & Time Management						
Continuous Professional Development						

According to your experience, how would you rate recent university graduates on each of these competencies? *

	Not at all Competent	Somewhat Competent	Neutral	Competent	Very Competent	N/A
Problem Solving Skills	○	○	○	○	○	○
Communication Skills	○	○	○	○	○	○
Working effectively with others	○	○	○	○	○	○
Leadership Skills	○	○	○	○	○	○
Effective use of Information Technology	○	○	○	○	○	○
Project Planning & Time	○	○	○	○	○	○
Managem						
Continuous Developm	○	○	○	○	○	○

How do you currently assess university graduates' *

Previous

6 / 6

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- Paragraph Text
- Multiple Choice
- Section Break
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- Checkboxes
- Dropdown
- Page Break

Fancy Pants

- Name
- Address
- Email
- Phone
- Price
- Rating
- File Upload
- Date
- Time
- Website
- Likert

Graduate Opinion Survey v2.0

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The survey should take approximately 10–15 minutes to complete

1 **Contact Details** | 2 Underpinning | 3 Core | 4 Design & Practise | 5 Advanced | 6 Employability

Contact Details

We first need to gather a little information about who is actually filling in our forms. This will provide us with some contextual data that we can use to look for trends based on geographical location etc. This information is strictly in confidence and you are not required to provide it in order to complete the forms. It would however be very useful to the project if you could provide full details within this section.

Name

Title | First | Last | Suffix

Email

Company

Sector

Biotechnology

Number of employees

1-50

Position

Institution Graduated

Address

Street Address

Address Line 2

City | State / Province / Region

Postal / Zip Code | Country

Consent

☐ Do you wish to be contacted with the results of this survey?

Next Page

1 / 6

Page Break

Underpinning Mathematics and Science

Click here for more details about our definition of "Underpinning Maths & Science". Links will open in a new browser tab.

How important do you consider each of these competencies for your career? *

Maths	○	○	○	○	○	○
Chemistry	○	○	○	○	○	○
Physics	○	○	○	○	○	○
Biology	○	○	○	○	○	○
Information Technology	○	○	○	○	○	○
Other	○	○	○	○	○	○

From your experience as a student, what was the predominant method of teaching for each competency? *

	Lectures	Labs	Tutorials	Case Studies	Problem-based	Other	N/A
Maths	○	○	○	○	○	○	○
Chemistry	○	○	○	○	○	○	○
Physics	○	○	○	○	○	○	○
Biology	○	○	○	○	○	○	○
Information Technology	○	○	○	○	○	○	○
Other	○	○	○	○	○	○	○

Where you have answered "Other", please provide details

Overall, how effective were the methods of teaching that you experienced on your course? *

	Very Ineffective	Ineffective	Neutral	Effective	Very Effective	N/A
Lectures	○	○	○	○	○	○
Labs	○	○	○	○	○	○
Tutorials	○	○	○	○	○	○
Case Studies	○	○	○	○	○	○
Problem-based	○	○	○	○	○	○
Other	○	○	○	○	○	○

In your opinion, what alternative teaching methods could be employed for most effective delivery? *

Next Page Previous 2 / 6

Page Break

Core Chemical Engineering Knowledge

Click here for more details about our definition of "Core Chemical Engineering Knowledge". Links will open in a new browser tab.

How important do you consider each of these competencies for your career *

	Not at all Important	Somewhat Important	Neutral	Important	Very Important	N/A
Fundament	○	○	○	○	○	○
Modelling & Metho	○	○	○	○	○	○
Process & Technolo	○	○	○	○	○	○
Svste	○	○	○	○	○	○
Safe	○	○	○	○	○	○
Sustainability, Ethi	○	○	○	○	○	○

From your experience as a student, what was the predominant method of teaching for each competency? *

	Lectures	Labs	Tutorials	Case Studies	Problem-based	Other	N/A
Fundamentals	○	○	○	○	○	○	○
Modelling & Quantitative Methods	○	○	○	○	○	○	○
Process & Product Technology	○	○	○	○	○	○	○
Systems	○	○	○	○	○	○	○
Safety	○	○	○	○	○	○	○
Sustainability, Economics, Ethics	○	○	○	○	○	○	○

Where you have answered "Other", please provide details

Overall, how effective were the methods of teaching that you experienced on your course? *

	Very Ineffective	Ineffective	Neutral	Effective	Very Effective	N/A
Lectures	○	○	○	○	○	○
Labs	○	○	○	○	○	○
Tutorials	○	○	○	○	○	○
Case Studies	○	○	○	○	○	○
Problem-based	○	○	○	○	○	○
Other	○	○	○	○	○	○

In your opinion, what alternative teaching methods could be employed for most effective delivery? *

Next Page Previous 3 / 6

Page Break

Engineering Practice & Design

Click here for more details about our definition of "Engineering Practice & Design". Links will open in a new browser tab.

How important do you consider each of these competencies for your career *

	Not at all Important	Somewhat Important	Neutral	Important	Very Important	N/A
Practical						
Data Analys						
Information						
Industrial Quality						

How important do you consider each of these competencies for your career *

	Not at all Important	Somewhat Important	Neutral	Important	Very Important	N/A
Systems Approach to						
Technical Rigour in						
Awareness of Safety, & Environment						
Awareness of Drive						

From your experience as a student, what was the predominant method of teaching for each competency? *

Overall, fective were the methods of teaching that you experienced on *

In your opinion, what teaching methods could be fective *

Next Page Previous 4 / 6

Page Break

Advanced Level

Click here for more details about our definition of "Advanced level". Links will open in a new browser tab.

How important do you consider each of these competencies for your career *

	Not at all Important	Somewhat Important	Neutral	Important	Very Important	N/A
Chemical Engineering Science Depth						
Limitations of Current Engineering Practise						
Awareness of Emerging Technologies						
Design in the Context of Uncertainty						
Innovative/Advanced Design						
Chemical Engineering Science Breadth						

In your opinion, what teaching methods could be employed for most effective delivery? *

Next Page Previous 5 / 6

Page Break

Employability Competencies

Click here for more details about our definition of "Employability Competencies". Links will open in a new browser tab.

How important do you consider each of these competencies for your career *

	Not at all Important	Somewhat Important	Neutral	Important	Very Important	N/A
Problem Solving Skills	○	○	○	○	○	○
Communication Skills	○	○	○	○	○	○
Working effectively with others	○	○	○	○	○	○
Leadership Skills	○	○	○	○	○	○
Effective use of Information Technology	○	○	○	○	○	○
Project Planning & Time Management	○	○	○	○	○	○
Continuous Professional Development	○	○	○	○	○	○

From your experience as a student, what was the predominant method of teaching for each competency? *

	Lectures	Labs	Tutorials	Case Studies	Problem-based	Other	N/A
Problem Solving Skills	○	○	○	○	○	○	○
Communication Skills	○	○	○	○	○	○	○
Working effectively with others	○	○	○	○	○	○	○
Leadership Skills	○	○	○	○	○	○	○
Effective use of Information Technology	○	○	○	○	○	○	○
Project Planning & Time Management	○	○	○	○	○	○	○
Continuous Professional Development	○	○	○	○	○	○	○

Where you have answered "Other", please provide details

In your opinion, what teaching methods could be employed for most effective delivery? *

Previous 6 / 6

9.2 Question template for the focus groups

Focus groups – Framework data gathering

Partner X – XXX University

Focus group held on (date, venue):

Participants and their affiliation:

Proposed agenda for the focus group:

1) Welcome and brief introduction of all attendees
2) Lead academic to briefly introduce the project and summarise the outcome of the questionnaires (hand out printed summary to work with during the session). Request agreement to record to discussions for data analysis purposes only.
3) Work in one or more groups, depending on the size of the focus group (max 6-7 attendees per facilitator recommended, if all three groups of stakeholders represented, groupings of academics/employers/students separately recommended). Present each topic/question to the group (see template below) and solicit their views on the topic. Record audio output of the group discussions and summarise the major points of responses in English in the attached template.
4) Summarise the outcome of the focus group to all attendees at the joint final session.
5) Ask the attendees to complete the feedback questionnaire
6) Return the completed template and the completed feedback questionnaires to Partner 1, UNEW asap after the focus group takes place. Also upload the documentation onto the Secure area of the website under WP2 resources/Focus groups 1

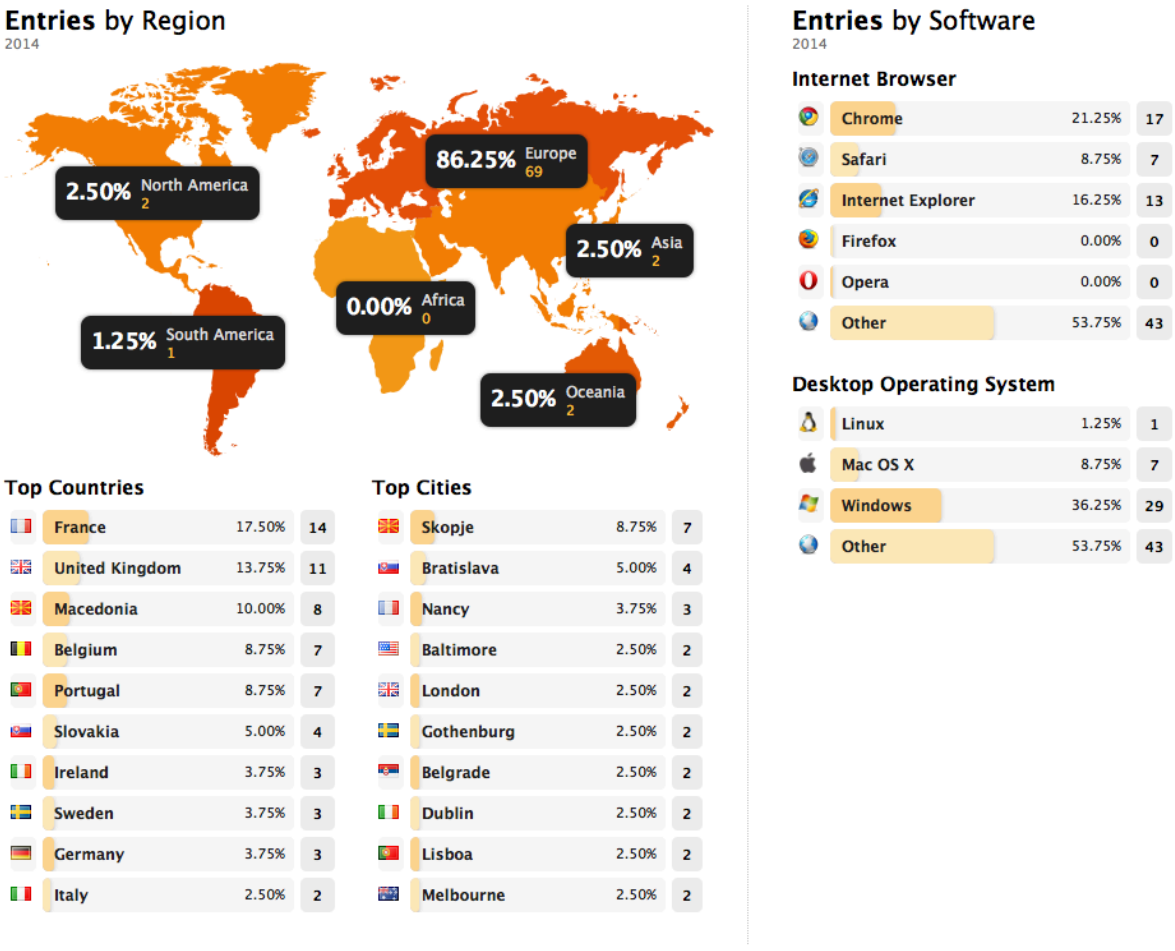
Topic/Responses Template

1) Do you agree with the questionnaire responses to the importance of CE knowledge areas (incl. underpinning and core CE)? Give reasons for agreement /disagreement	
2) Do you agree with the questionnaire responses to the importance of employability competencies? Give reasons for agreement /disagreement	
3) What methods of delivery do you believe are most effective for CE knowledge? Justify.	
4) What methods of delivery do you believe are most effective for employability competencies? Justify.	
5) What methods do you believe are most objective/robust for assessing the effectiveness of CE knowledge delivery? Justify.	
6) What methods do you believe are most objective/robust for assessing the effectiveness of employability	

competency delivery? Justify.	
7) Most frequently cited methods of effectiveness evaluation were exams and questionnaires (academia) or interview/training centre (employers). What are your views on the suitability of these methods within the proposed framework?	

9.3 Questionnaire summary statistics analysis

Academics



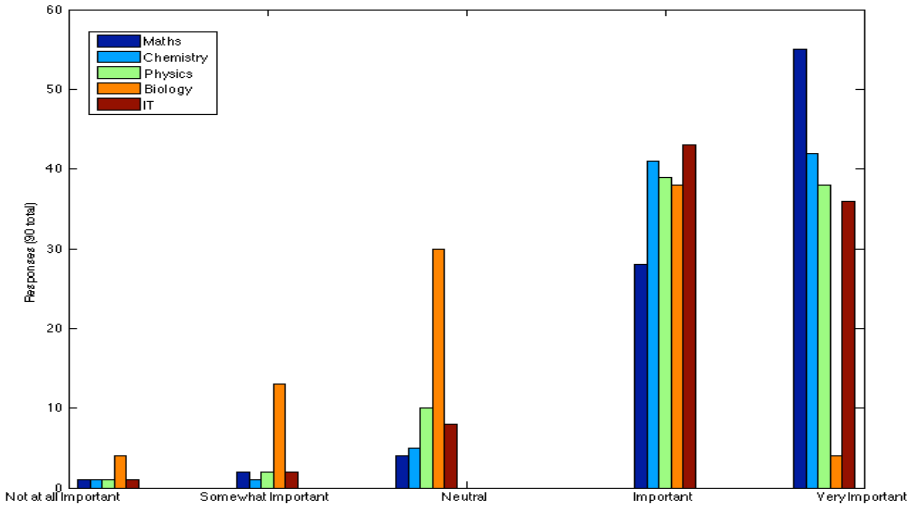
1. Underpinning

a. How important do you consider the following attributes for graduates' careers after graduation?

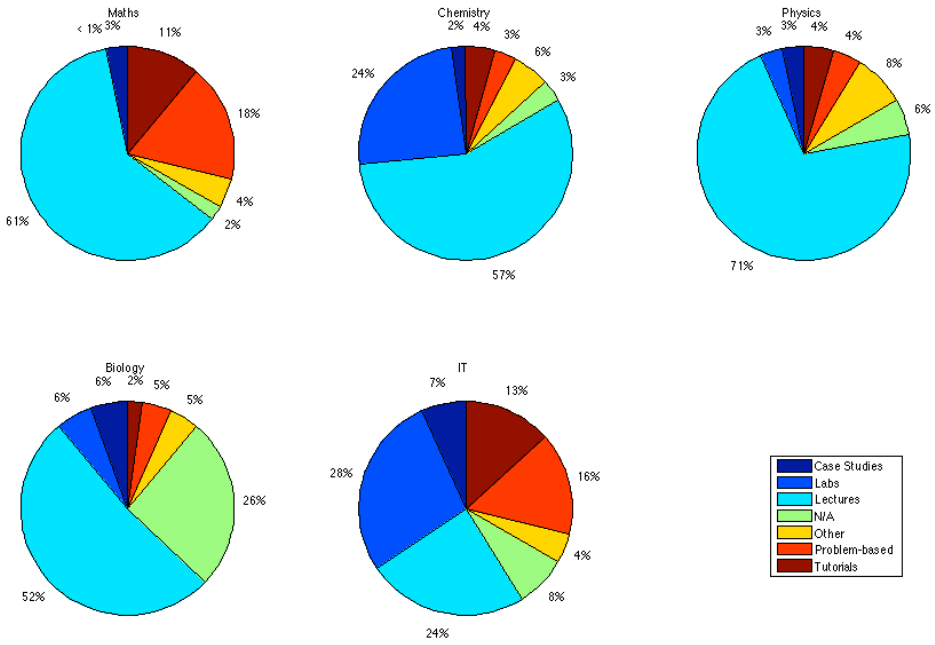
Descriptives

		Maths	Chemistry	Physics	Biology	IT
N	Valid	90	90	90	89	90
	Missing or N/A	0	0	0	1	0
M		4.49	4.36	4.23	3.28	4.23
SD		.78	.74	.82	.93	.79

Min	1.0	1.0	1.0	1.0	1.0
Max	5.0	5.0	5.0	5.0	5.0



b. What is your institution's predominant method of teaching each of these competencies?

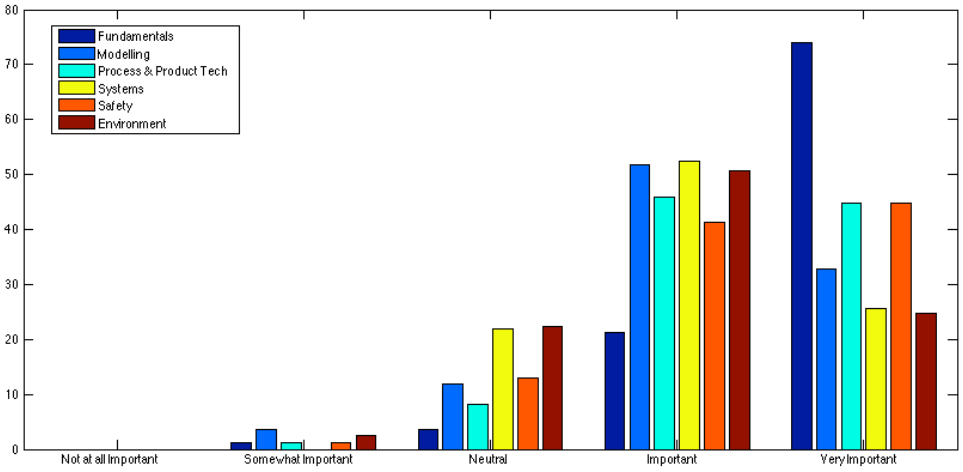


2. Core

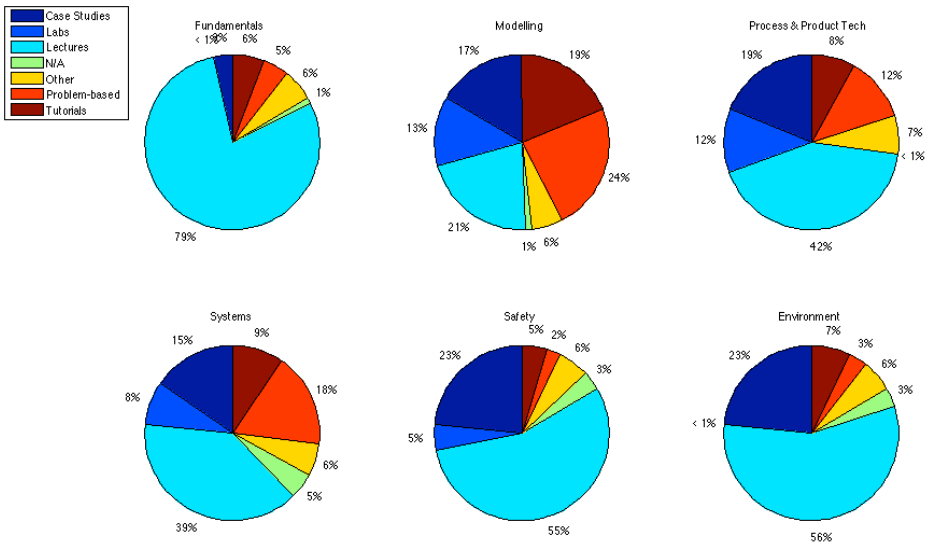
a. How important do you consider the following attributes for graduates' careers after graduation?

Descriptives

		Fundamentals	Modelling & Quantitative Methods	Process & Product Technology	Systems	Safety	Sustainability Economics Ethics
N	Valid	85	85	85	82	85	85
	Missing or N/A	5	5	5	8	5	5
M		4.68	4.14	4.34	4.04	4.29	3.98
SD		.60	.76	.68	.69	.74	.76
Min		2.0	2.0	2.0	3.0	2.0	2.0
Max		5.0	5.0	5.0	5.0	5.0	5.0



b. What is your institution's predominant method of teaching each of these competencies?

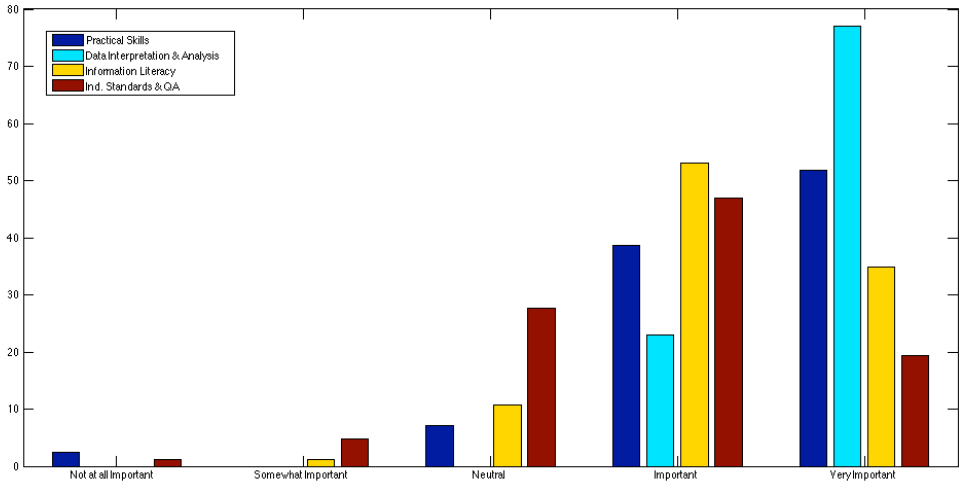


3. Design & Practice

a. How important do you consider the following attributes for graduates' careers after graduation?

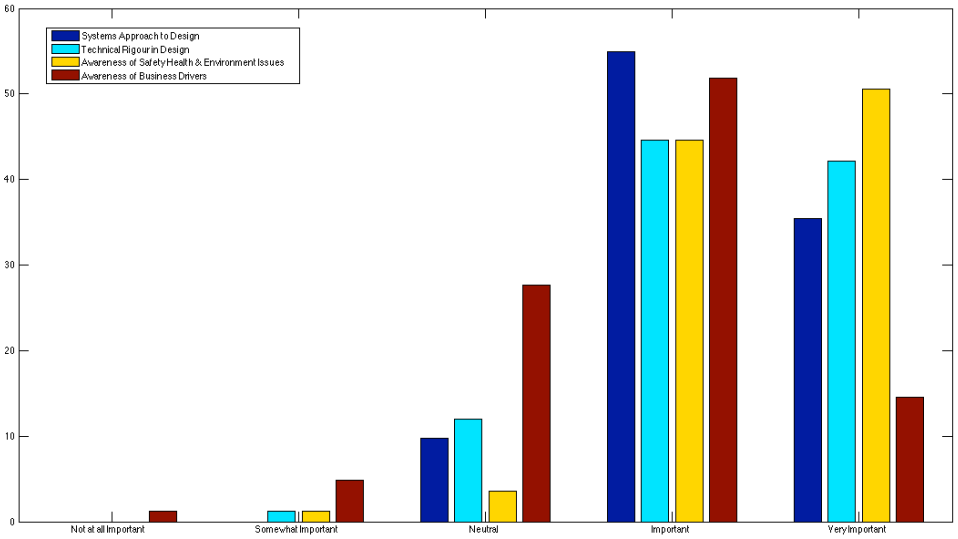
Descriptives (1)

		Practical Skills	Data Interpretation & Analysis	Information Literacy	Industrial Standards & Quality Assurance
N	Valid	83	83	83	83
	Missing or N/A	7	7	7	7
M		4.37	4.77	4.22	3.78
SD		.82	.42	.68	.86
Min		1.0	4.0	2.0	1.0
Max		5.0	5.0	5.0	5.0



Descriptives (2)

		Systems Approach to Design	Technical Rigour in Design	Awareness of Safety Health & Environment Issues	Awareness of Business Drivers
N	Valid	82	83	83	83
	Missing or N/A	8	7	7	7
M		4.26	4.28	4.45	3.73
SD		.62	.72	.63	.81
Min		3.0	2.0	2.0	1.0
Max		5.0	5.0	5.0	5.0

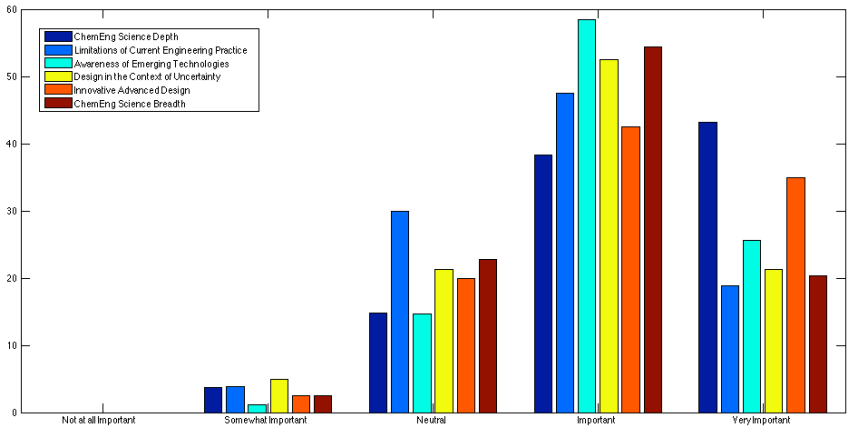


4. Advanced

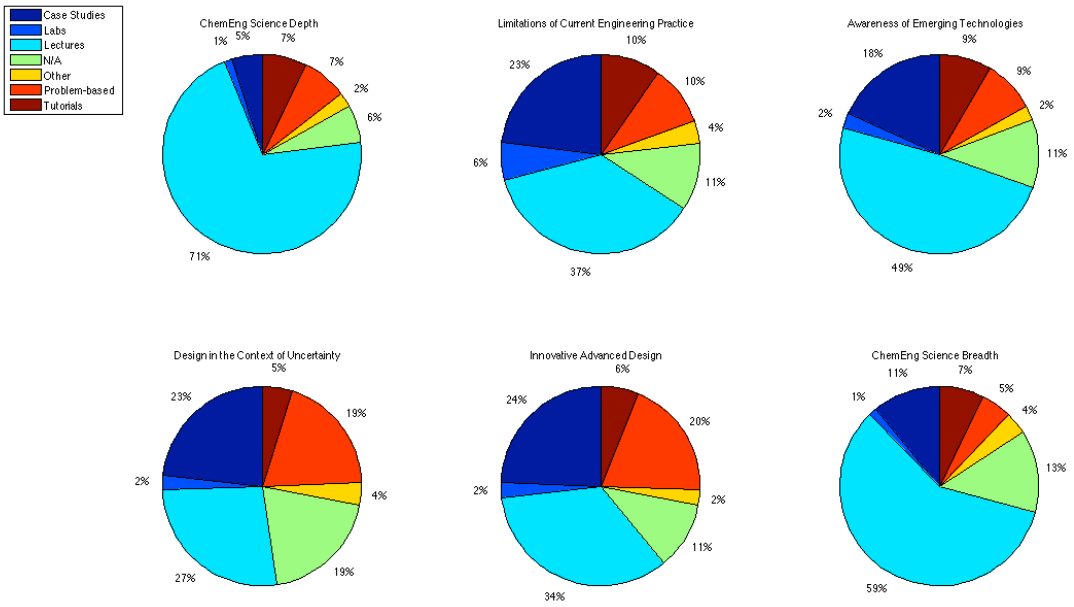
a. How important do you consider the following attributes for graduates' careers after graduation?

