Northumbria Research Link

International student success – do the raw materials meet the specification?

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External Examiner Comments

"There has been a decline in student performance over the last three years with too many students failing to pass or complete modules. The University must question whether it is acting responsibly in recruiting so many students who are either incapable or unmotivated to pass or complete the degree programme." (O'Mongain 2008)

What are specifications?

Manufacturing a steel component.

- More than 3,500 grades of steel (EN10020:2000)
- Tolerance and surface finish on component drawing (Many st'ds)
- Supply Chain – quality must conform (EN ISO 9001:2008)

Recruiting an MSc student (Specialist course)

- More than 17,000 Universities in the world
- Level of under graduate degree in a cognate subject area*
- English level requirements specified by IELTS*

*(*used as predictors of academic success)*

Predictors of academic success

English Language

- Not clearly established (Graham 1987; Cook, Evans et al. 2004)
- Limited but significant (Abel 2002; Yen and Kuzma 2009)
- Argue against using English (Light, Xu et al. 1987; Seelan 2002)

Entry tests

- GMAT, GRE, GAMSAT *"fails to consider the significance of content knowledge"* (Mathews 2007)

Previous academic performance

- High UCPA tends to lead to high GCPA (Alias and Zain 2006)
- Diagnostic mathematics test (Robinson and Croft 2003)

Postgraduate student recruitment

Process

- Academic entry requirements
- English level
- Special conditions

Northumbria's comparator group (18 Institutions, 50 Programmes)

- Academic - 48% (24) Same, 40% (20) Higher and 12% (6) Lower
- English – 52% (26) Same and 48% (24) Lower
- Special – "degree in a cognate area"

Comments

- Higher UG can Lead to higher PG (Alias and Zain 2006)
- Hull ask for higher academic and lower English than Northumbria in CS
- Academic ability has a greater impact on success (Cownie and Addison 1996; Horspool 2006; Seelan 2002)

Process

– Five specialist programmes identified (ME, EPE, MCE, CNT, *CS*)

– "*Expert opinion*" from Module and Programme leaders used to create a 20 question MCQ test on underpinning knowledge

– Fundamental subject knowledge questions and questions on knowledge expected to underpin the "*deepening*" modules

– MCQ test given to final year UG students in subject discipline (ME *n=38,* EPE *n=29,* MCE *n=11,* CNT *n=10*)

Results

– All generally normally distributed. Means:- ME=55.0%, EPE=64.3%, MCE=60.9% and CNT=73.5%

– Using a pass mark of 50% - 78.9% (30/38) passed ME, 86.2% (25/29) passed EPE, 81.8% (9/11) passed MCE and 100% (10/10) passed CNT