Descriptives

		Chemeng Science Depth	Limitations of Current Engineering Practice	Awareness of Emerging Technologies	Design in the Context of Uncertainty	Innovative Advanced Design	Chemeng Science Breadth
N	Valid	81	80	82	80	80	79
	Missing or N/A	9	10	8	10	10	11
M		4.21	3.81	4.09	3.90	4.10	3.92
SD		.83	.78	.67	.79	.81	.73
Min		2.0	2.0	2.0	2.0	2.0	2.0
Max		5.0	5.0	5.0	5.0	5.0	5.0



b. What is your institution's predominant method of teaching each of these competencies?

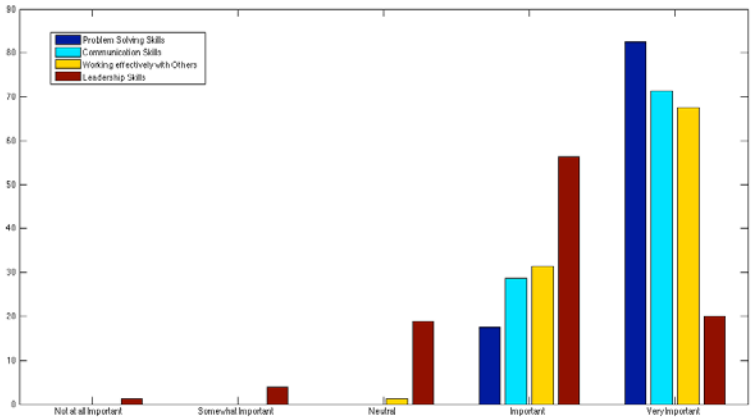


5. Employability

a. How important do you consider the following attributes for graduates' careers after graduation?

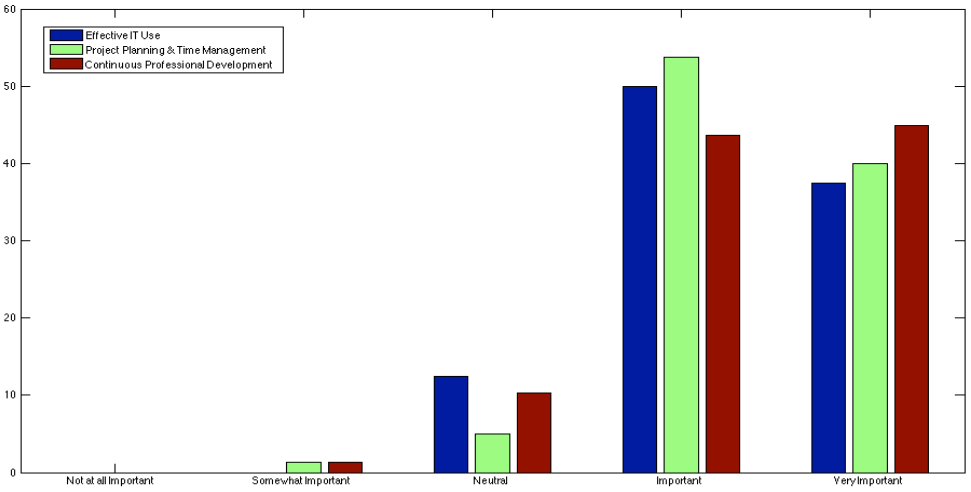
Descriptives (1)

		Problem Solving Skills	Communication Skills	Working effectively with Others	Leadership Skills
N	Valid	80	80	80	80
	Missing or N/A	10	10	10	10
M		4.83	4.71	4.66	3.90
SD		.38	.46	.50	.81
Min		4.0	4.0	3.0	1.0
Max		5.0	5.0	5.0	5.0

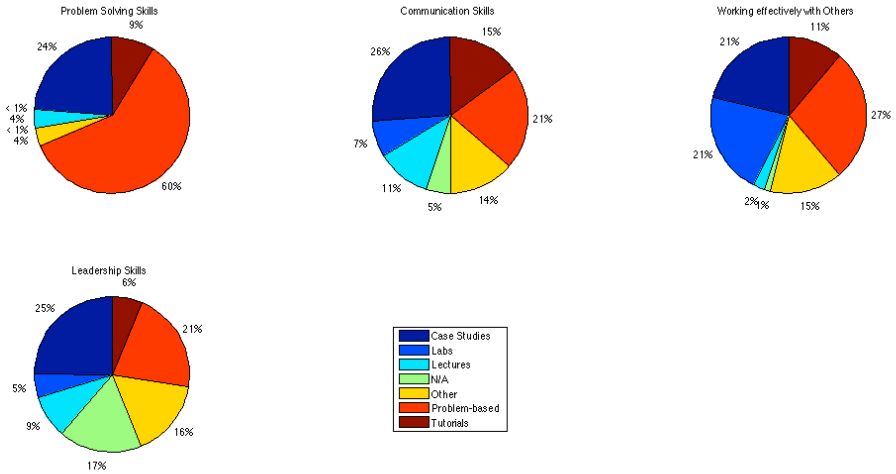


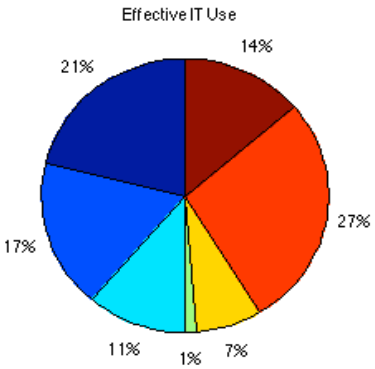
Descriptives (2)

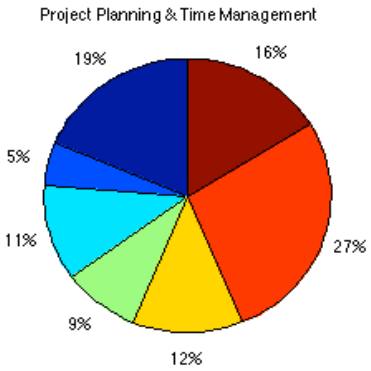
		Effective IT Use	Project Planning & Time Management	Continuous Professional Development
N	**Valid**	80	80	78
	Missing or N/A	10	10	12
M		4.25	4.33	4.32
SD		.67	.63	.71
Min		3.0	2.0	2.0
Max		5.0	5.0	5.0

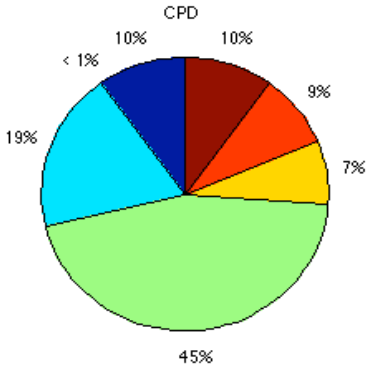


b. What is your institution's predominant method of teaching each of these competencies?




Effective IT Use
14%
21%
27%
17%
11%
1%
7%

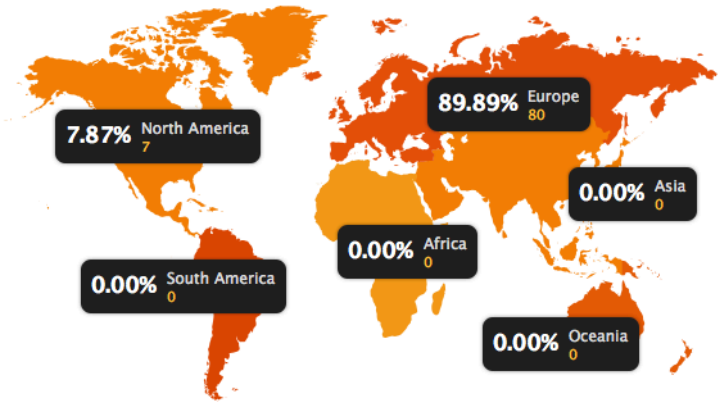

Project Planning & Time Management
19%
16%
5%
11%
27%
9%
12%


CPD
10%
10%
< 1%
9%
19%
7%
45%


Case Studies
Labs
Lectures
N/A
Other
Problem-based
Tutorials

Employer survey

Entries by Region
2014



Top Countries

	Portugal	44.94%	40
	Germany	12.36%	11
	United Kingdom	11.24%	10
	United States	7.87%	7
	Slovakia	3.37%	3
	France	3.37%	3
	Ireland	2.25%	2
	Italy	2.25%	2
	Hungary	2.25%	2
	Norway	2.25%	2

Top Cities

	Lisboa	15.73%	14
	Leça	5.62%	5
	London	4.49%	4
	Ludwigshafen	4.49%	4
	Vila Nova De Gaia	4.49%	4
	Marinha Grande	3.37%	3
	Maia	3.37%	3
	Bratislava	2.25%	2
	Essen	2.25%	2
	Dublin	2.25%	2

Entries by Software
2014

Internet Browser

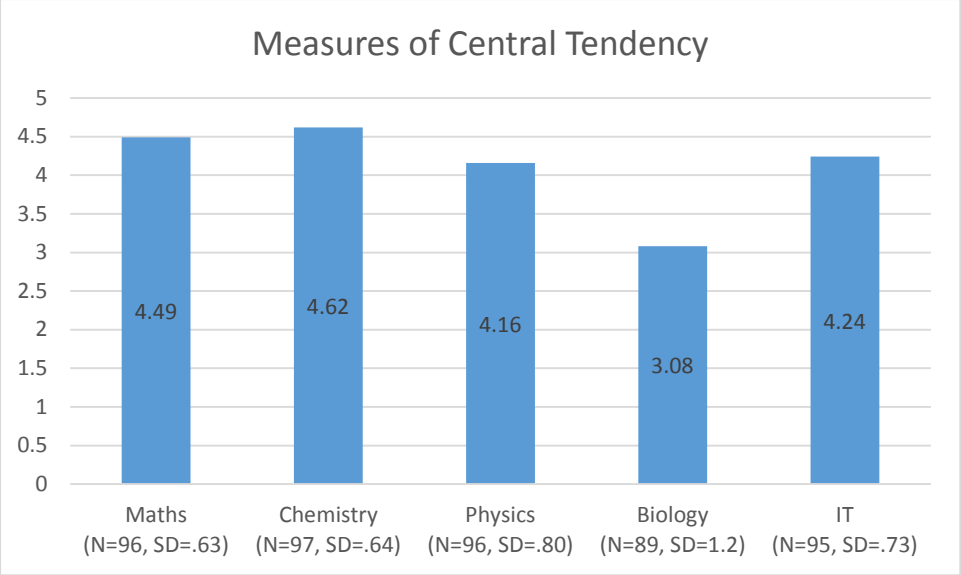
	Chrome	15.73%	14
	Safari	3.37%	3
	Internet Explorer	52.81%	47
	Firefox	0.00%	0
	Opera	0.00%	0
	Other	28.09%	25

Desktop Operating System

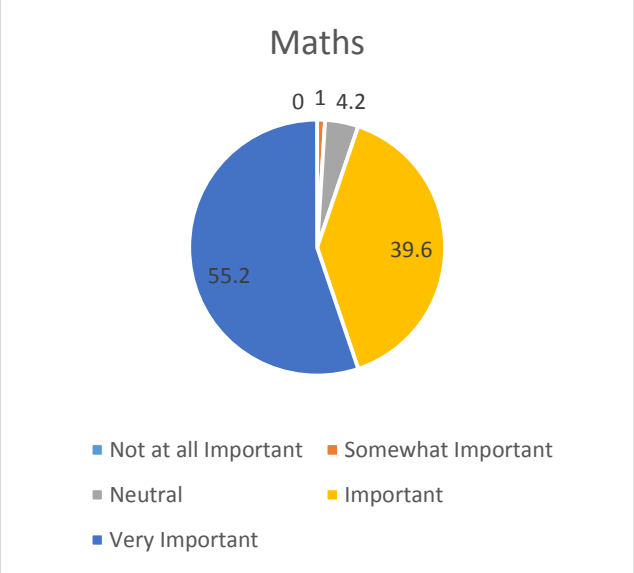
	Mac OS X	4.49%	4
	Windows	66.29%	59
	Linux	0.00%	0
	Other	29.21%	26

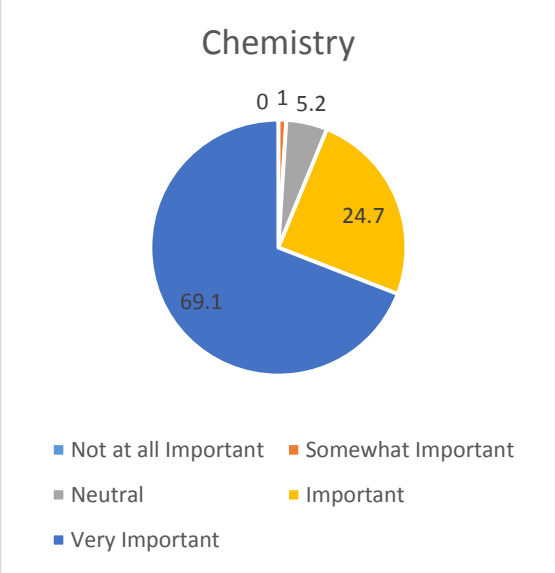
1. Underpinning

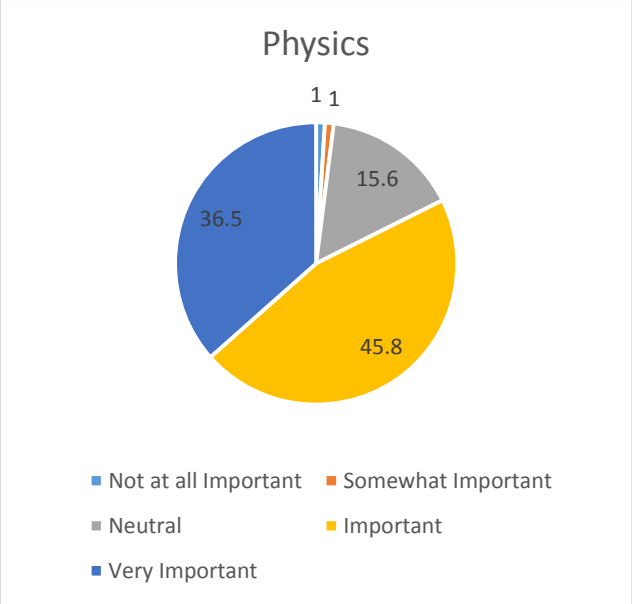
a. How important do you consider the following graduate attributes for your business?

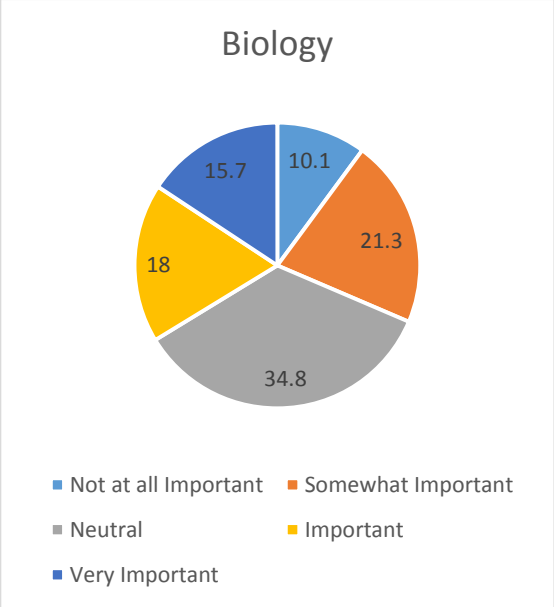


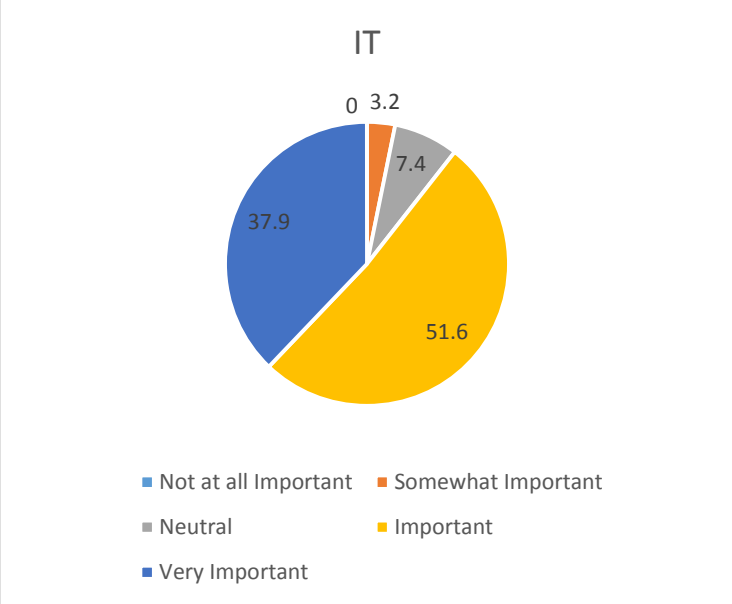
Percentages of Responses



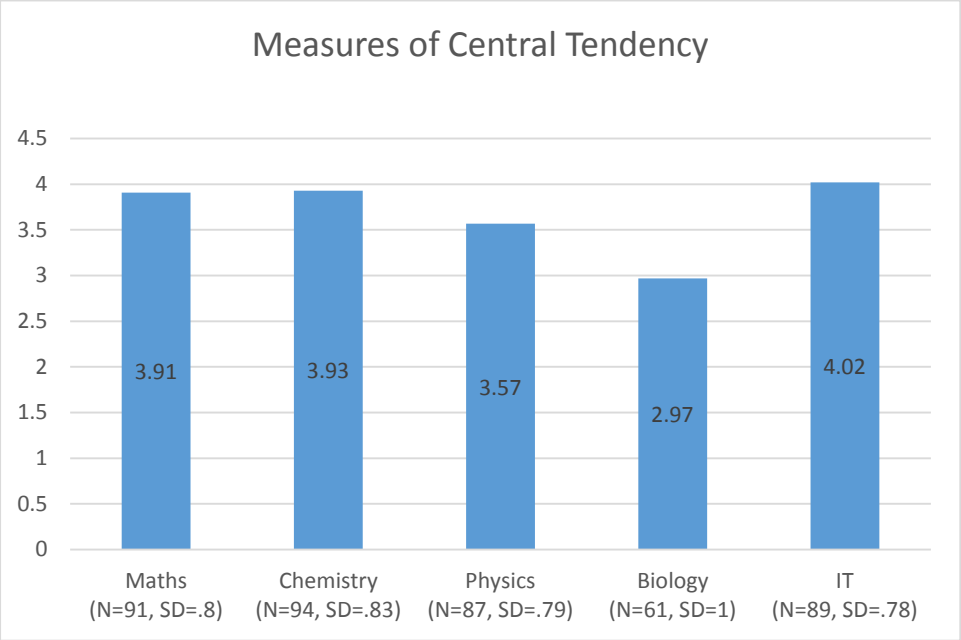



Physics
1
1
15.6
36.5
45.8
Not at all Important
Somewhat Important
Neutral
Important
Very Important

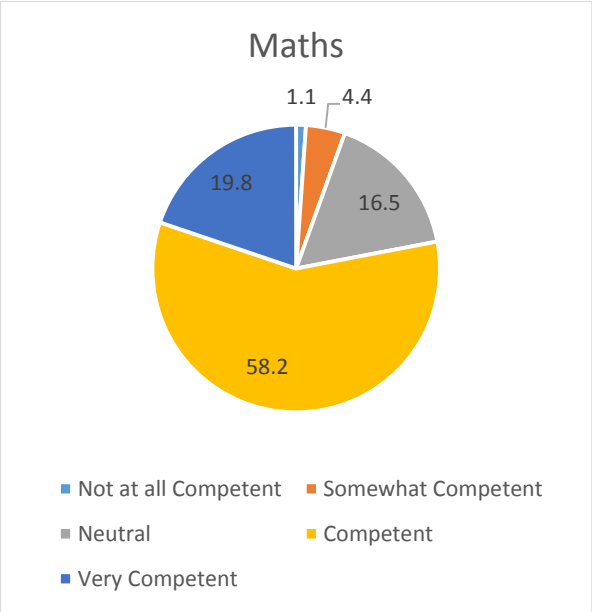

Biology
10.1
21.3
18
15.7
34.8
Not at all Important
Somewhat Important
Neutral
Important
Very Important

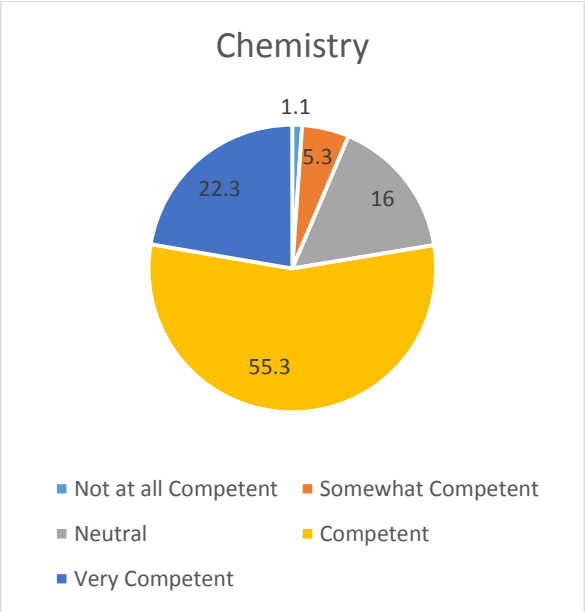

IT
0
3.2
7.4
37.9
51.6
Not at all Important
Somewhat Important
Neutral
Important
Very Important

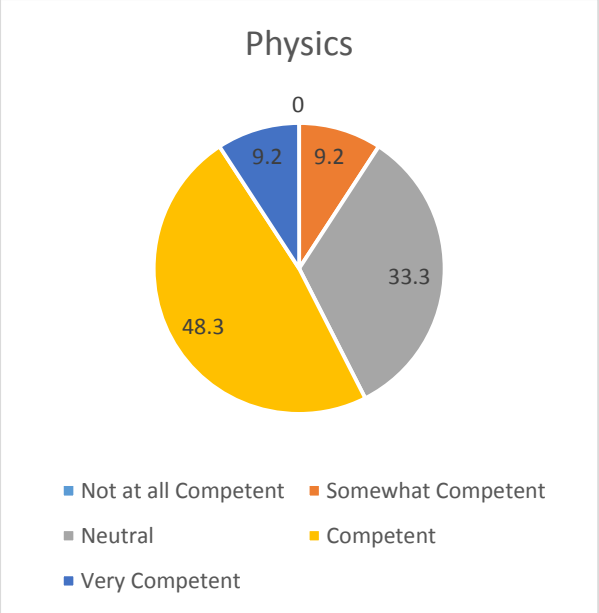
b. According to your experience, how would you rate recent university graduates on each of these competencies?

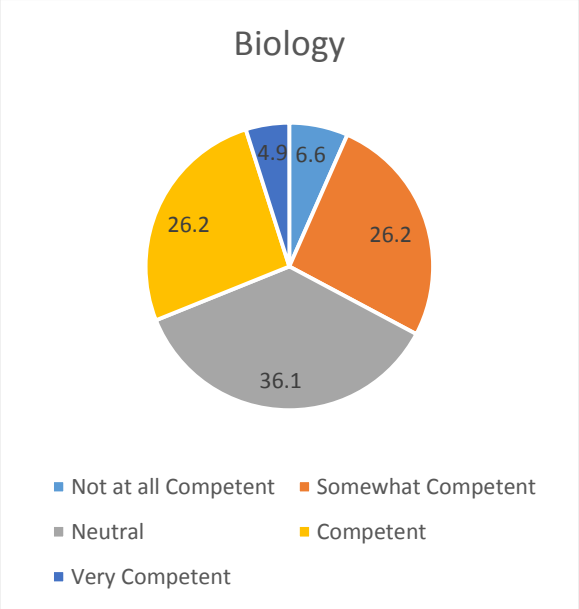


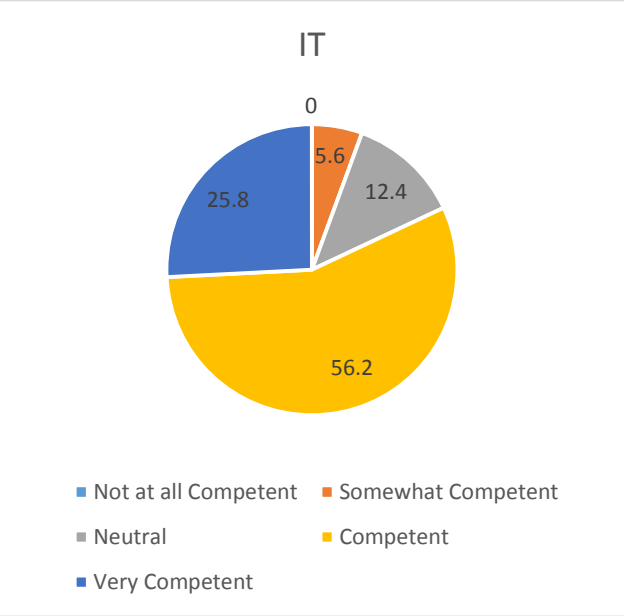
Percentages of Responses





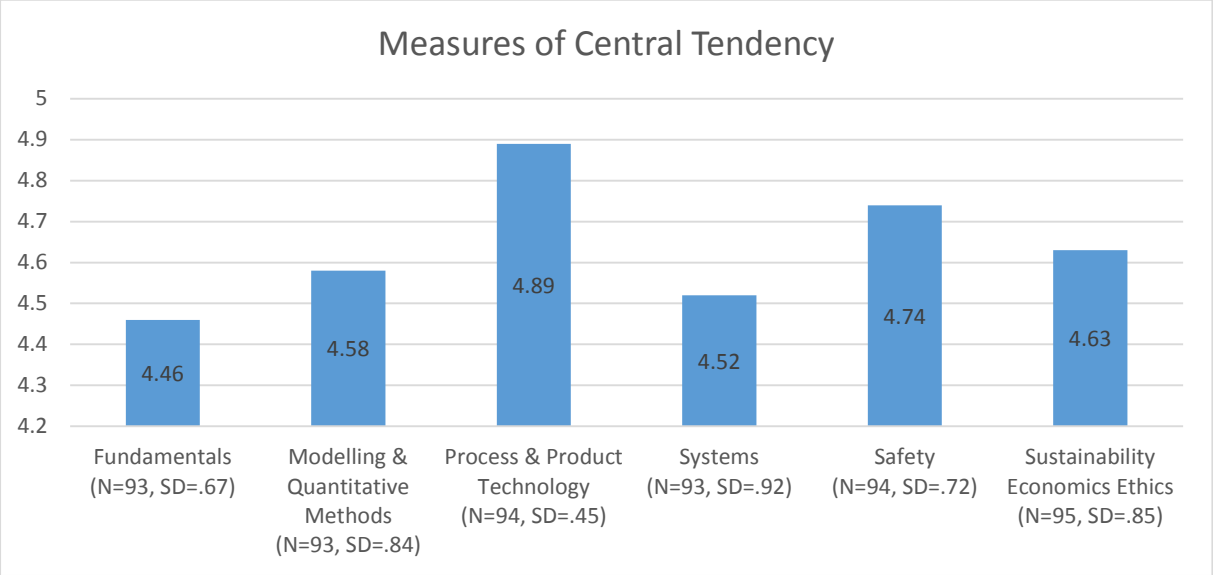

Physics
0
9.2
9.2
33.3
48.3
Not at all Competent
Somewhat Competent
Neutral
Competent
Very Competent


Biology
4.9
6.6
26.2
26.2
36.1
Not at all Competent
Somewhat Competent
Neutral
Competent
Very Competent

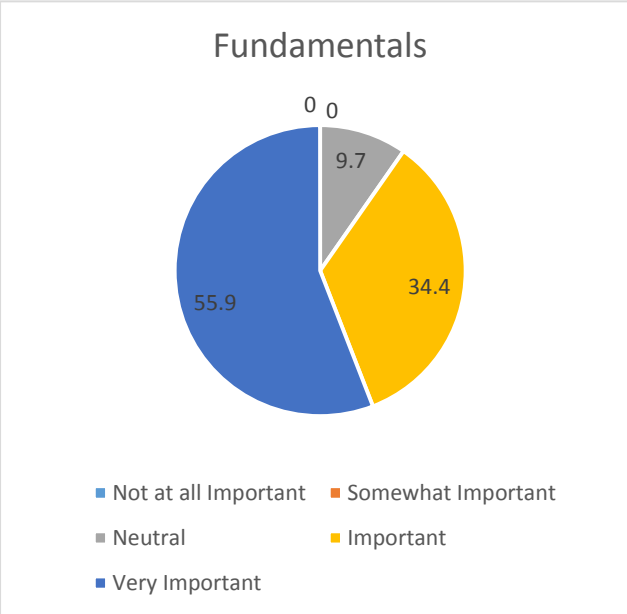

IT
0
5.6
12.4
25.8
56.2
Not at all Competent
Somewhat Competent
Neutral
Competent
Very Competent

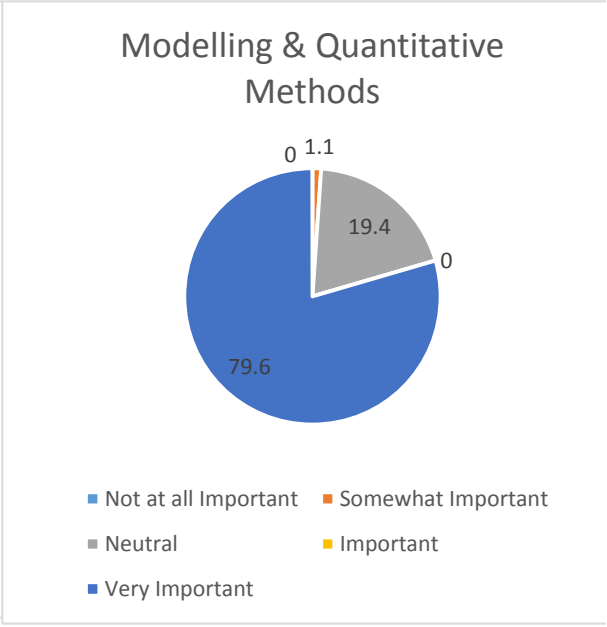
2. Core

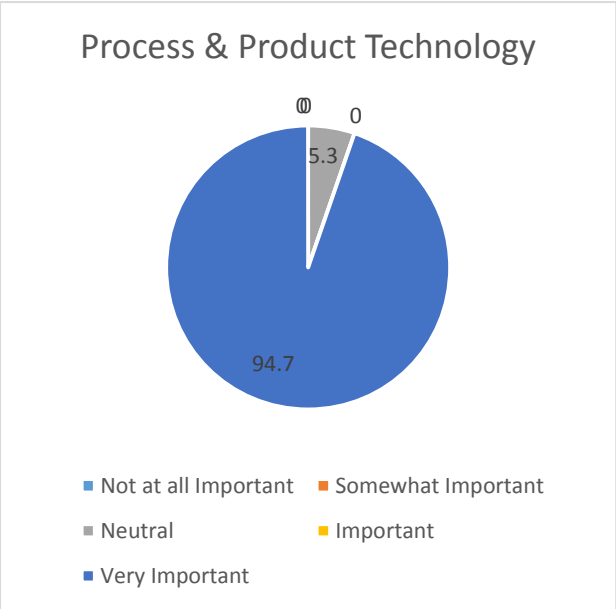
a. How important do you consider the following graduate attributes for your business?

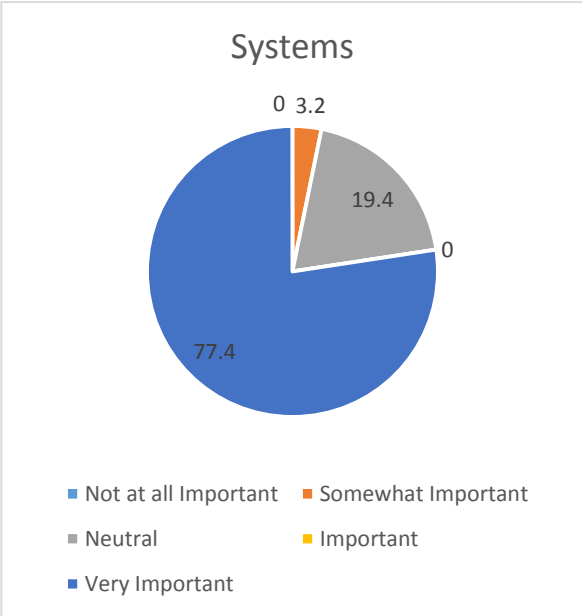


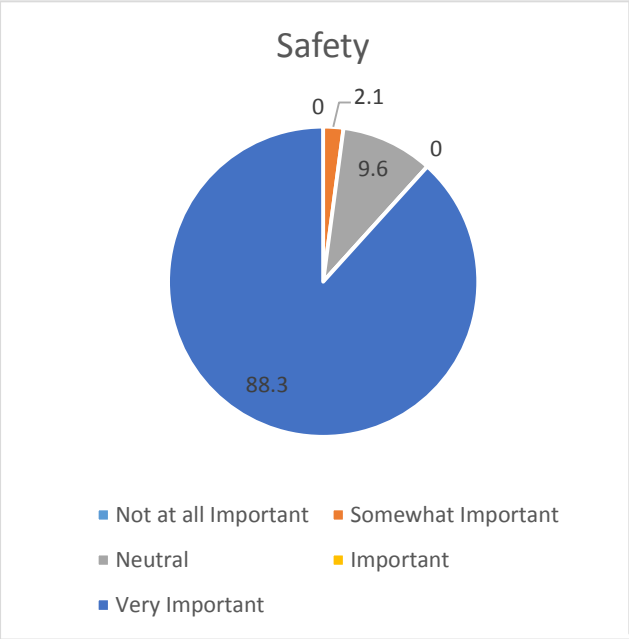
Percentages of Responses

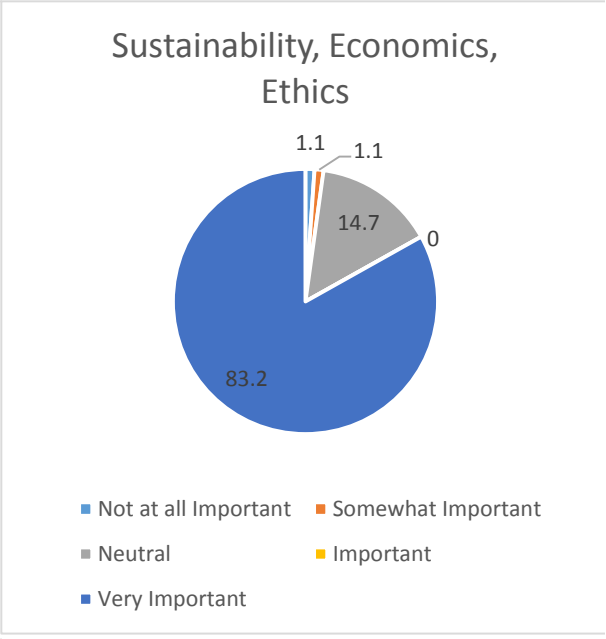




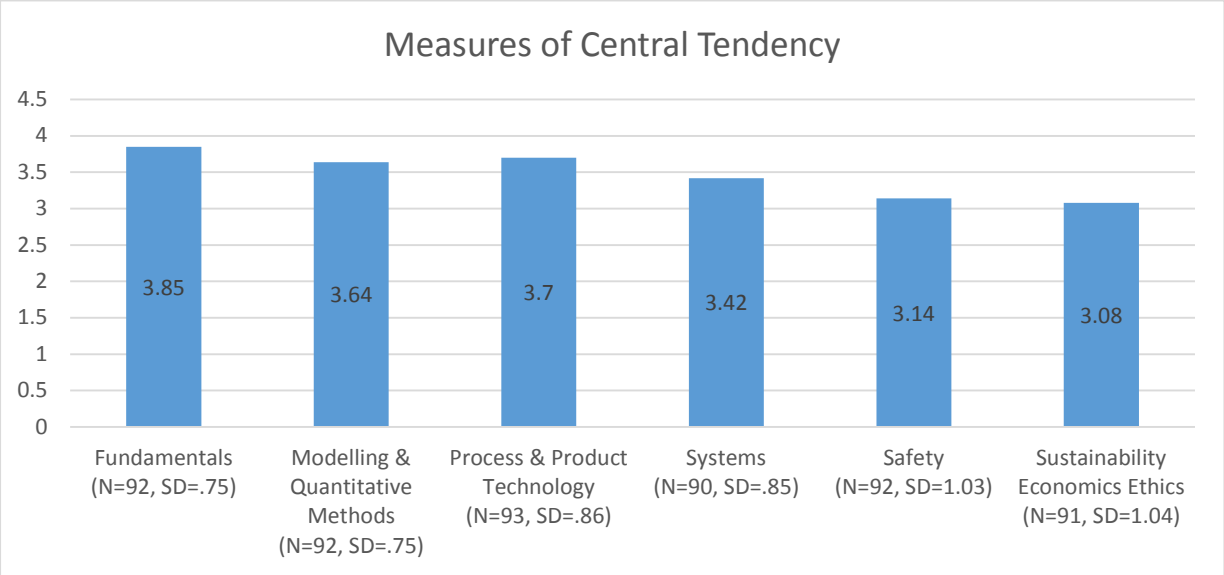

Process & Product Technology
0
0
5.3
94.7
Not at all Important
Somewhat Important
Neutral
Important
Very Important


Systems
0
3.2
19.4
0
77.4
Not at all Important
Somewhat Important
Neutral
Important
Very Important

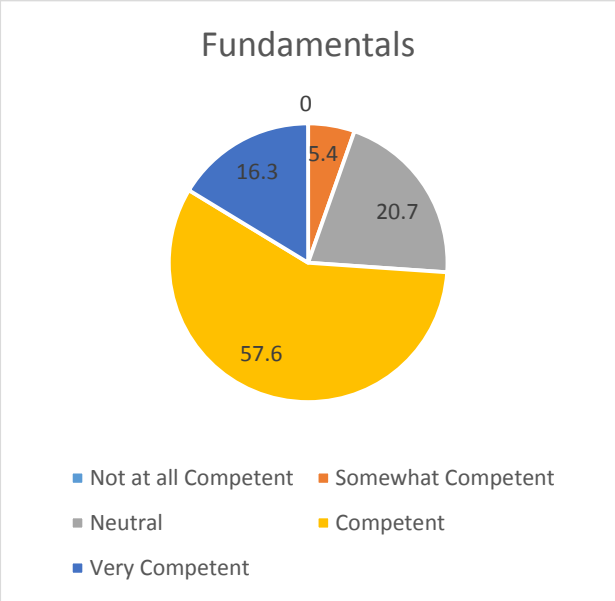

Safety
0
2.1
0
9.6
88.3
Not at all Important
Somewhat Important
Neutral
Important
Very Important

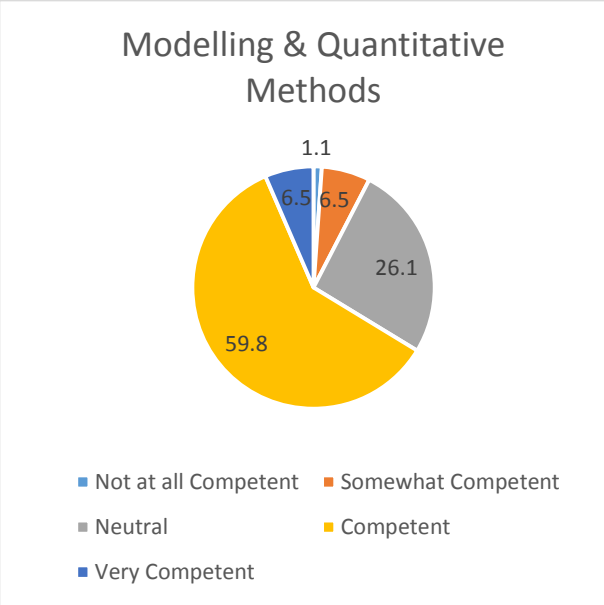

Sustainability, Economics, Ethics
1.1
1.1
14.7
0
83.2
Not at all Important
Somewhat Important
Neutral
Important
Very Important

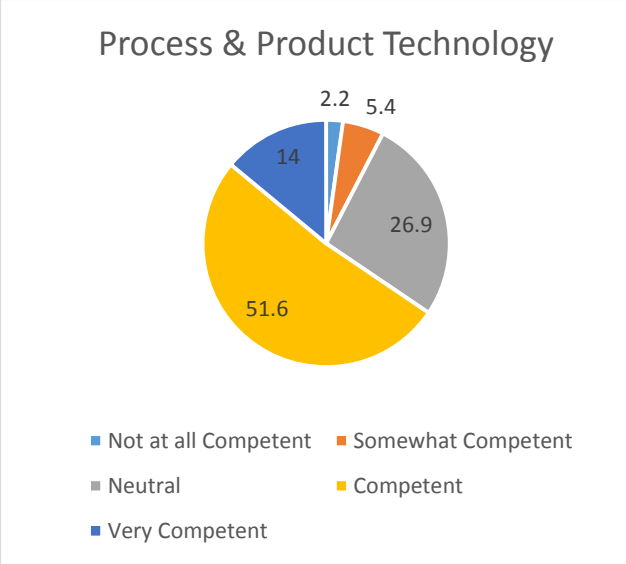
b. According to your experience, how would you rate recent university graduates on each of these competencies?

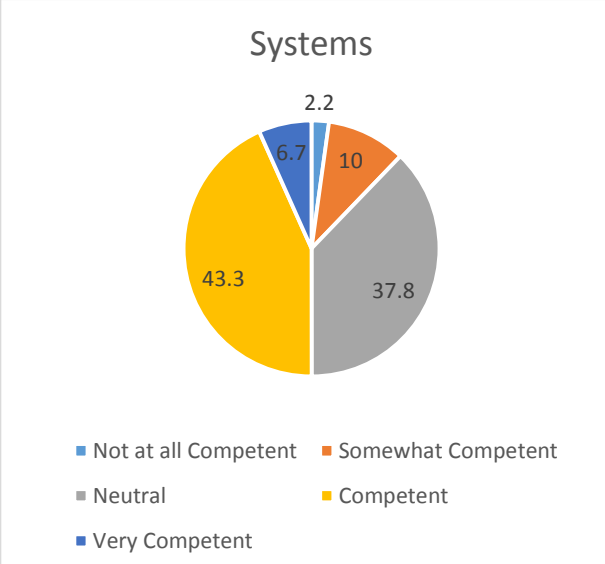


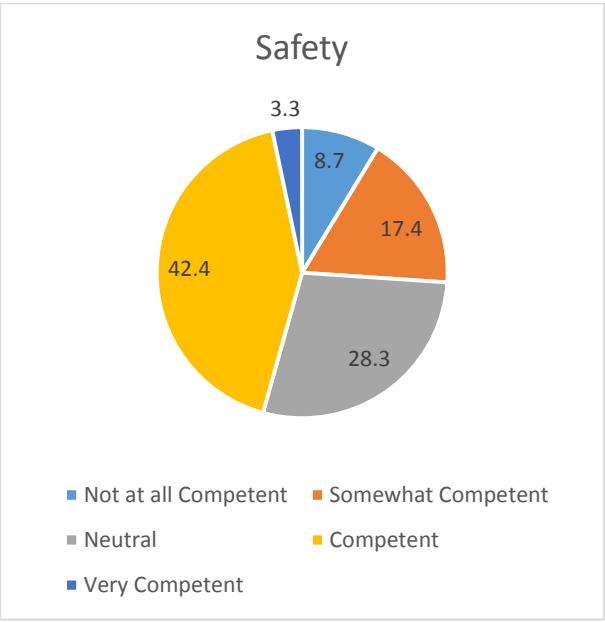
Percentages of Responses

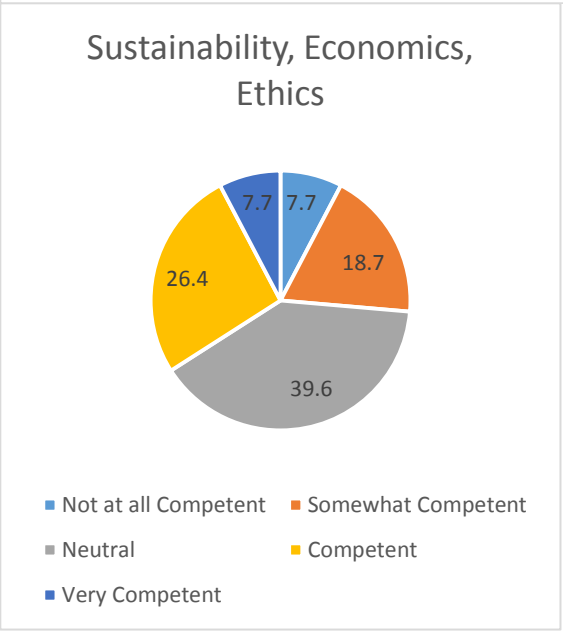





Process & Product Technology
2.2
5.4
14
26.9
51.6
Not at all Competent
Somewhat Competent
Neutral
Competent
Very Competent

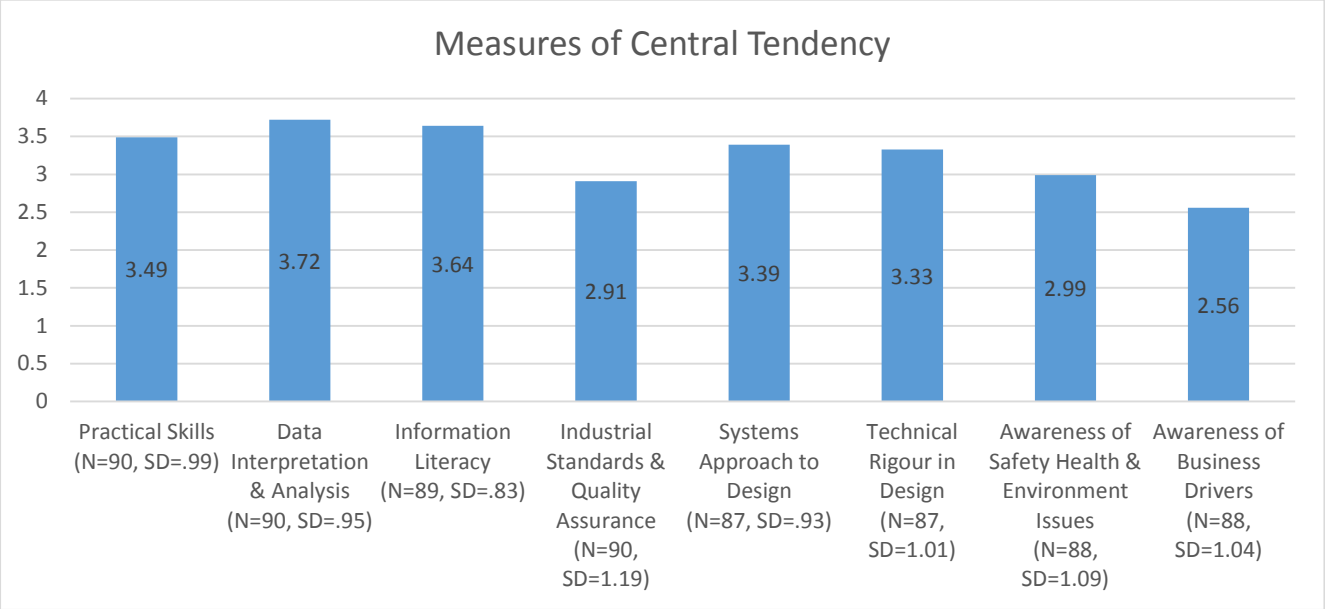

Systems
2.2
6.7
10
43.3
37.8
Not at all Competent
Somewhat Competent
Neutral
Competent
Very Competent


Safety
3.3
8.7
17.4
42.4
28.3
Not at all Competent
Somewhat Competent
Neutral
Competent
Very Competent

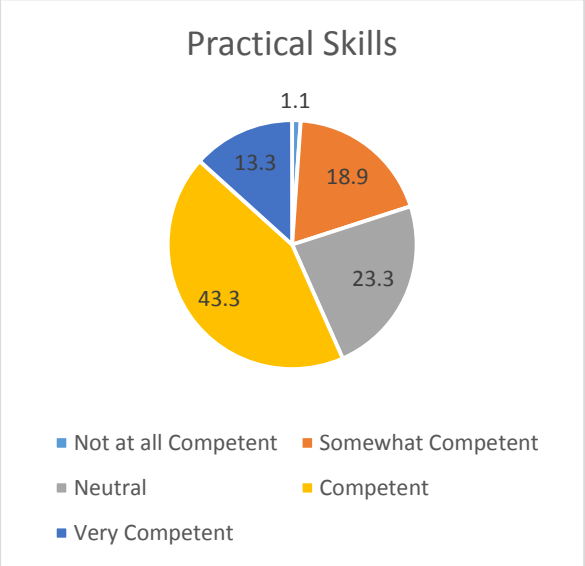

Sustainability, Economics, Ethics
7.7
7.7
18.7
26.4
39.6
Not at all Competent
Somewhat Competent
Neutral
Competent
Very Competent

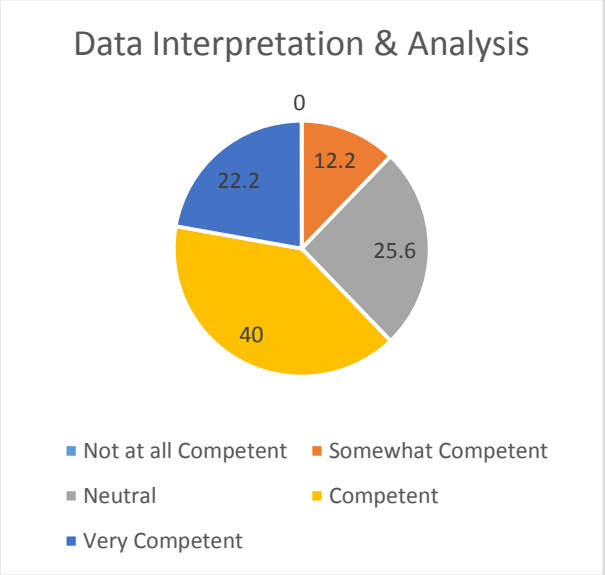
3. Design & Practice

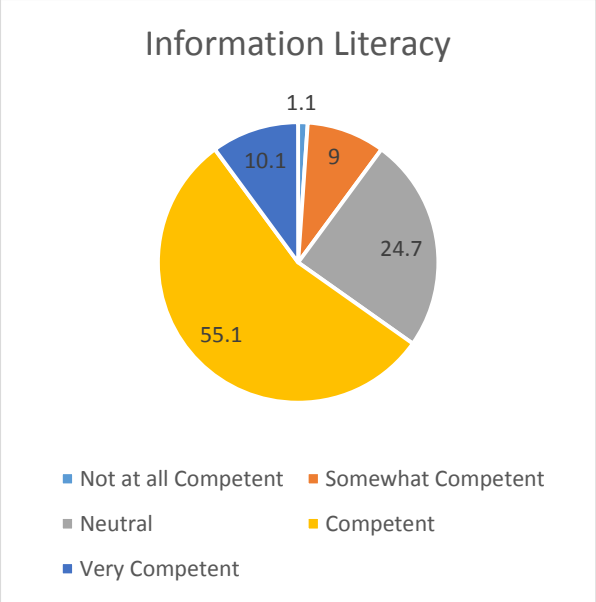
a. According to your experience, how would you rate recent university graduates on each of these competencies?