Individual questions answered correctly for MSc Mechanical Engineering test

Individual questions answered correctly for MSc Electrical Power Engineering test
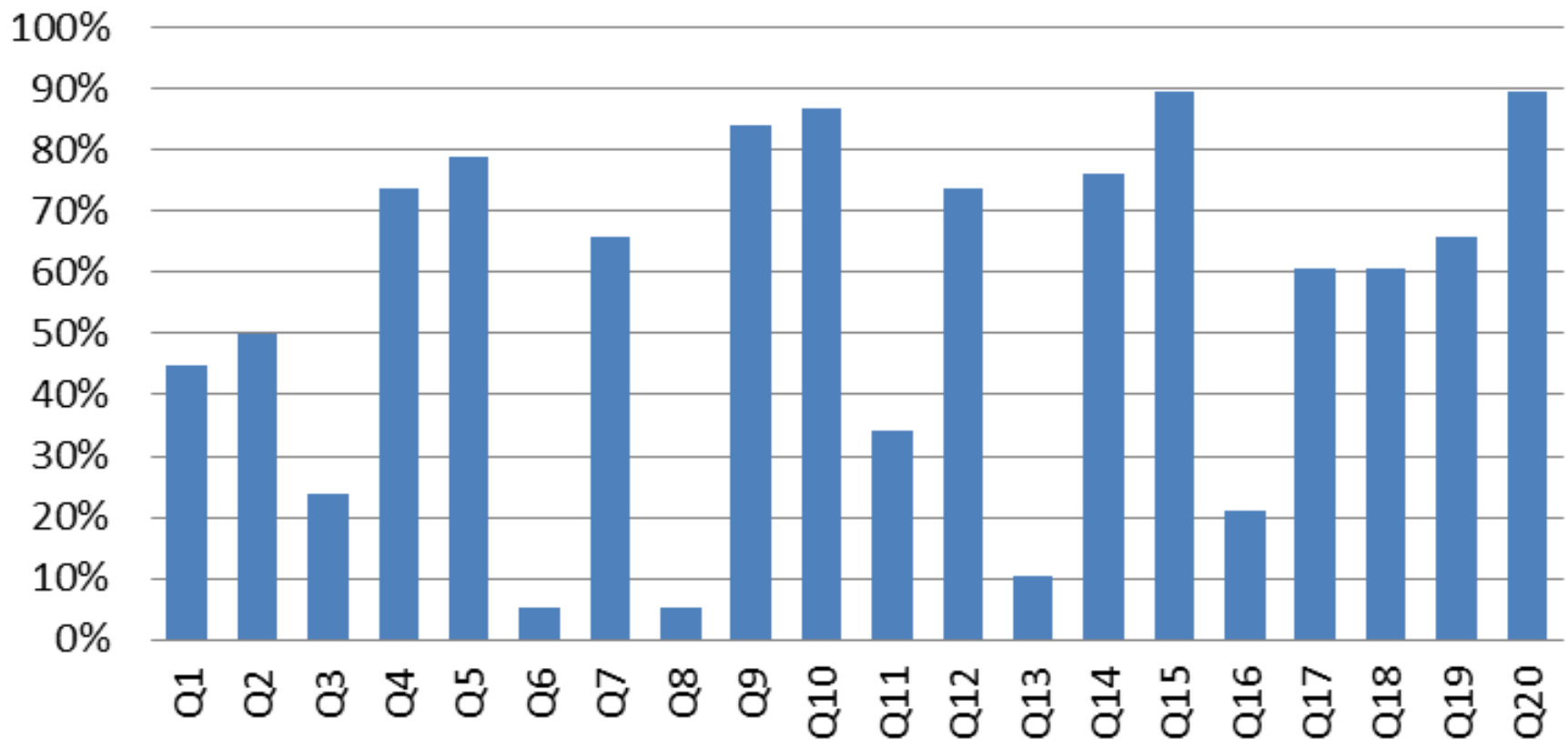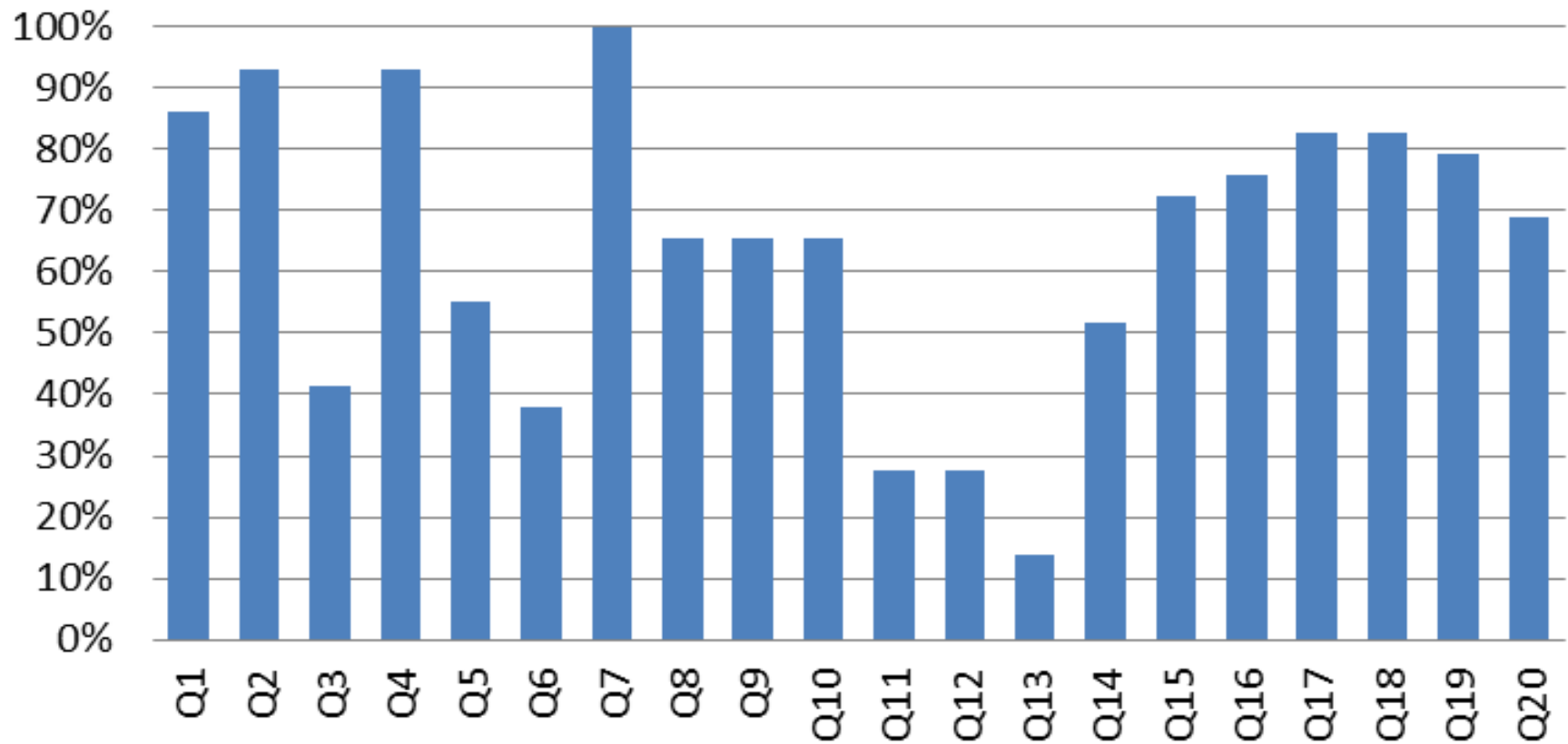
What knowledge should students have?