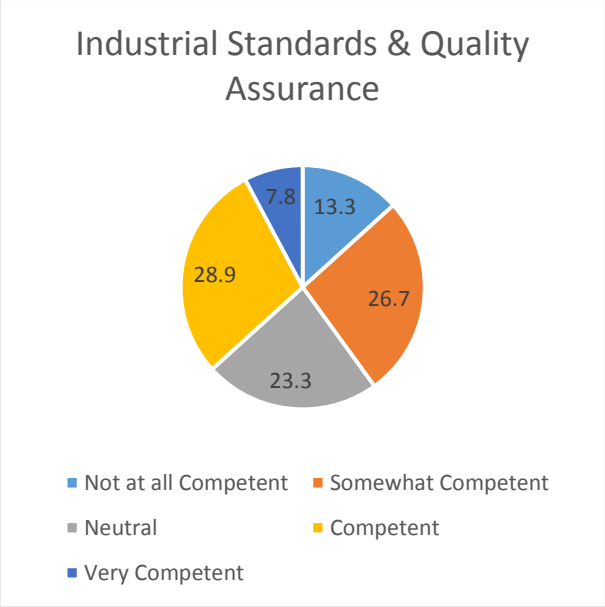


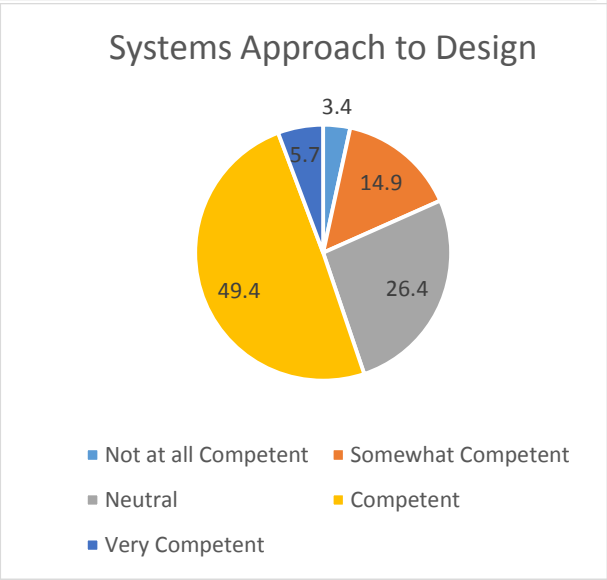
Percentages of Responses

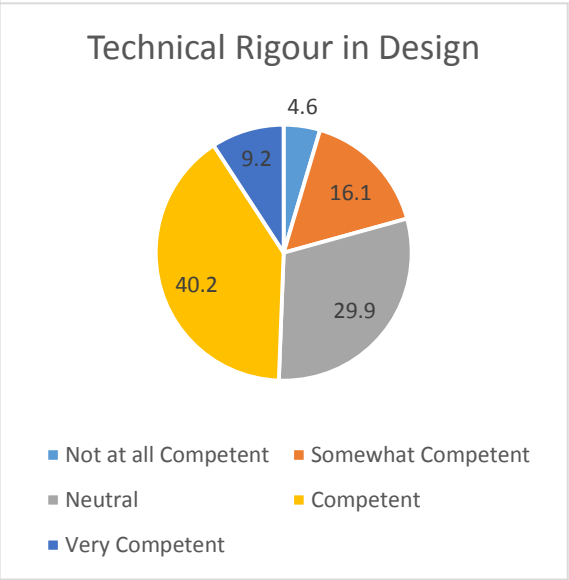


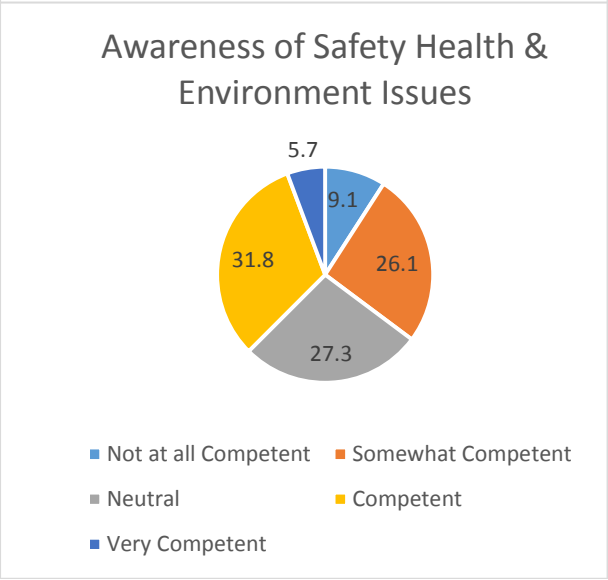


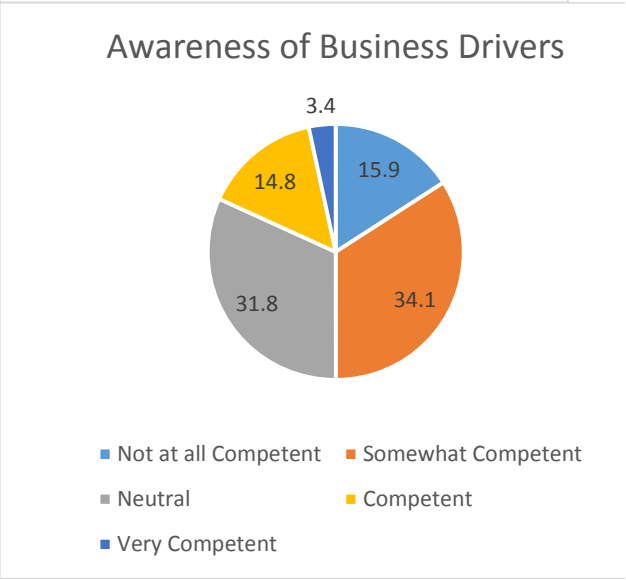

Information Literacy
1.1
9
24.7
55.1
10.1
Not at all Competent
Somewhat Competent
Neutral
Competent
Very Competent


Industrial Standards & Quality Assurance
13.3
26.7
23.3
28.9
7.8
Not at all Competent
Somewhat Competent
Neutral
Competent
Very Competent


Systems Approach to Design
3.4
14.9
26.4
49.4
5.7
Not at all Competent
Somewhat Competent
Neutral
Competent
Very Competent

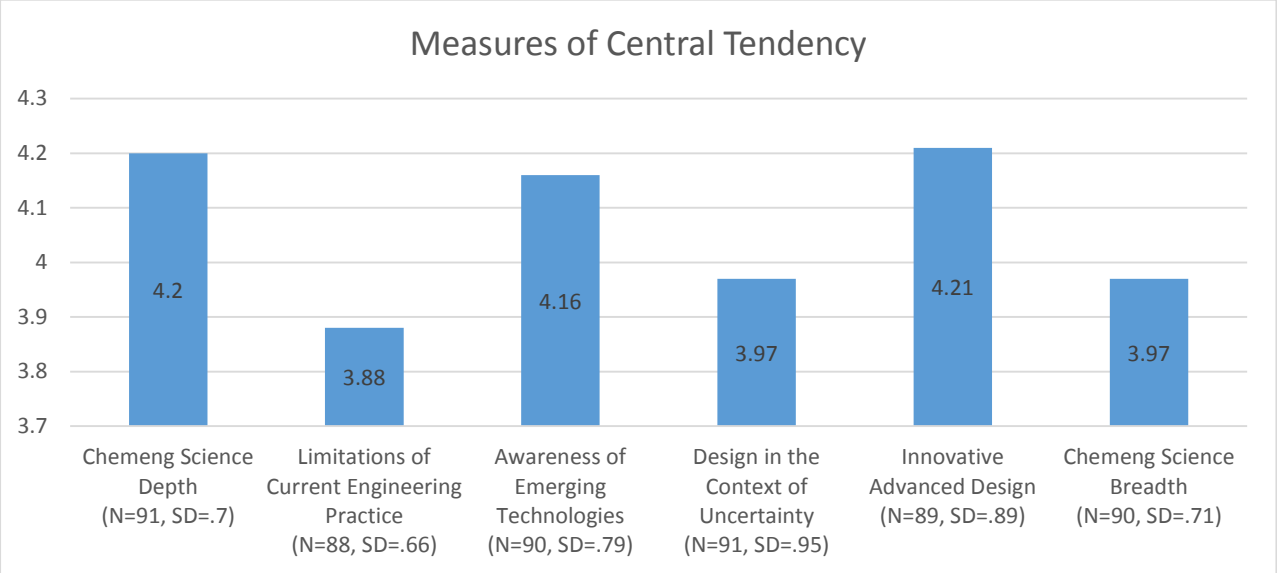

Technical Rigour in Design
4.6
16.1
29.9
40.2
9.2
Not at all Competent
Somewhat Competent
Neutral
Competent
Very Competent


Awareness of Safety Health & Environment Issues
5.7
9.1
26.1
27.3
31.8
Not at all Competent
Somewhat Competent
Neutral
Competent
Very Competent

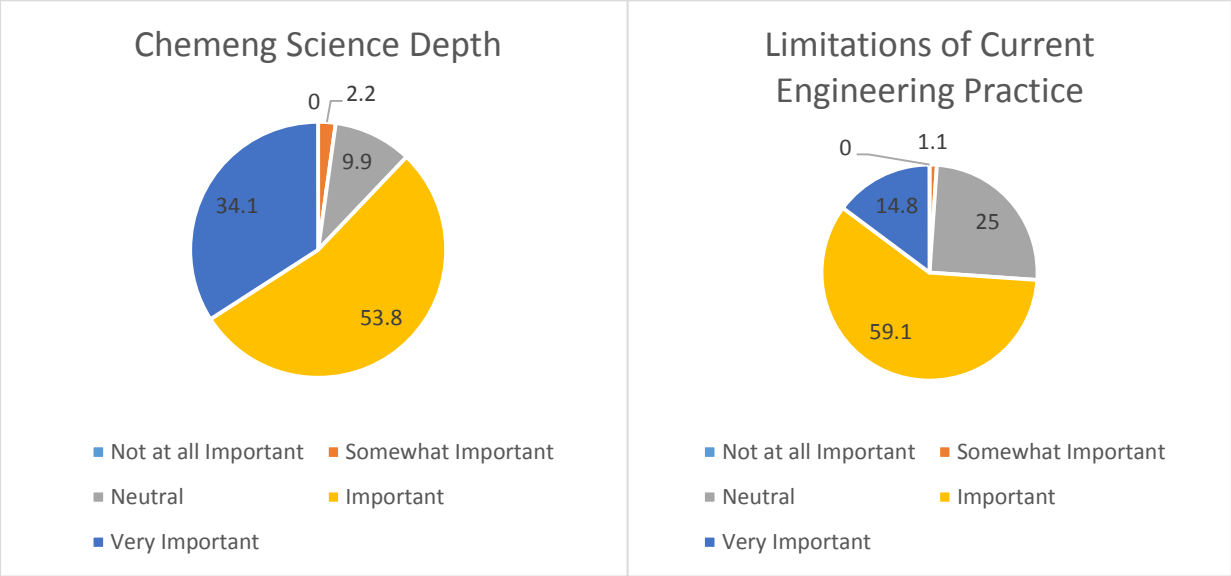

Awareness of Business Drivers
3.4
15.9
34.1
31.8
14.8
Not at all Competent
Somewhat Competent
Neutral
Competent
Very Competent

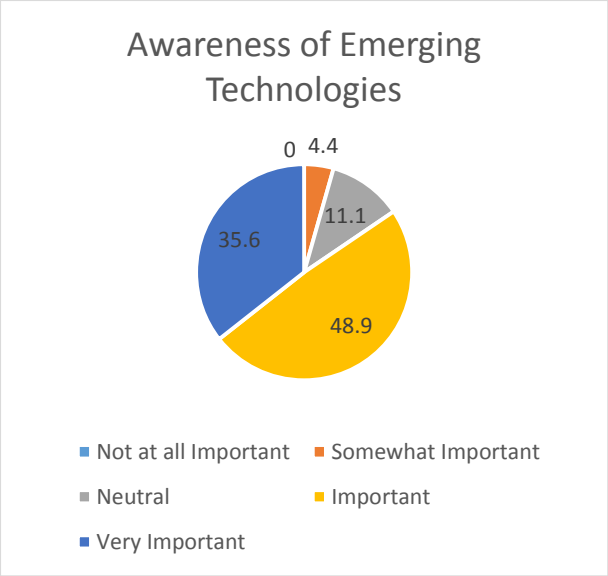
4. Advanced

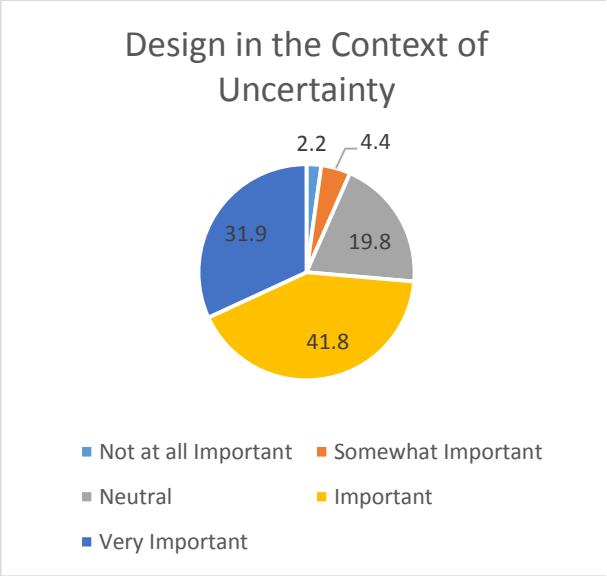
a. How important do you consider the following graduate attributes for your business?

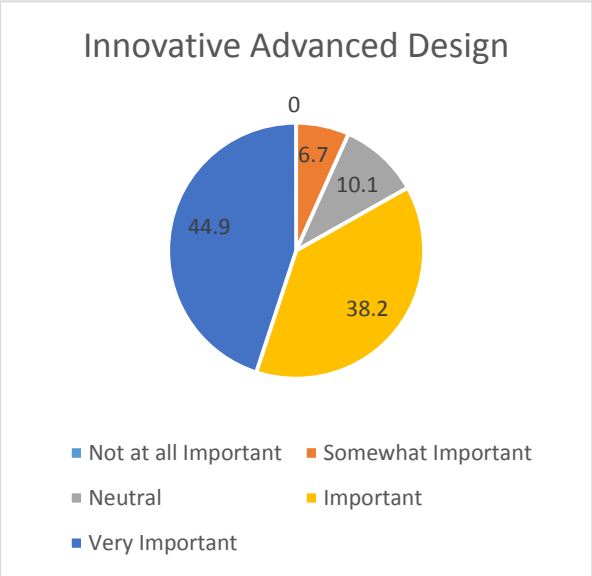


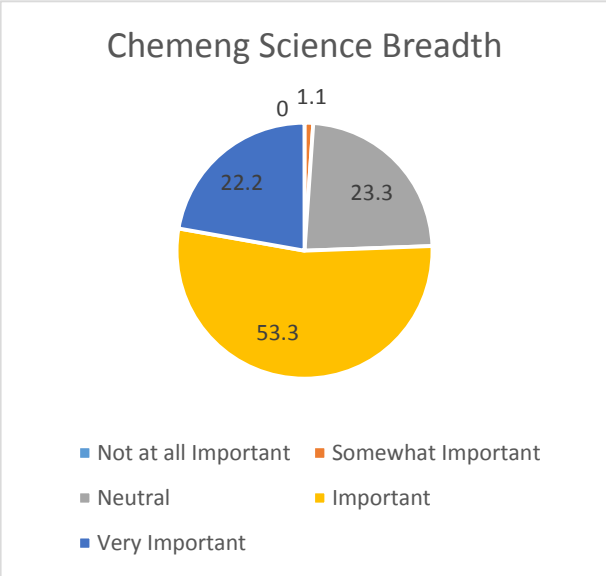
Percentages of Responses





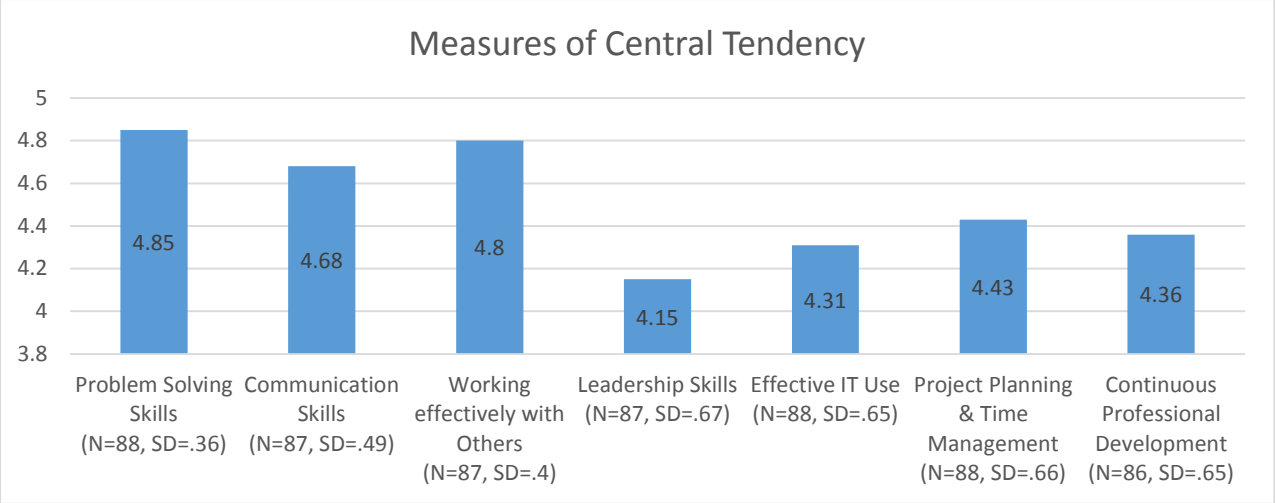




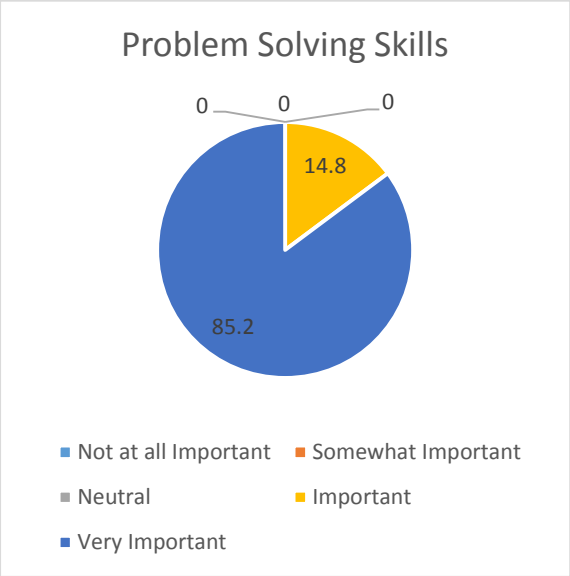


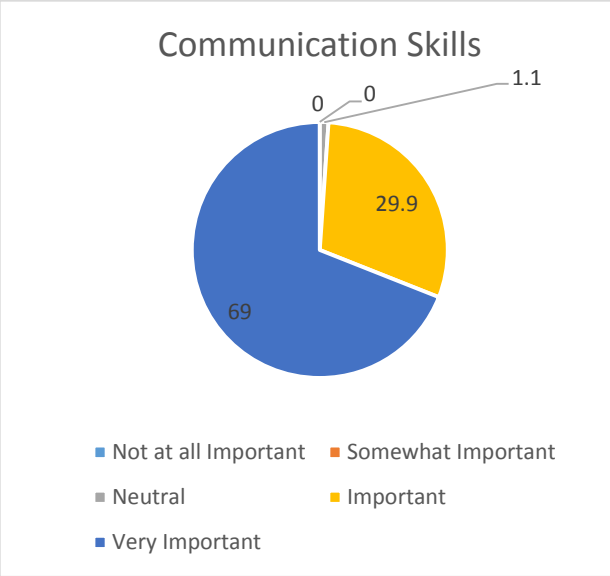
5. Employability

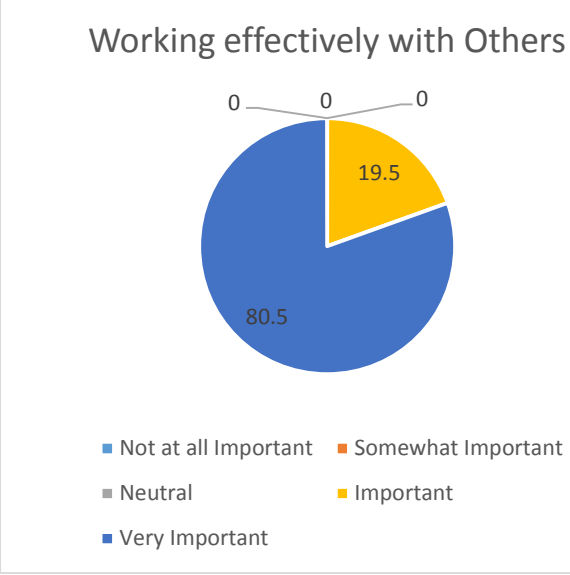
a. How important do you consider the following graduate attributes for your business?

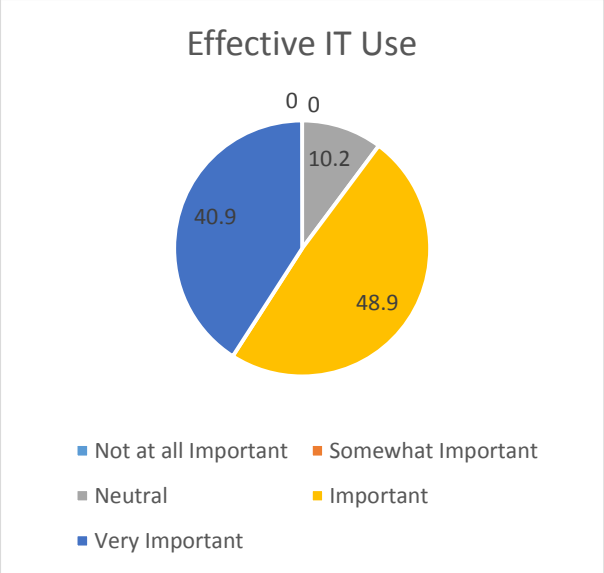


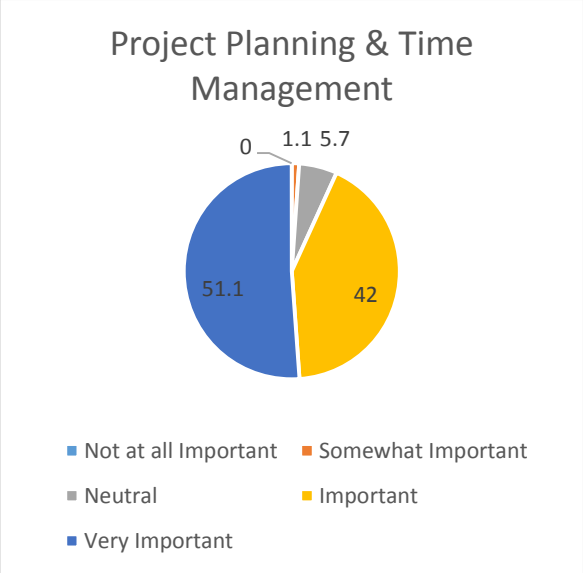
Percentages of Responses

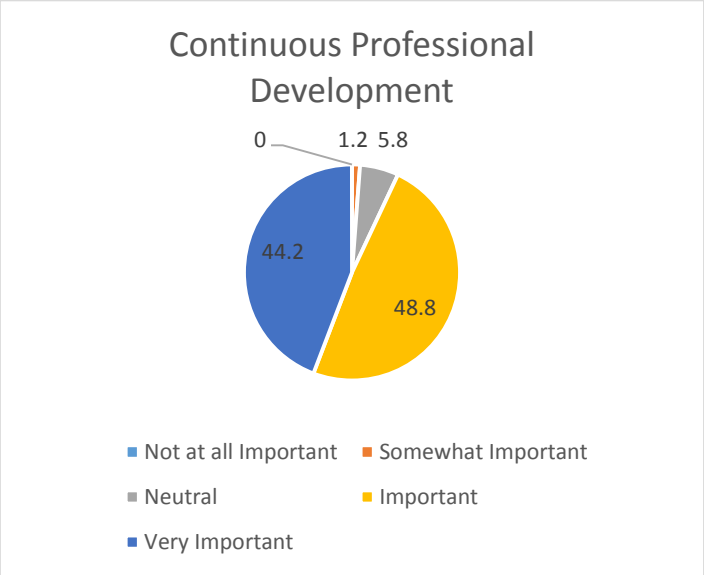




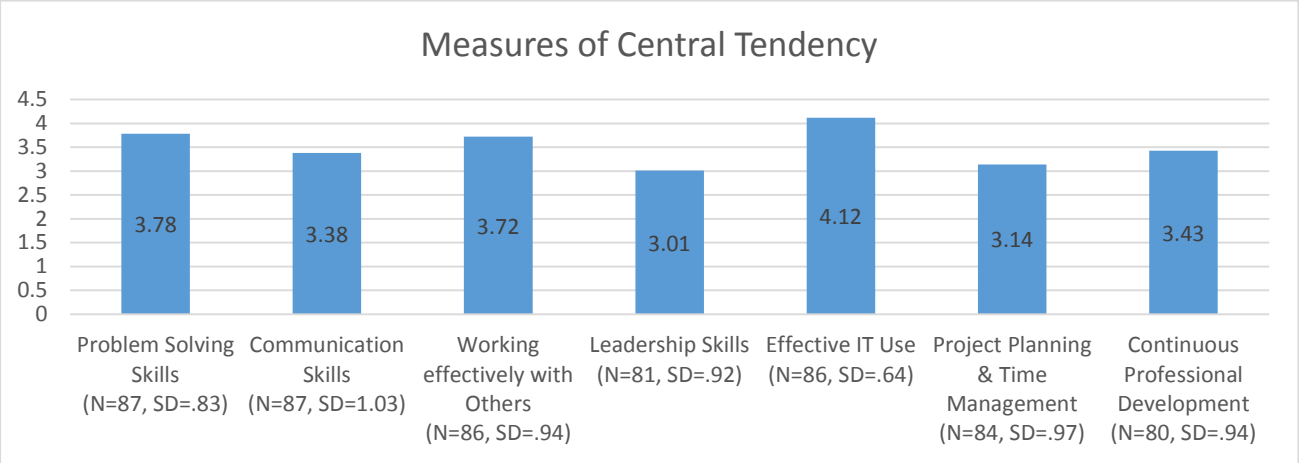


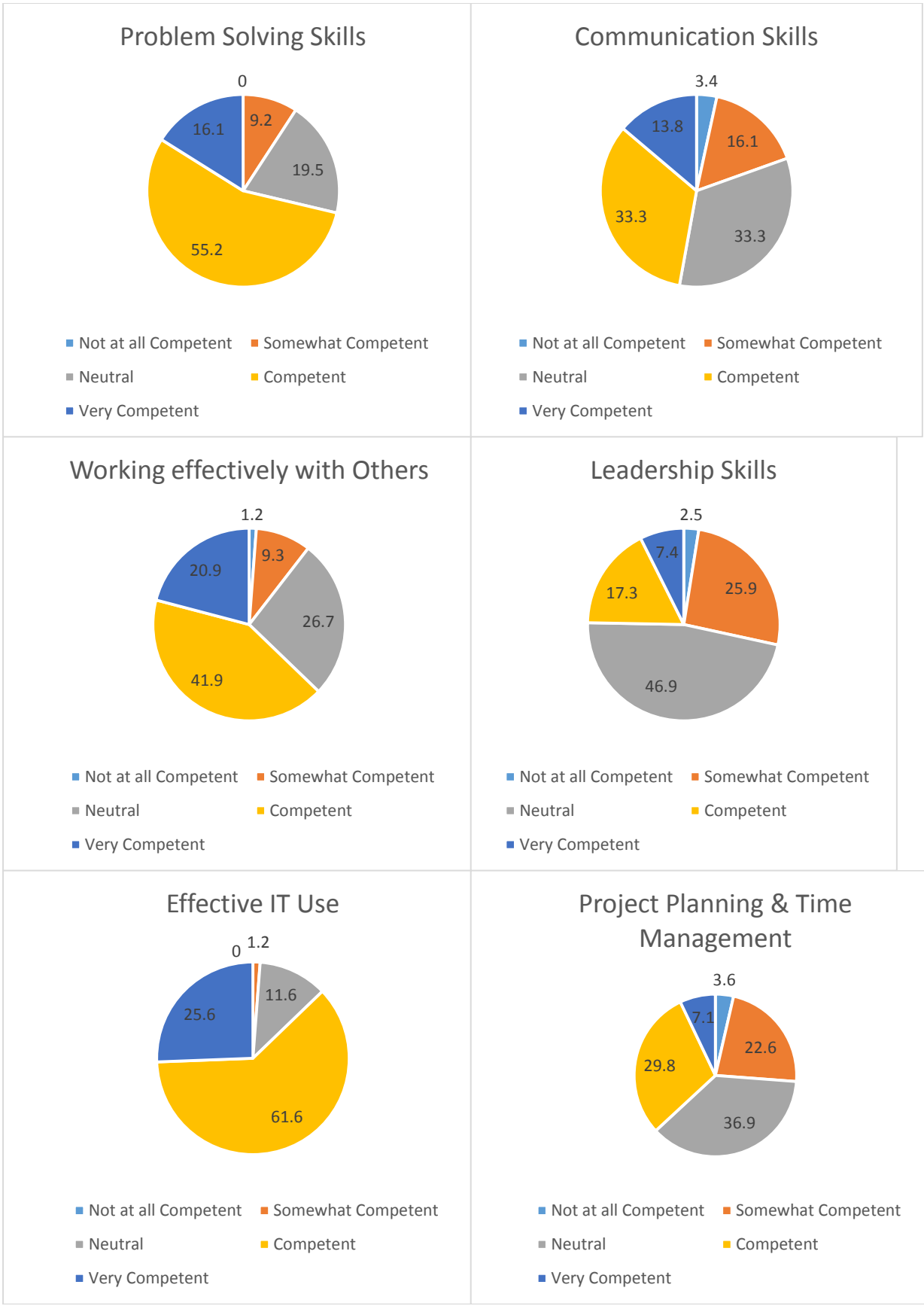


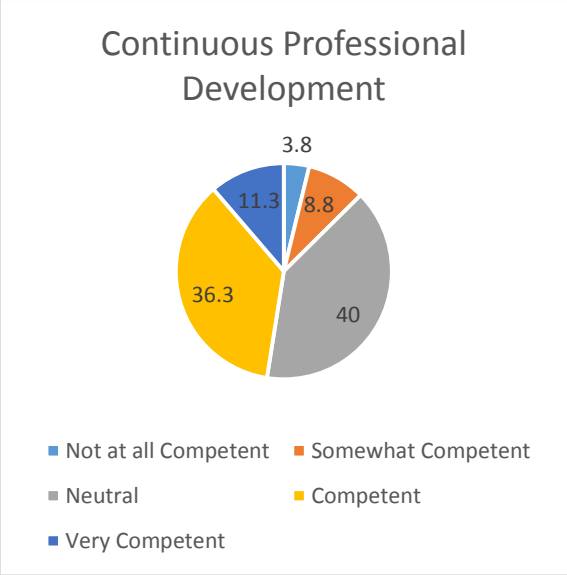




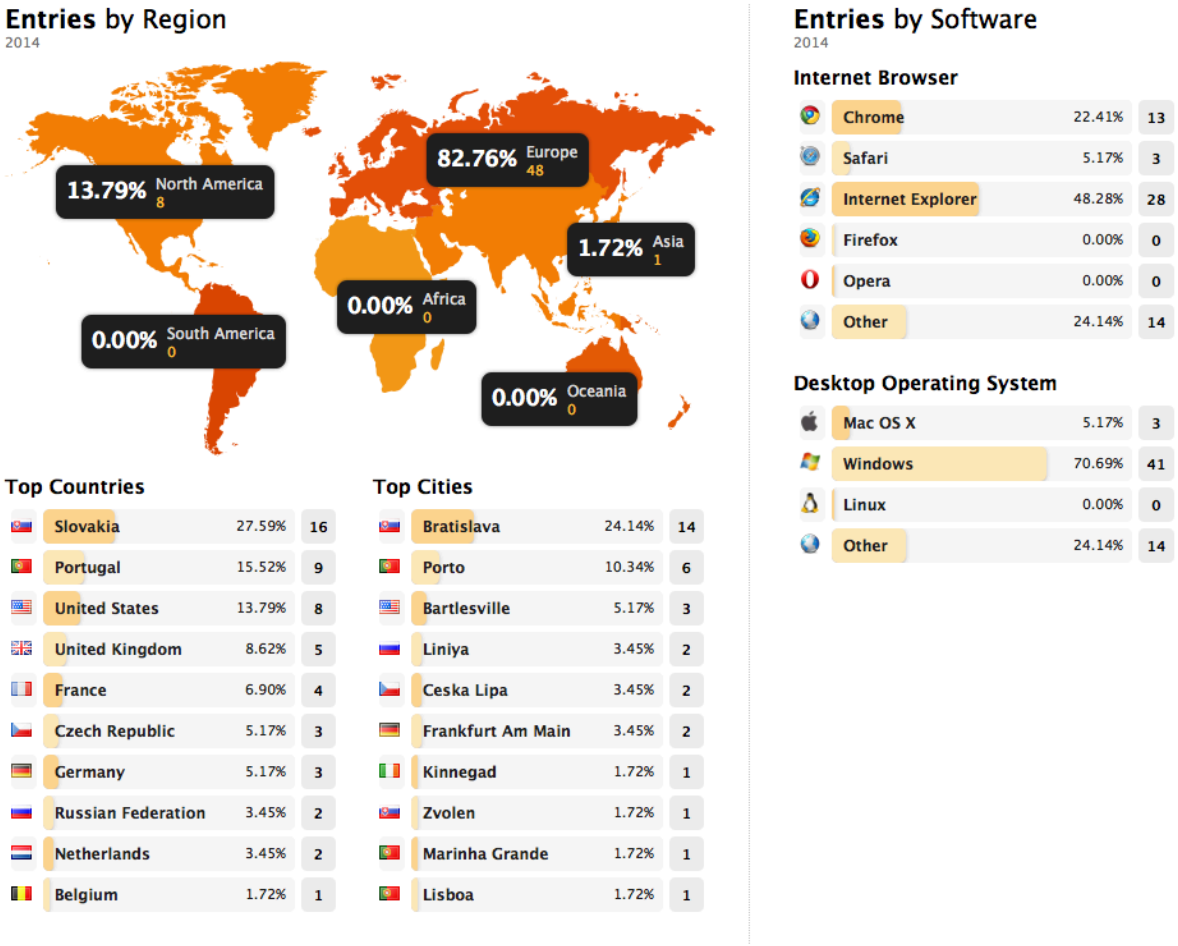
b. According to your experience, how would you rate recent university graduates on each of these competencies?



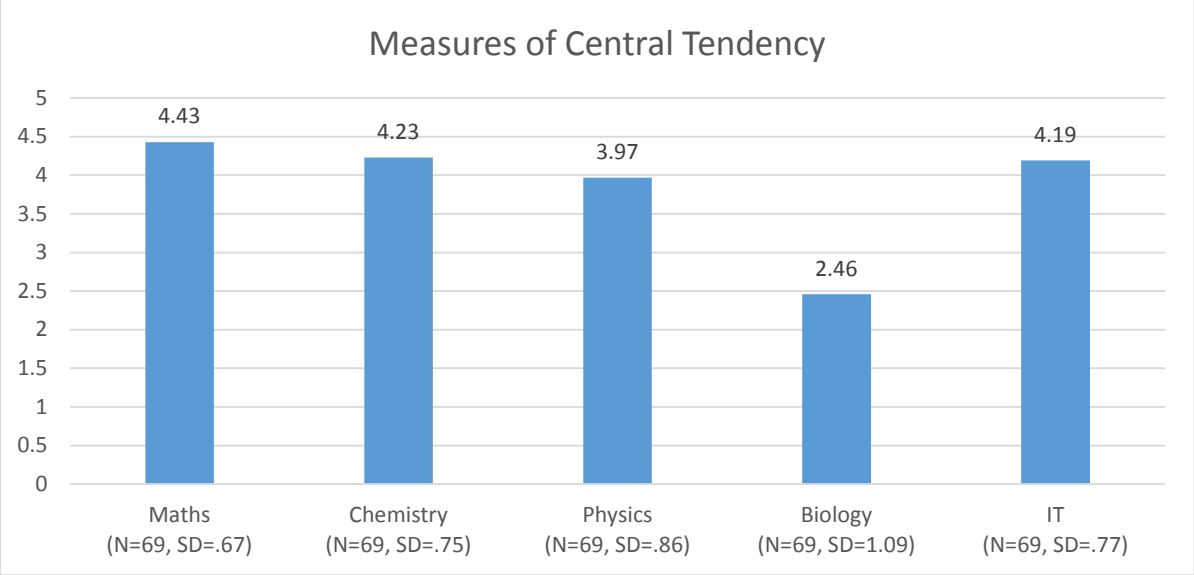

Problem Solving Skills
0
9.2
19.5
55.2
16.1
Not at all Competent
Somewhat Competent
Neutral
Competent
Very Competent
Communication Skills
3.4
16.1
33.3
33.3
13.8
Not at all Competent
Somewhat Competent
Neutral
Competent
Very Competent
Working effectively with Others
1.2
9.3
26.7
41.9
20.9
Not at all Competent
Somewhat Competent
Neutral
Competent
Very Competent
Leadership Skills
2.5
25.9
46.9
17.3
7.4
Not at all Competent
Somewhat Competent
Neutral
Competent
Very Competent
Effective IT Use
0
1.2
11.6
61.6
25.6
Not at all Competent
Somewhat Competent
Neutral
Competent
Very Competent
Project Planning & Time Management
3.6
22.6
36.9
29.8
7.1
Not at all Competent
Somewhat Competent
Neutral
Competent
Very Competent



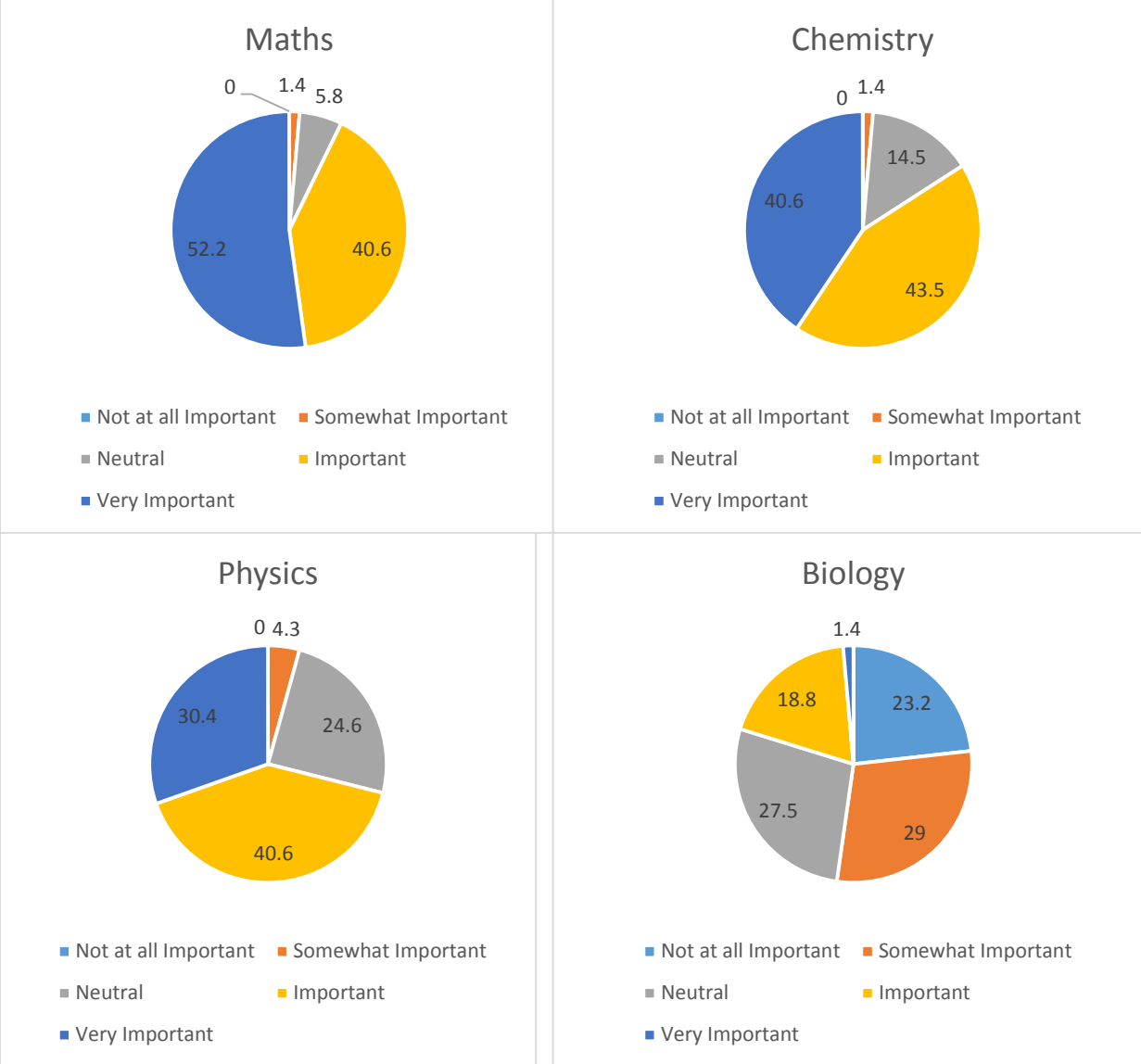
Graduate survey

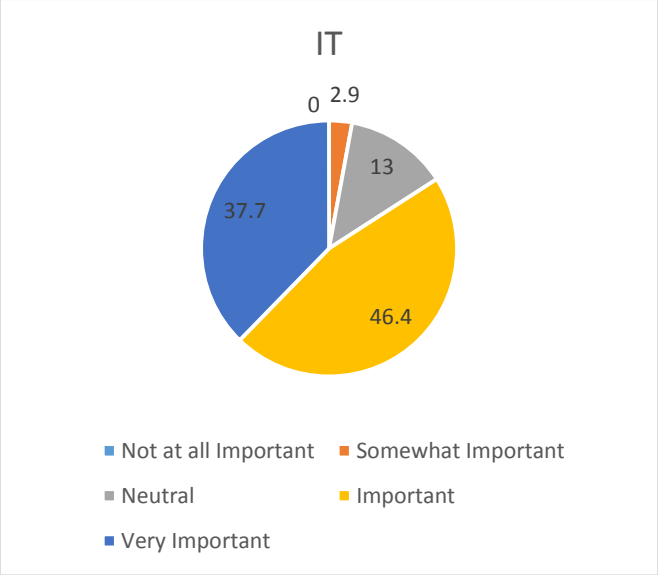


1. **Underpinning**
   a. **How important do you consider each of these competencies for your career?**

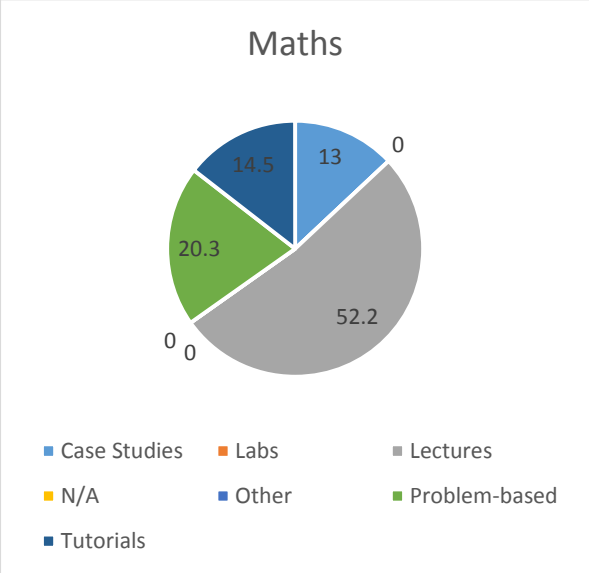


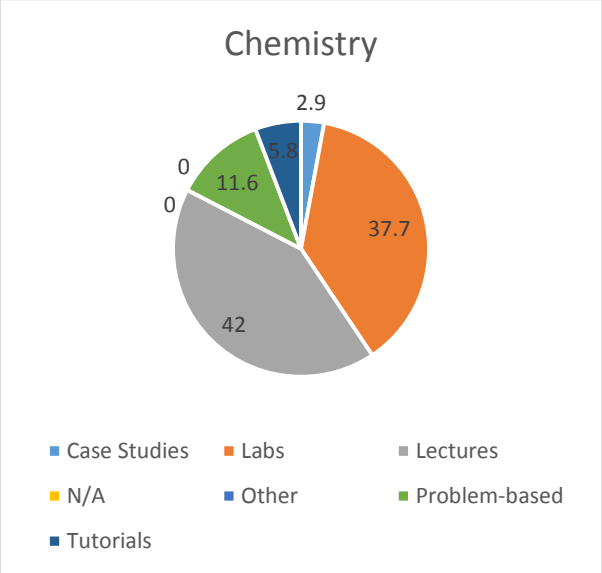
Percentages of Responses

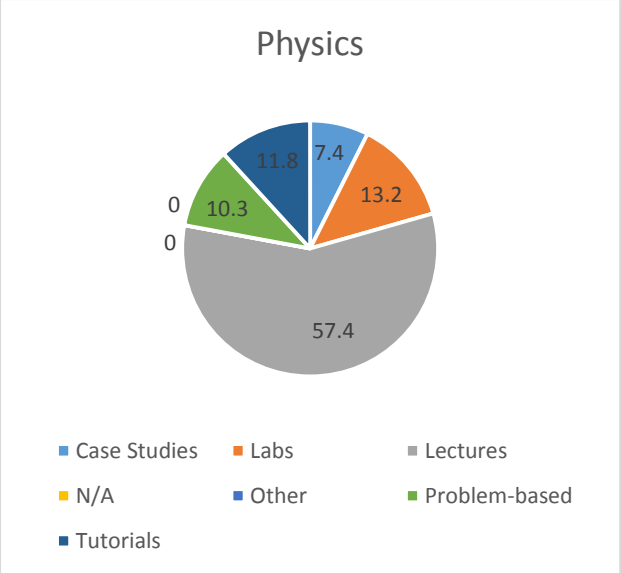


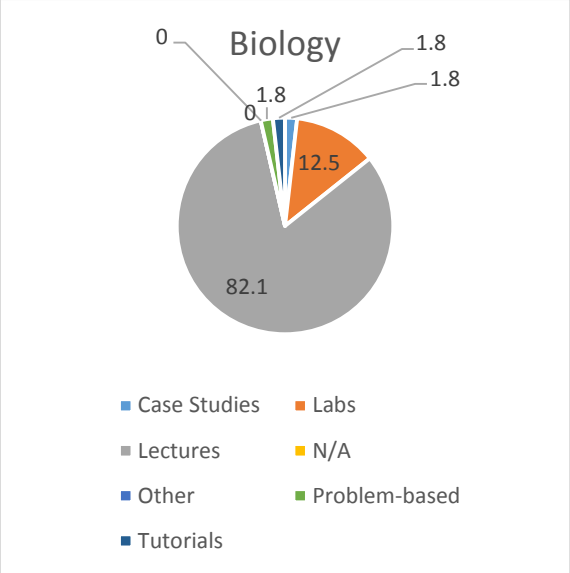


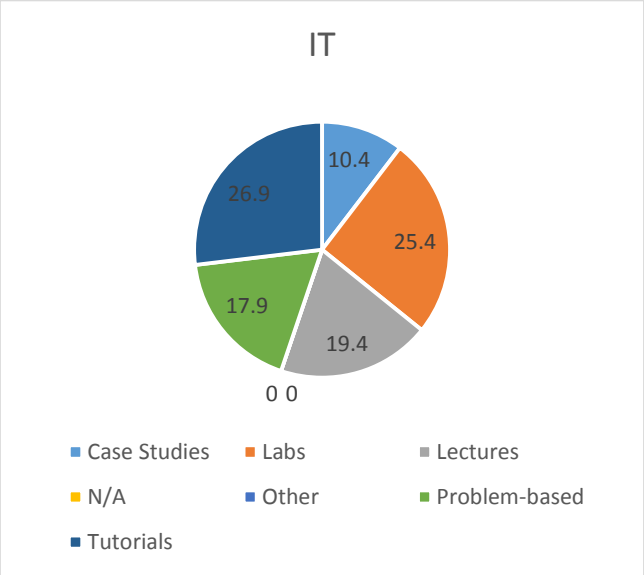
b. From your experience as a student, what was the predominant method of teaching for each competency?



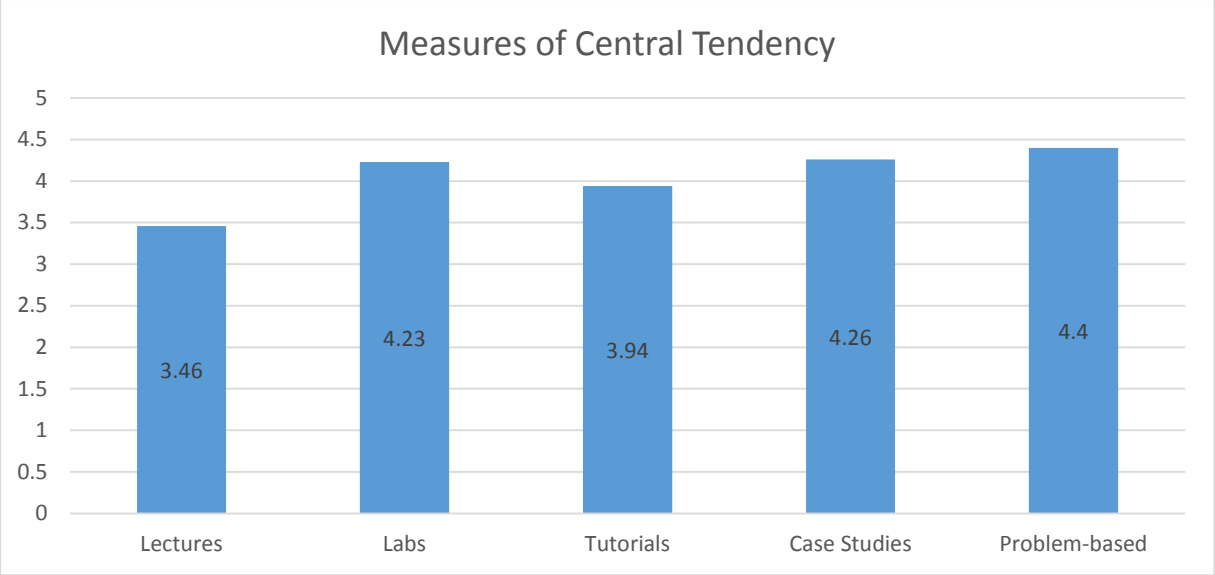


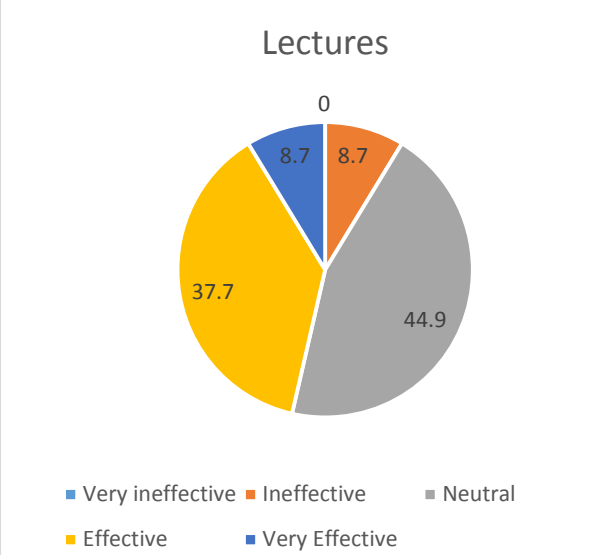


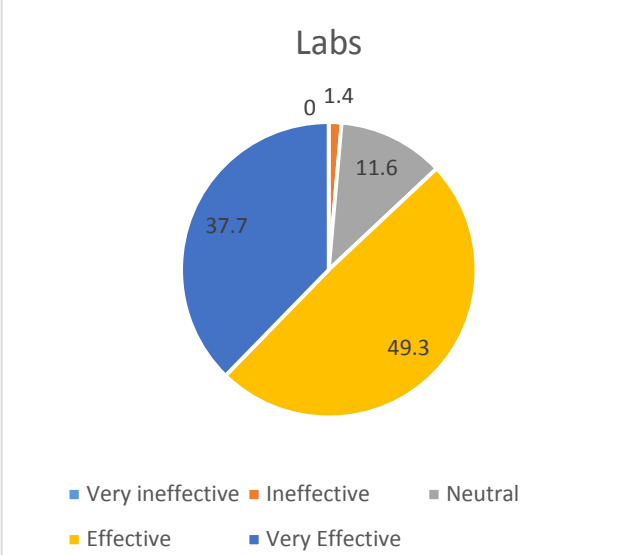


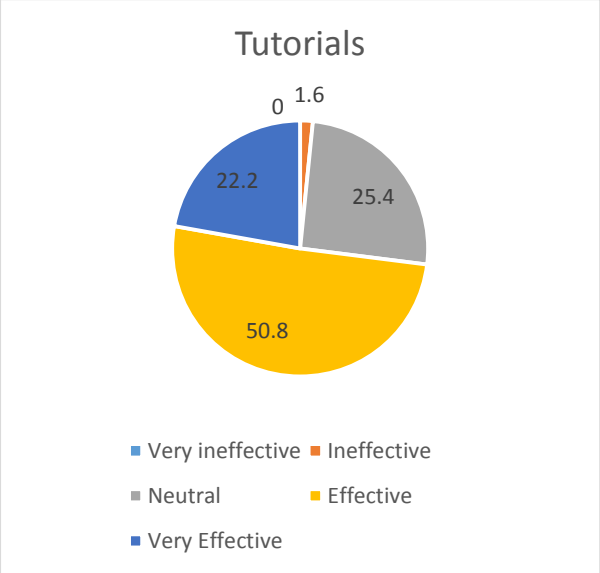


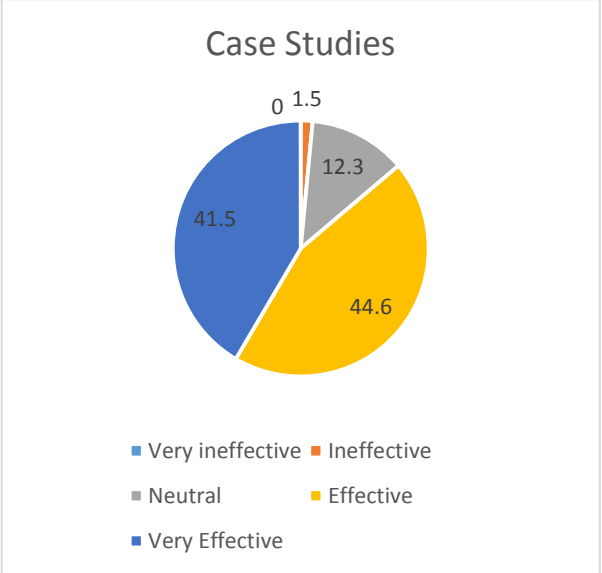
c. Overall, how effective were the methods of teaching that you experienced on your course?

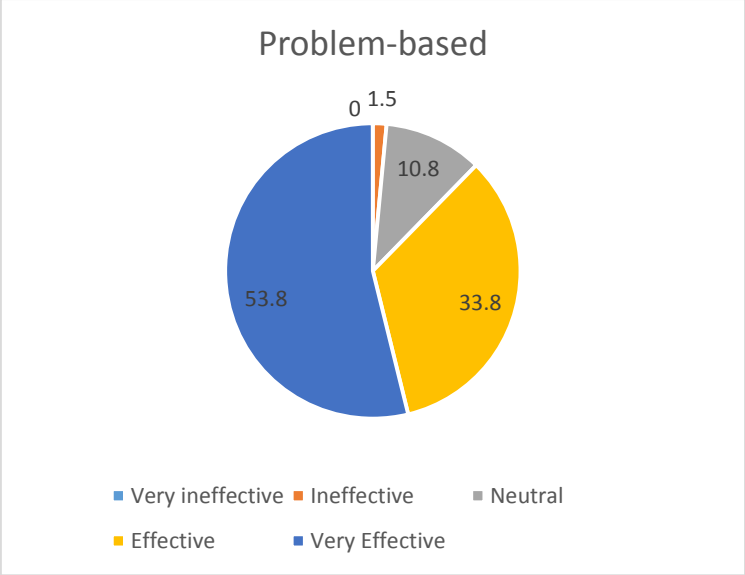

Measures of Central Tendency
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
3.46
4.23
3.94
4.26
4.4
Lectures
Labs
Tutorials
Case Studies
Problem-based


Lectures
0
8.7
8.7
37.7
44.9
Very ineffective
Ineffective
Neutral
Effective
Very Effective


Labs
0
1.4
11.6
37.7
49.3
Very ineffective
Ineffective
Neutral
Effective
Very Effective

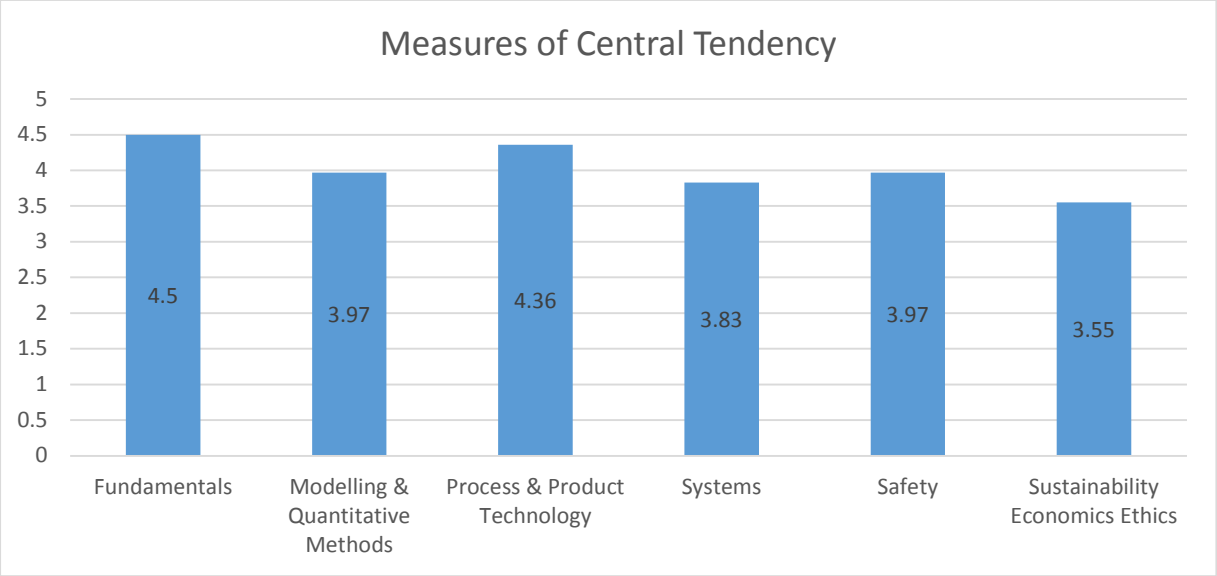

Tutorials
0
1.6
22.2
25.4
50.8
Very ineffective
Ineffective
Neutral
Effective
Very Effective

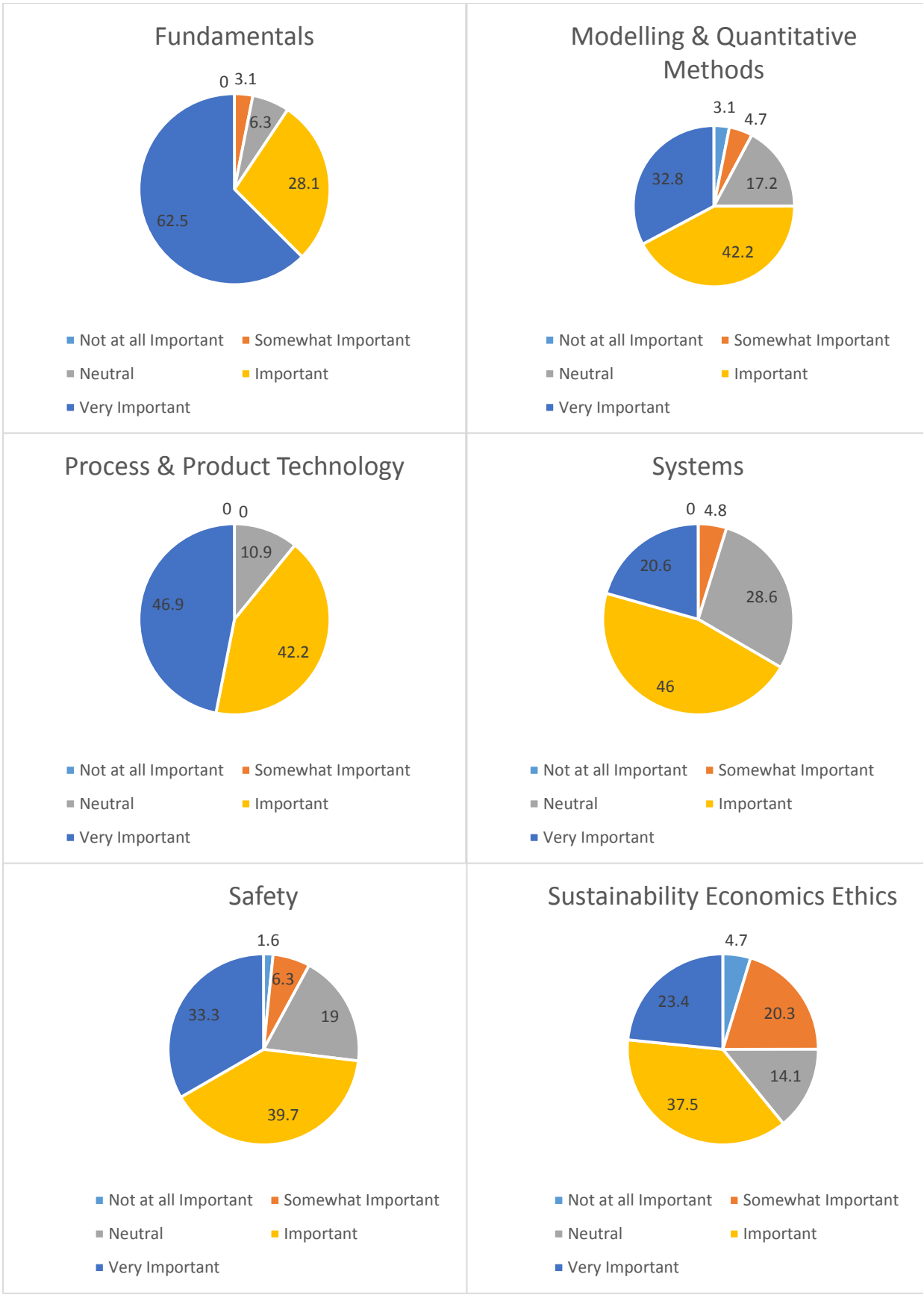

Case Studies
0
1.5
12.3
41.5
44.6
Very ineffective
Ineffective
Neutral
Effective
Very Effective



2. Core

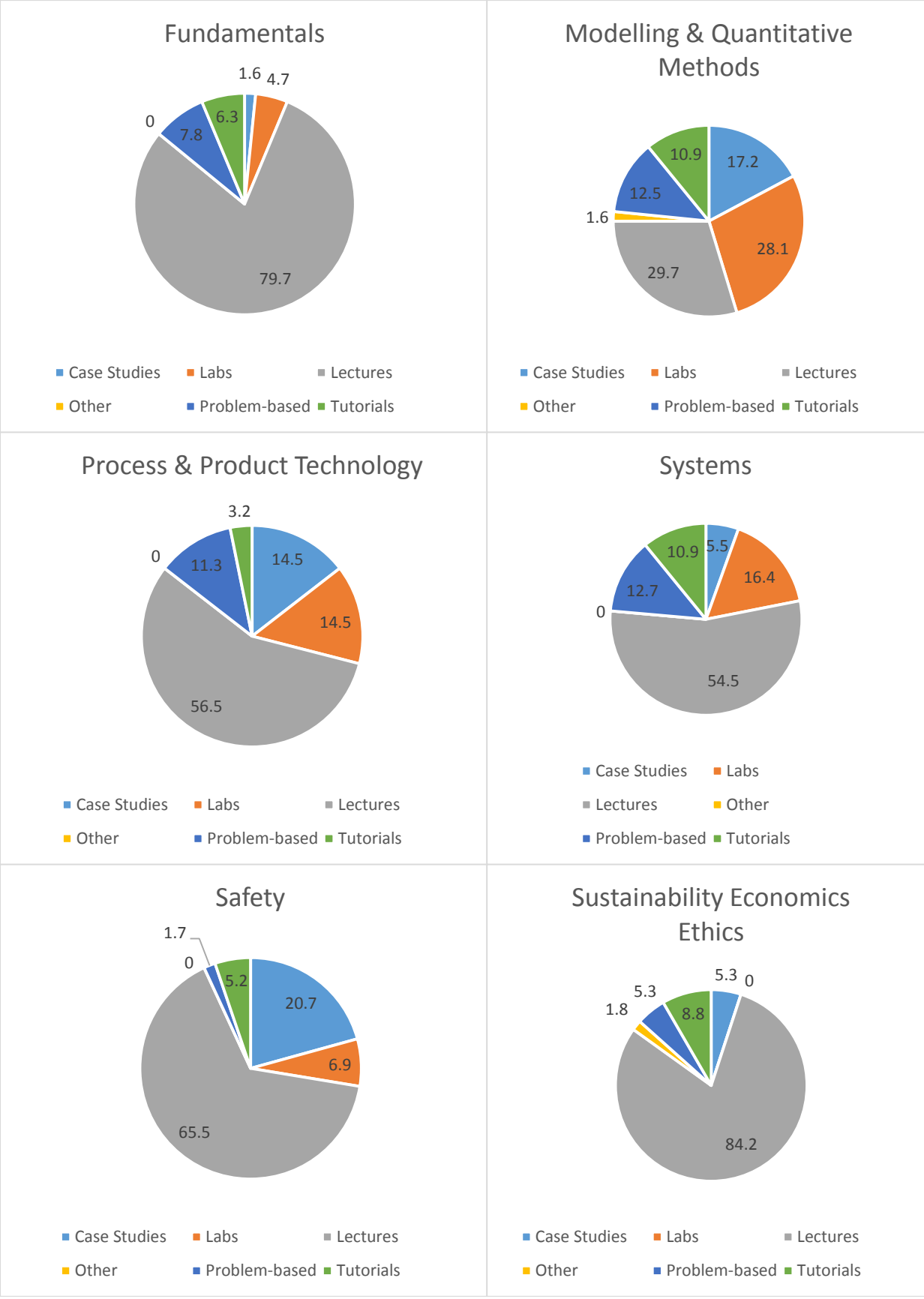
a. How important do you consider each of these competencies for your career?



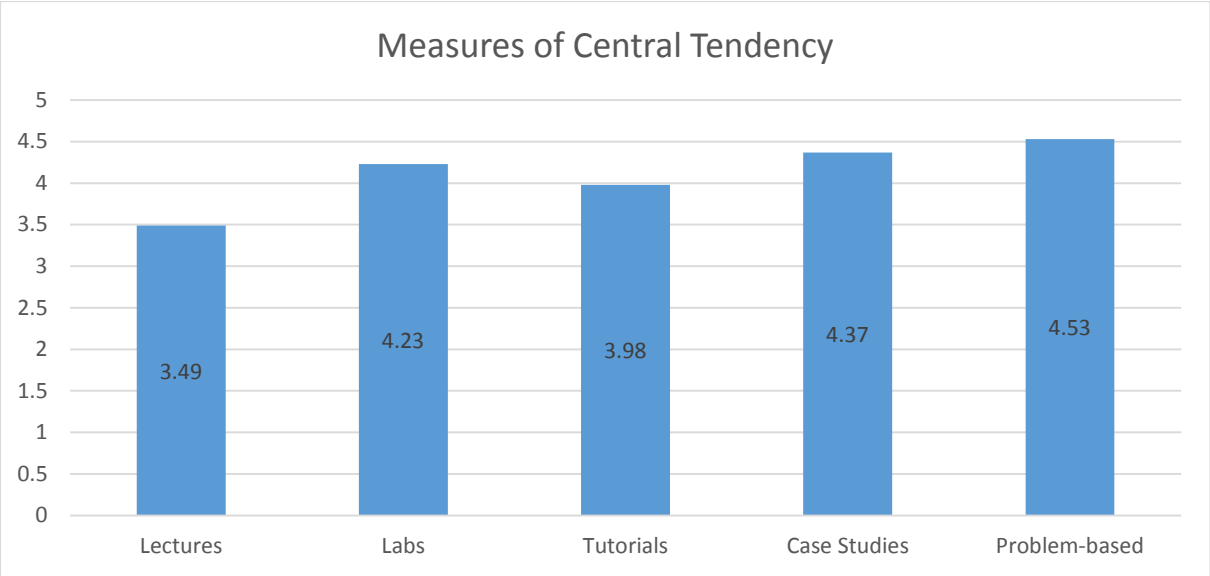

Fundamentals
0
3.1
6.3
28.1
62.5
Not at all Important
Somewhat Important
Neutral
Important
Very Important
Modelling & Quantitative Methods
3.1
4.7
32.8
17.2
42.2
Not at all Important
Somewhat Important
Neutral
Important
Very Important
Process & Product Technology
0
0
10.9
46.9
42.2
Not at all Important
Somewhat Important
Neutral
Important
Very Important
Systems
0
4.8
20.6
28.6
46
Not at all Important
Somewhat Important
Neutral
Important
Very Important
Safety
1.6
6.3
33.3
19
39.7
Not at all Important
Somewhat Important
Neutral
Important
Very Important
Sustainability Economics Ethics
4.7
23.4
20.3
14.1
37.5
Not at all Important
Somewhat Important
Neutral
Important
Very Important

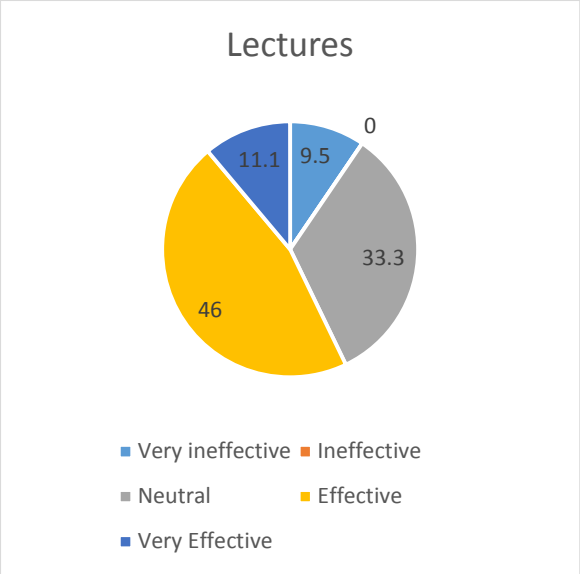
+

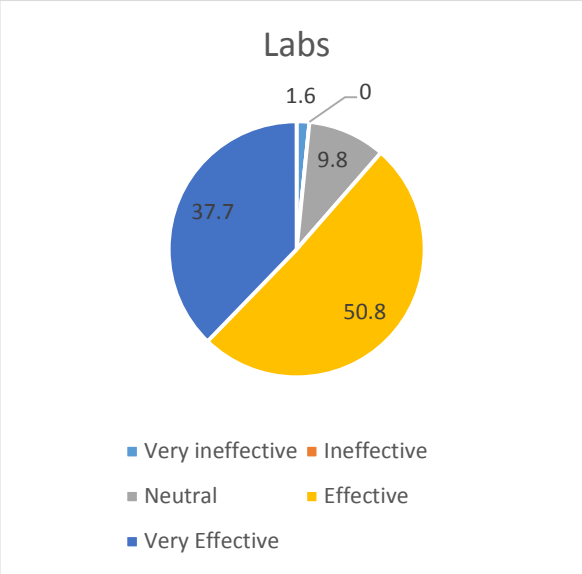
b. From your experience as a student, what was the predominant method of teaching for each competency?

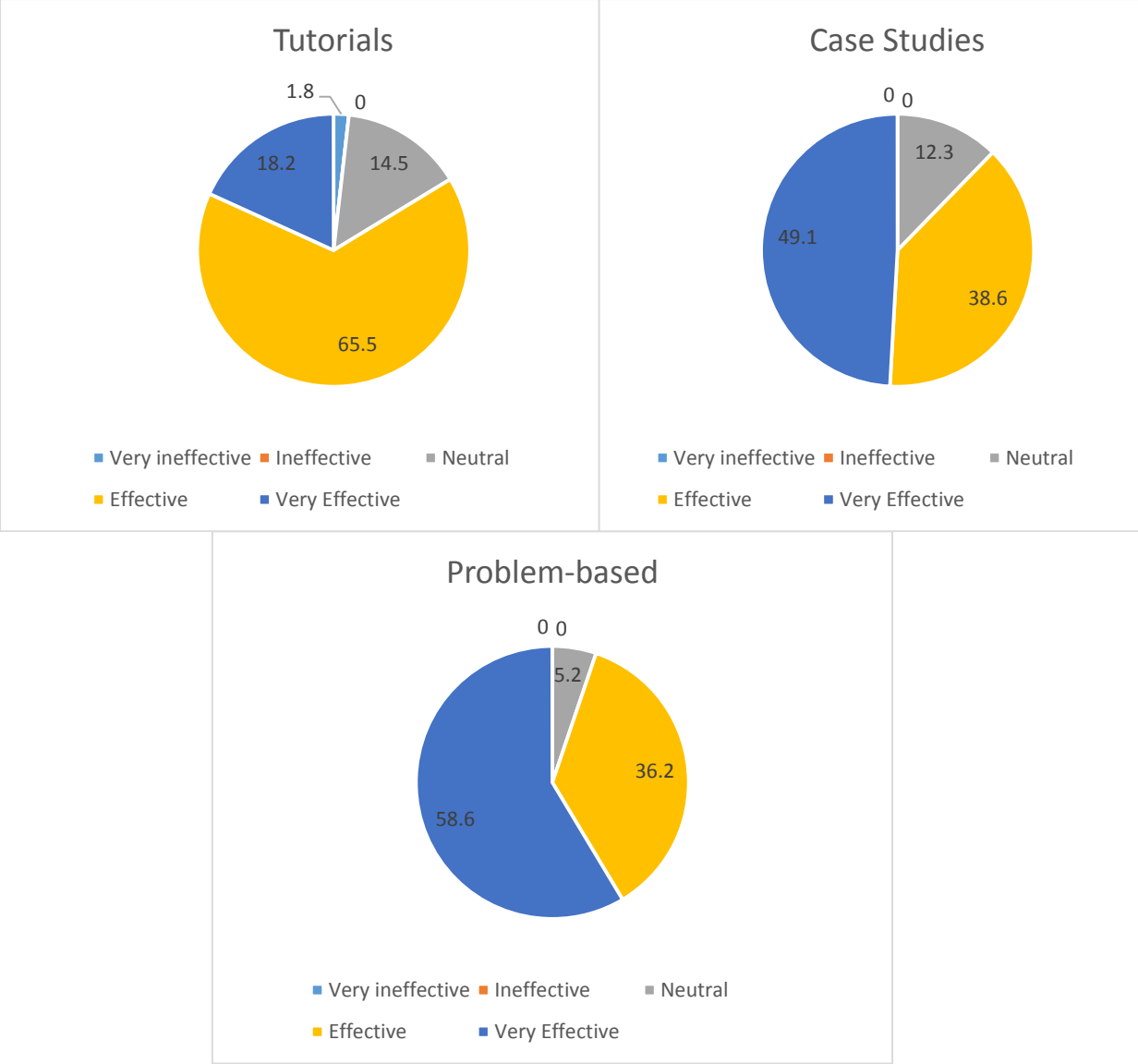


c. Overall, how effective were the methods of teaching that you experienced on your course?



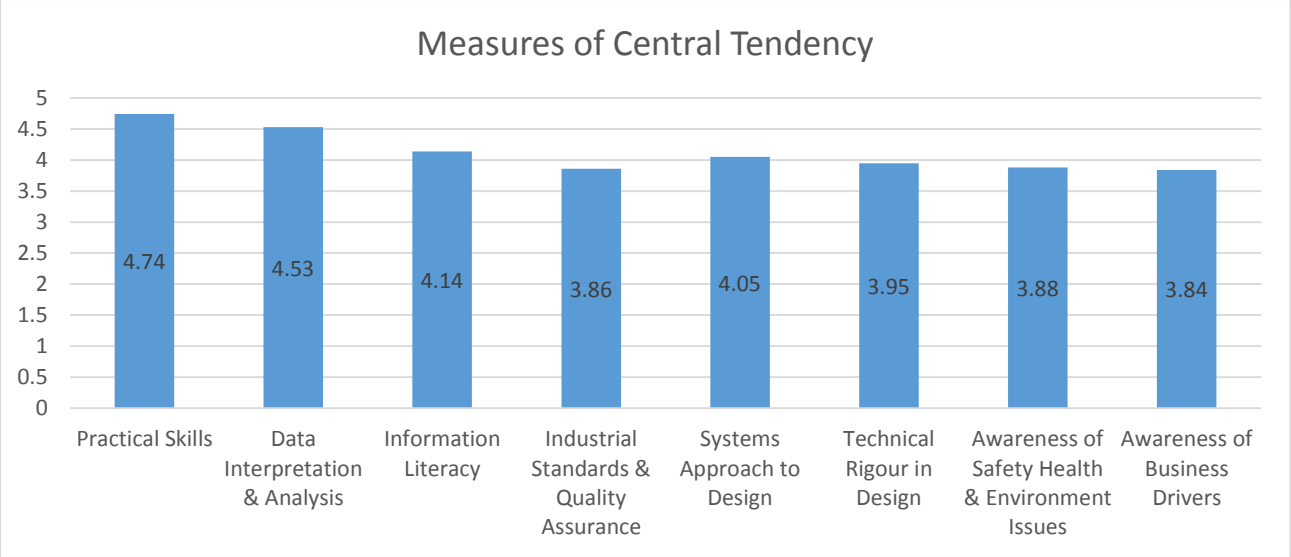


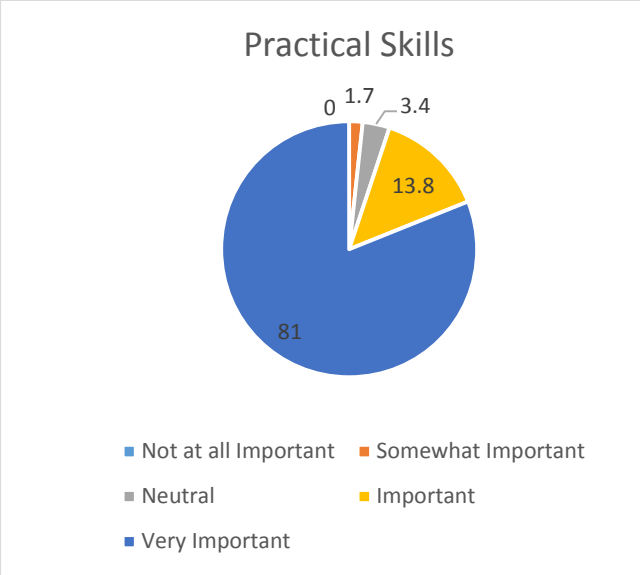


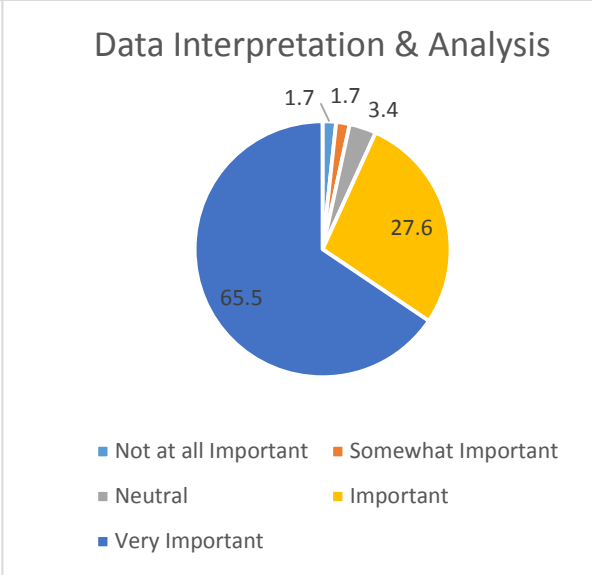


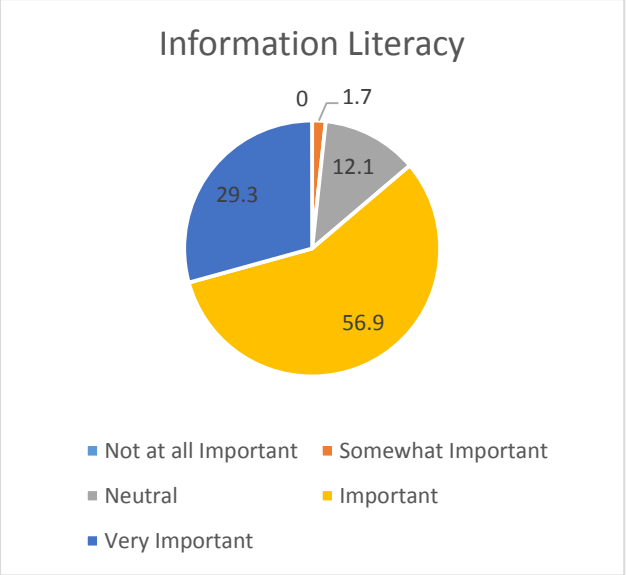
3. Design & Practice

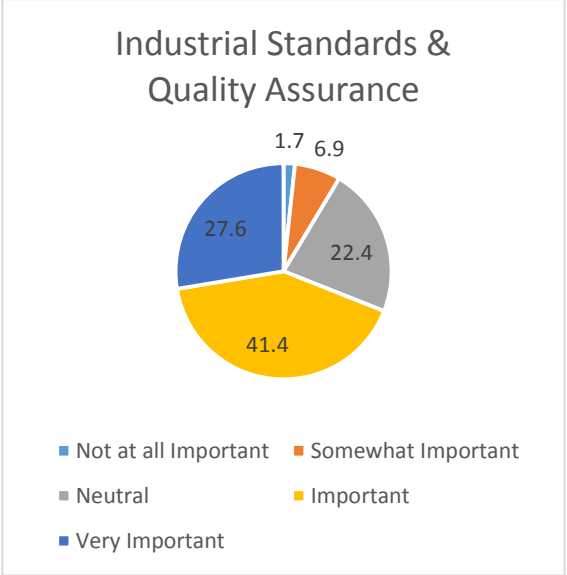
a. How important do you consider each of these competencies for your career

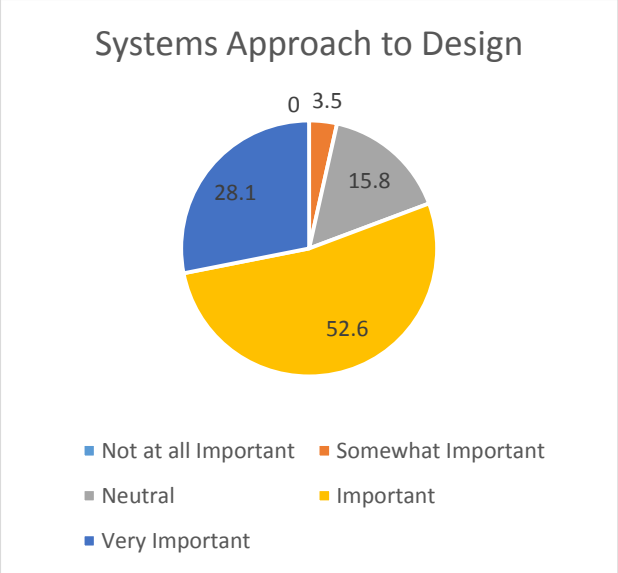

Measures of Central Tendency
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
4.74
4.53
4.14
3.86
4.05
3.95
3.88
3.84
Practical Skills
Data Interpretation & Analysis
Information Literacy
Industrial Standards & Quality Assurance
Technical Rigour in Design
Awareness of Safety Health & Environment Issues
Awareness of Business Drivers

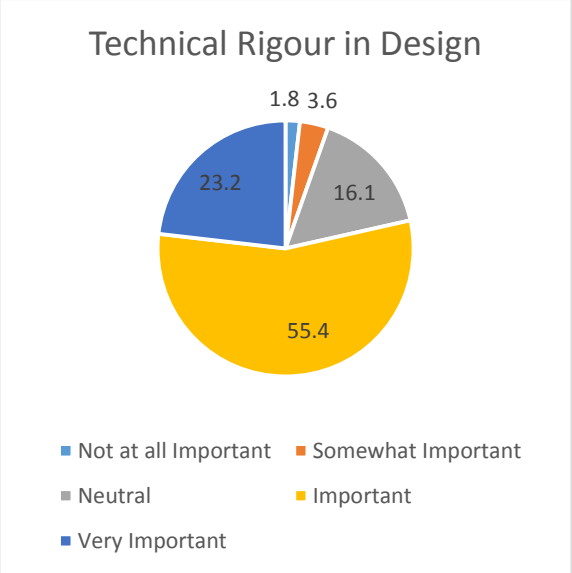

Practical Skills
0
1.7
3.4
13.8
81
Not at all Important
Somewhat Important
Neutral
Important
Very Important

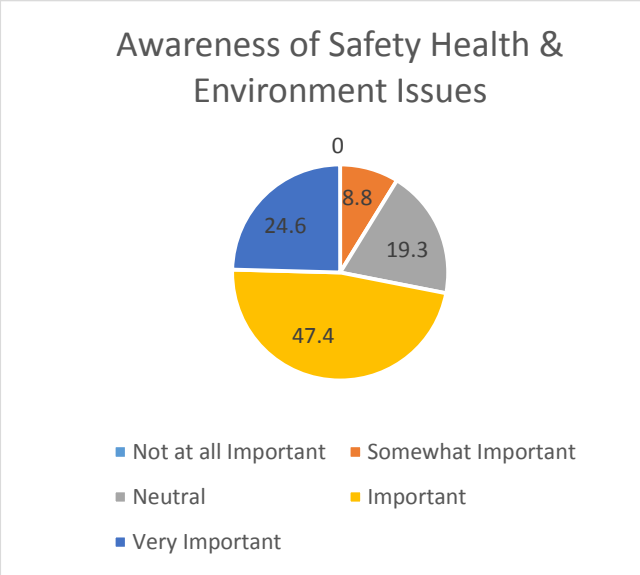

Data Interpretation & Analysis
1.7
1.7
3.4
27.6
65.5
Not at all Important
Somewhat Important
Neutral
Important
Very Important

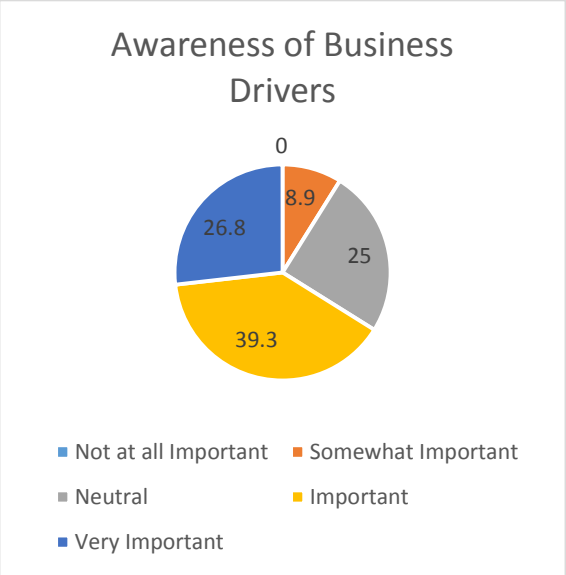

Information Literacy
0
1.7
12.1
29.3
56.9
Not at all Important
Somewhat Important
Neutral
Important
Very Important


Industrial Standards & Quality Assurance
1.7
6.9
27.6
22.4
41.4
Not at all Important
Somewhat Important
Neutral
Important
Very Important









b. From your experience as a student, what was the predominant method of teaching for each competency?

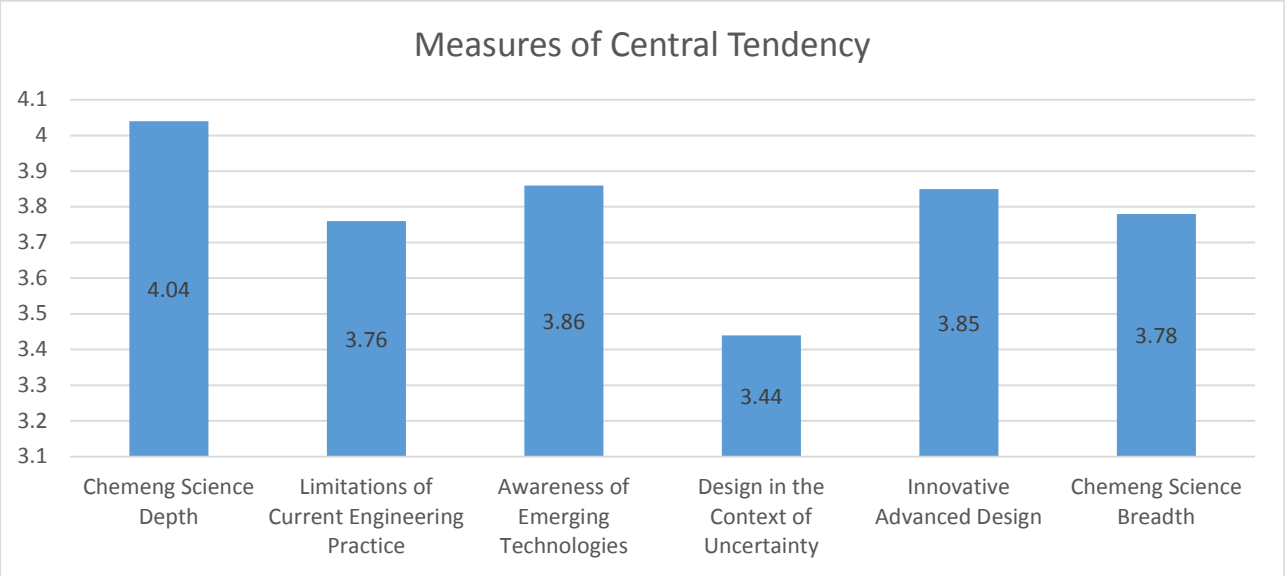
Open question (?) – TBA

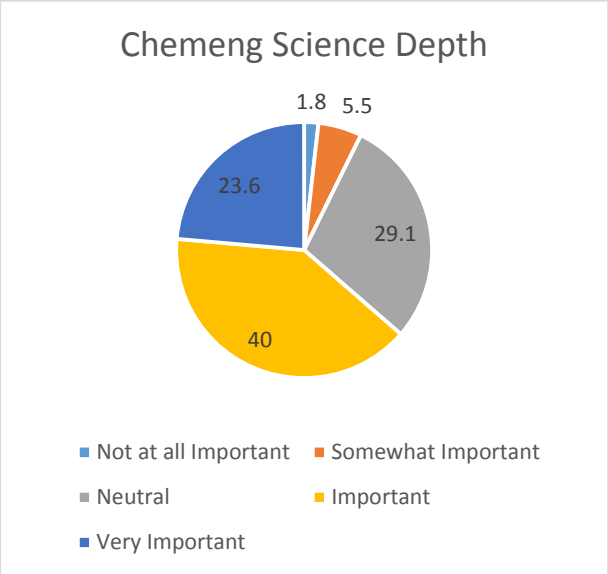
c. Overall, how effective were the methods of teaching that you experienced on your course?

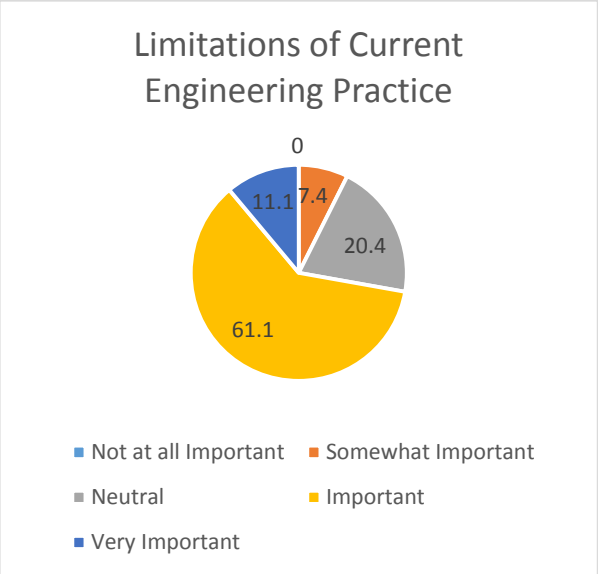
Open question (?) – TBA

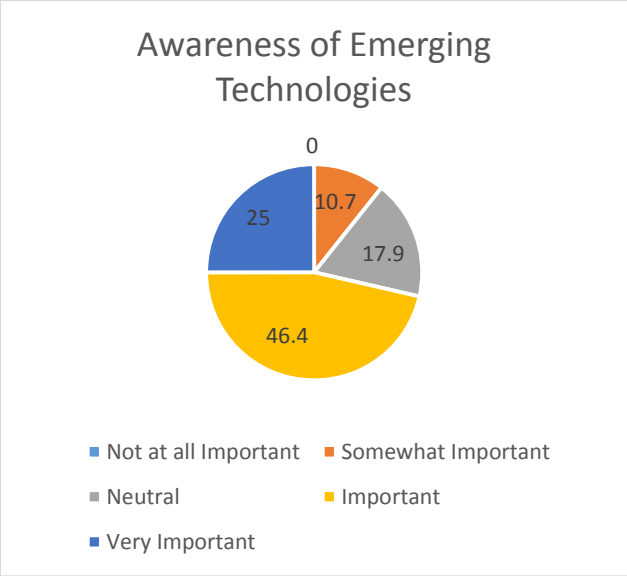
4. Advanced

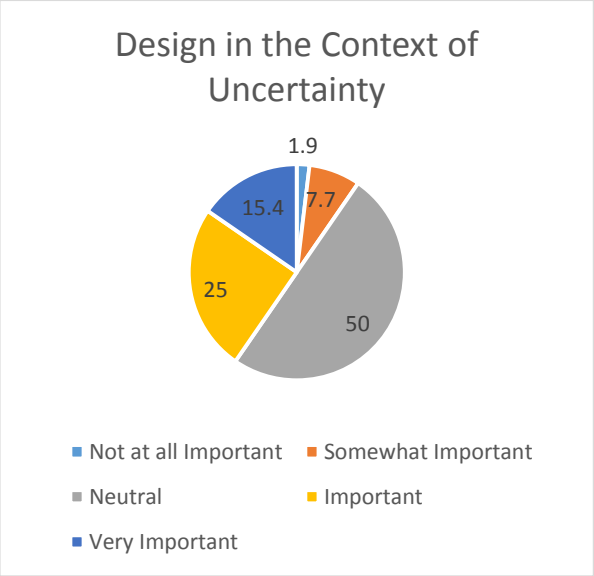
a. How important do you consider each of these competencies for your career?

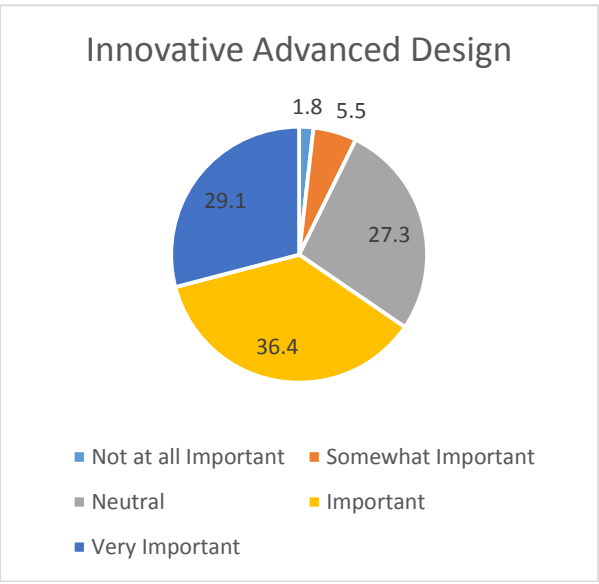


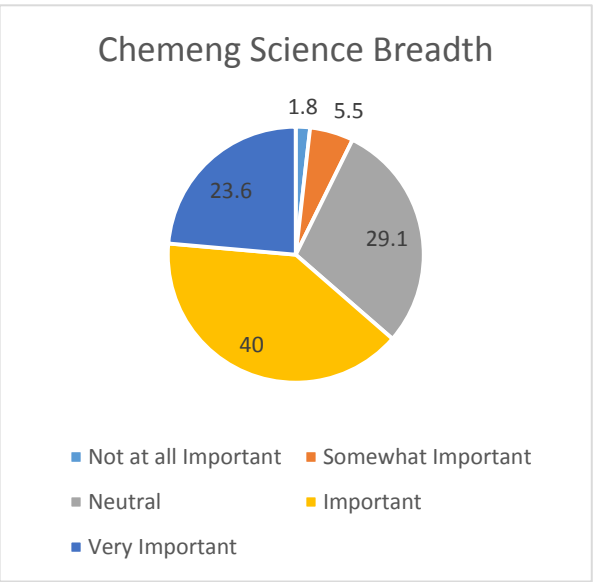





Awareness of Emerging Technologies
0
10.7
17.9
46.4
25
Not at all Important
Somewhat Important
Neutral
Important
Very Important

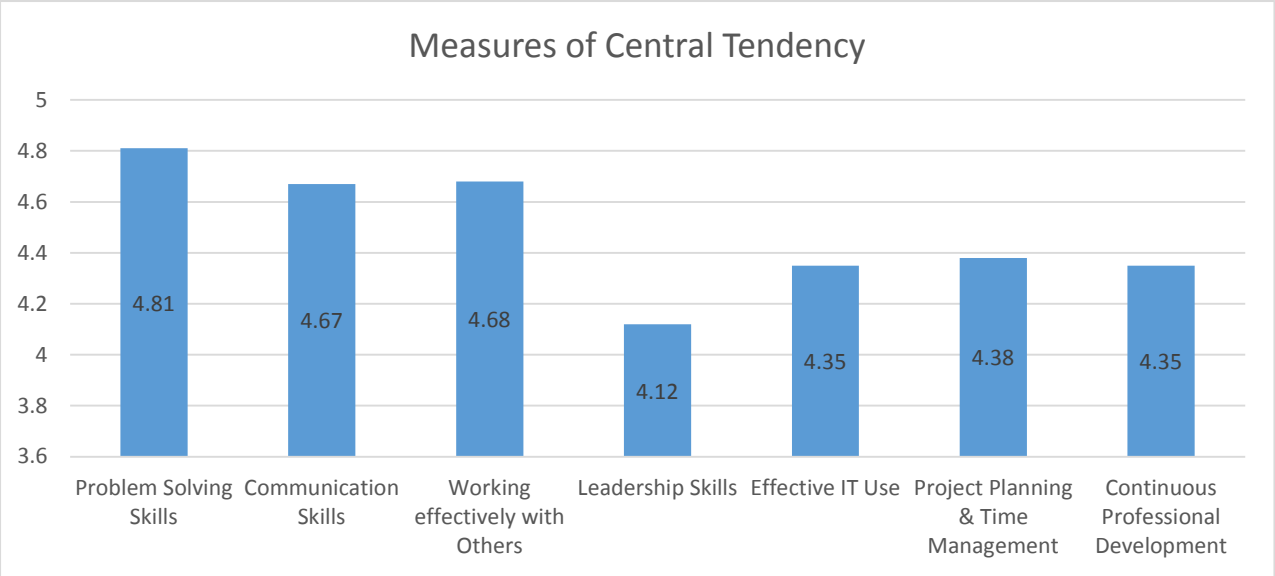

Design in the Context of Uncertainty
1.9
7.7
50
25
15.4
Not at all Important
Somewhat Important
Neutral
Important
Very Important

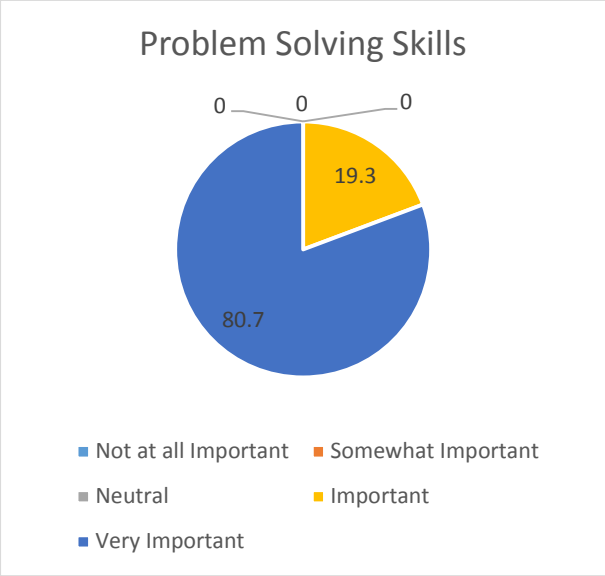

Innovative Advanced Design
1.8
5.5
27.3
36.4
29.1
Not at all Important
Somewhat Important
Neutral
Important
Very Important

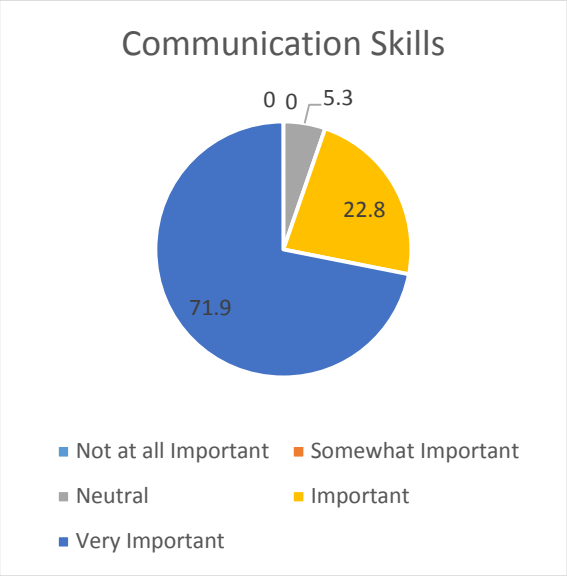

Chemeng Science Breadth
1.8
5.5
29.1
40
23.6
Not at all Important
Somewhat Important
Neutral
Important
Very Important

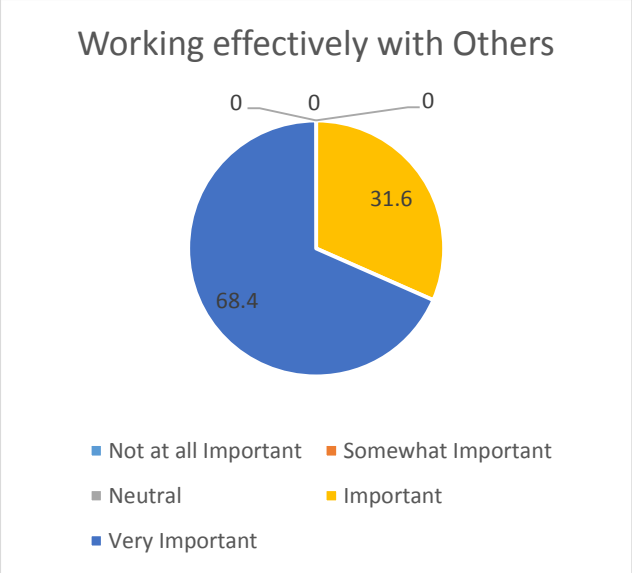
5. Employability

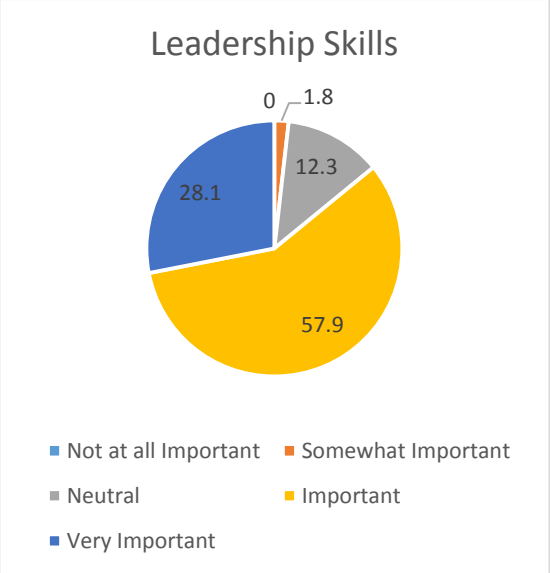
a. How important do you consider each of these competencies for your career

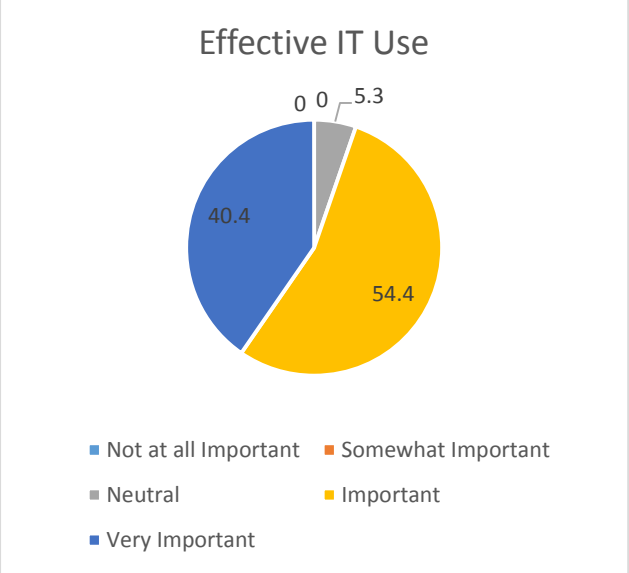


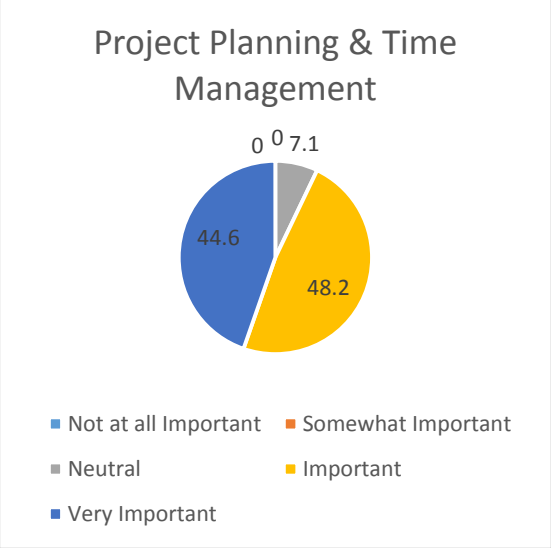


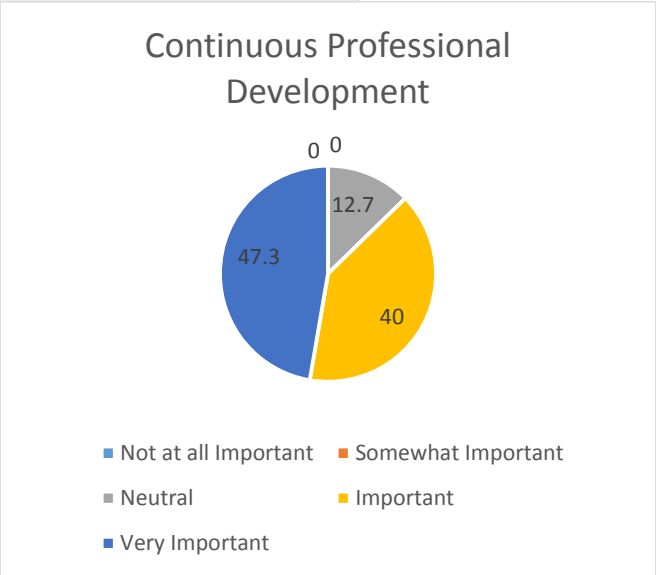




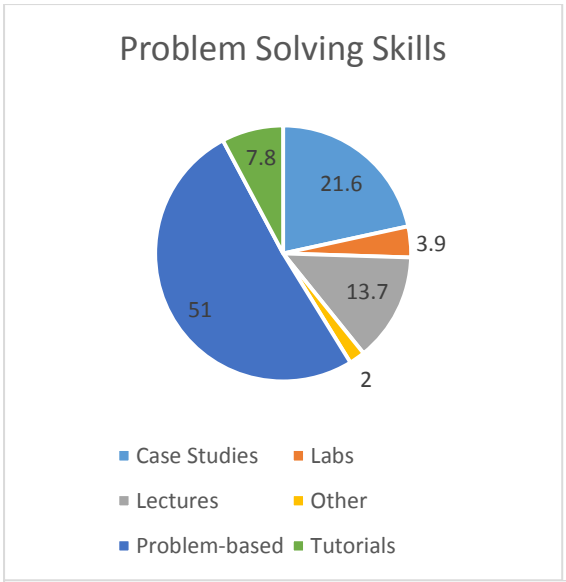


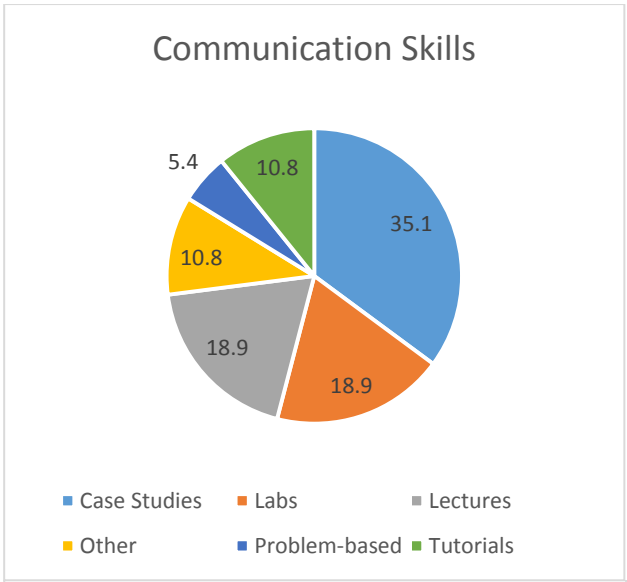


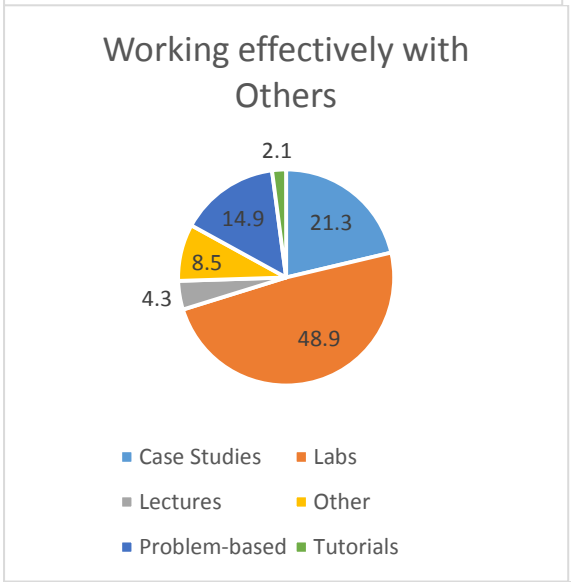


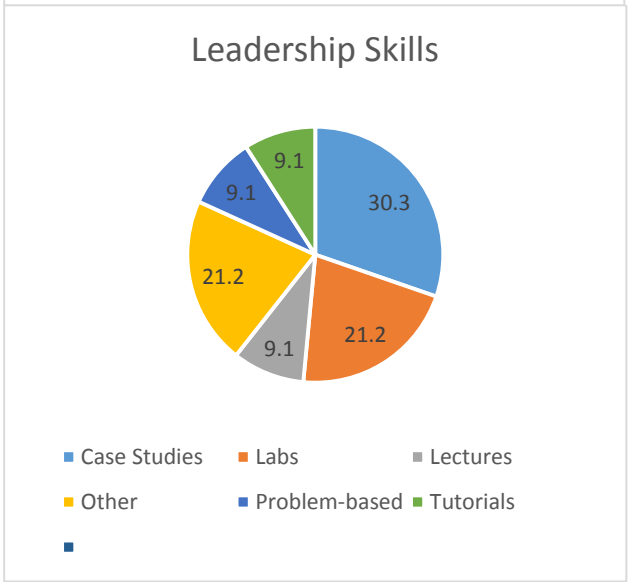


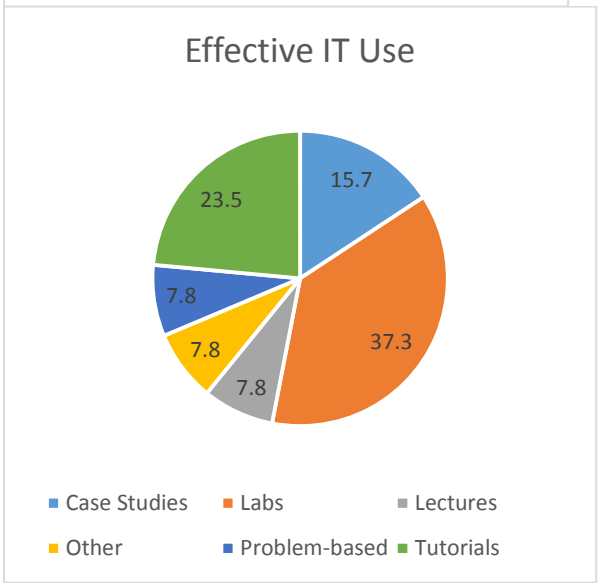
b. From your experience as a student, what was the predominant method of teaching for each competency?

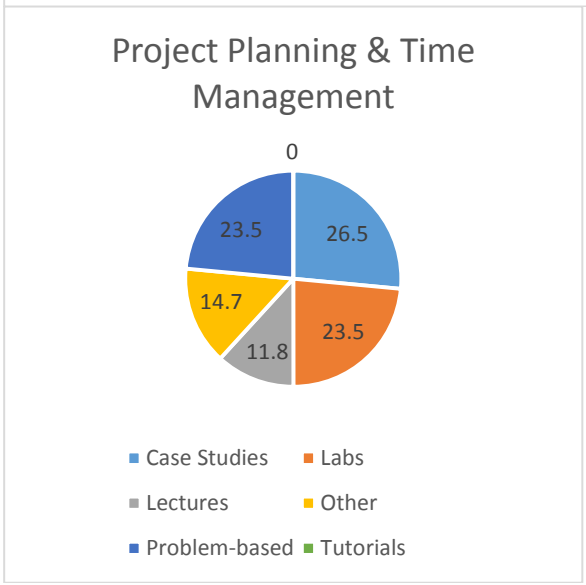

Problem Solving Skills
7.8
21.6
3.9
13.7
51
2
Case Studies
Labs
Lectures
Other
Problem-based
Tutorials


Communication Skills
5.4
10.8
35.1
10.8
18.9
18.9
Case Studies
Labs
Lectures
Other
Problem-based
Tutorials


Working effectively with Others
2.1
14.9
21.3
8.5
4.3
48.9
Case Studies
Labs
Lectures
Other
Problem-based
Tutorials


Leadership Skills
9.1
9.1
30.3
21.2
21.2
9.1
Case Studies
Labs
Lectures
Other
Problem-based
Tutorials


Effective IT Use
15.7
23.5
7.8
37.3
7.8
7.8
Case Studies
Labs
Lectures
Other
Problem-based
Tutorials

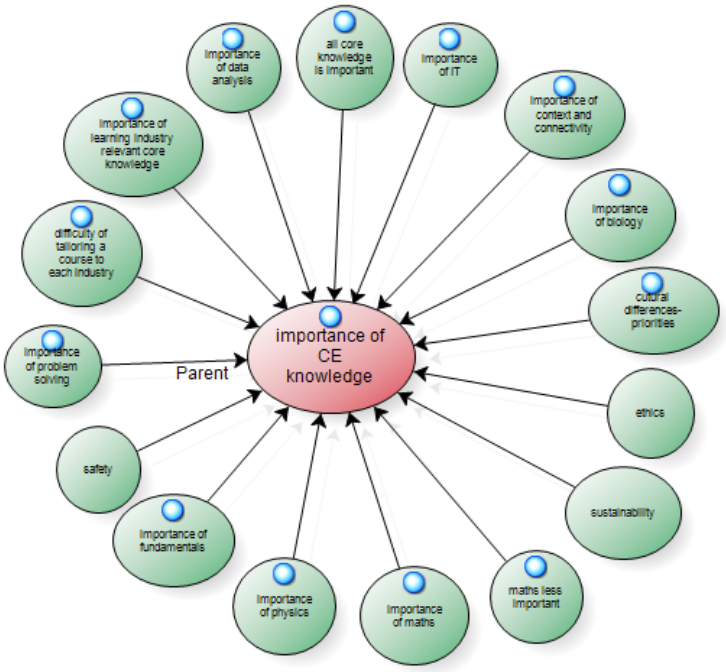

Project Planning & Time Management
0
23.5
26.5
14.7
23.5
11.8
Case Studies
Labs
Lectures
Other
Problem-based
Tutorials


Continuous Professional Development
3.8
19.2
19.2
7.7
19.2
30.8
Case Studies
Labs
Lectures
Other
Problem-based
Tutorials

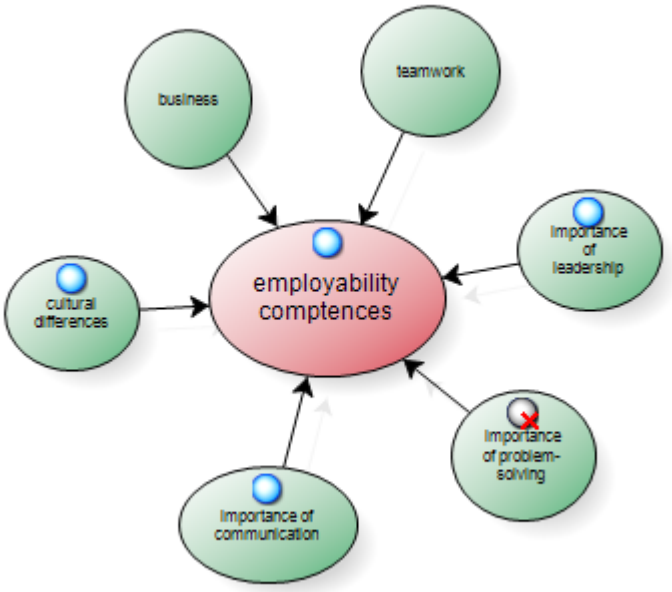
9.4 Focus group analysis

The nvivo9 models generated during phase 1 of the data analysis are shown below.

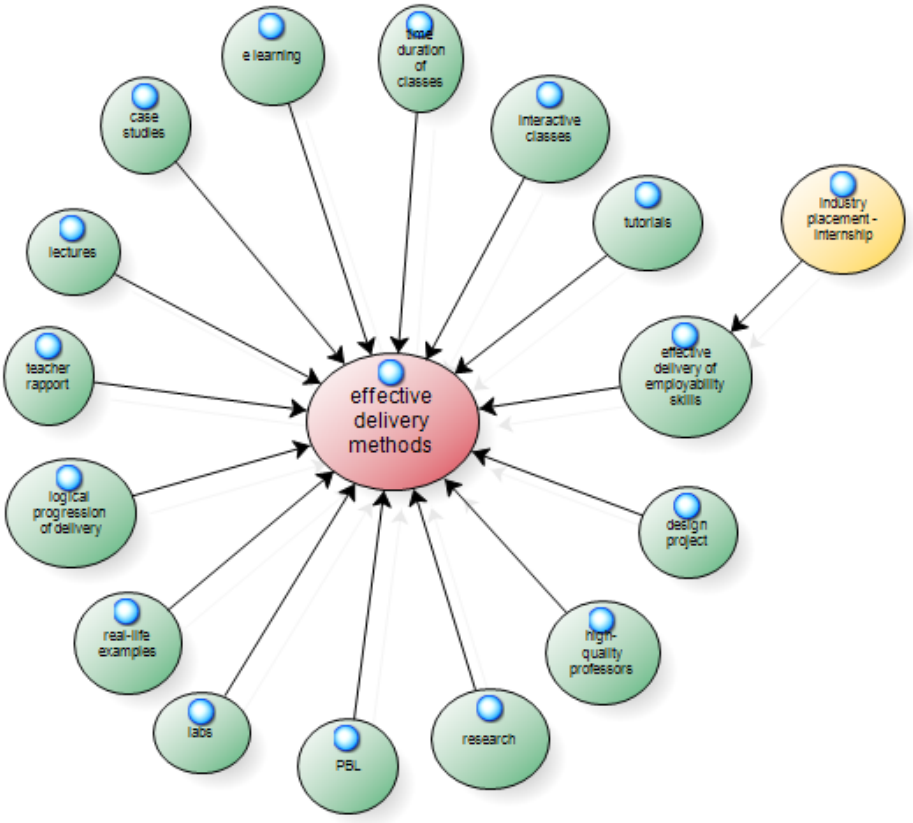
Model 1: importance of CE knowledge



Model 2: employability competences



Model 3: effective delivery



Model 4: Assessment