Individual questions answered correctly for MSc Microlectronic and Communications Engineering test

Individual questions answered for MSc Computer Network Technology test

		(ME_UG)	(ME_test)
Mechanical Engineering UG degree results (ME_UG)	**Pearson's r**	1	0.350*
	p (sig 2-tailed)		0.031
			38
MSc Mechanical		**Test score of 50% equates to Degree score of 58.2%**	1
(ME_test)	**p (sig 2-tailed)**	0.031	
	N	38	38
		(EEELC_UG)	(MCE_test)
EEE Light Current UG degree results (EEELC_UG)	**Pearson's r**	1	0.227
	p (sig 2-tailed)		0.503
	N	11	11
MSc Microelectronics and Communication Engineering test results (MCE_test)	**Pearson's r**	0.227	1
	p (sig 2-tailed)	0.503	
	N	11	11
		(EEEHC_UG)	(EPE_test)
EEE Heavy Current UG degree results(EEEHC_UG)	**Pearson's r**	1	0.422*
	p (sig 2-tailed)		0.023
		Test score of 50% equates to Degree score of 62.7%	29
MSc Electrical P results (EPE_test)			1
	p (sig 2-tailed)	0.023	
	N	29	29
		(CNT_UG)	(CNT_test)
Computer & Network Technology UG results (CNT_UG)	**Pearson's r**	1	0.264
	p (sig 2-tailed)		0.462
	N	10	10
MSc Computer Network Technology test results (CNT_test)	**Pearson's r**	0.264	1
	p (sig 2-tailed)	0.462	
	N	10	10
* Correlation is significant at the 0.05 level (2-tailed)			

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UG and PG student knowledge

Process

- – Four specialist programmes identified (ME, EPE, MCE, CNT)
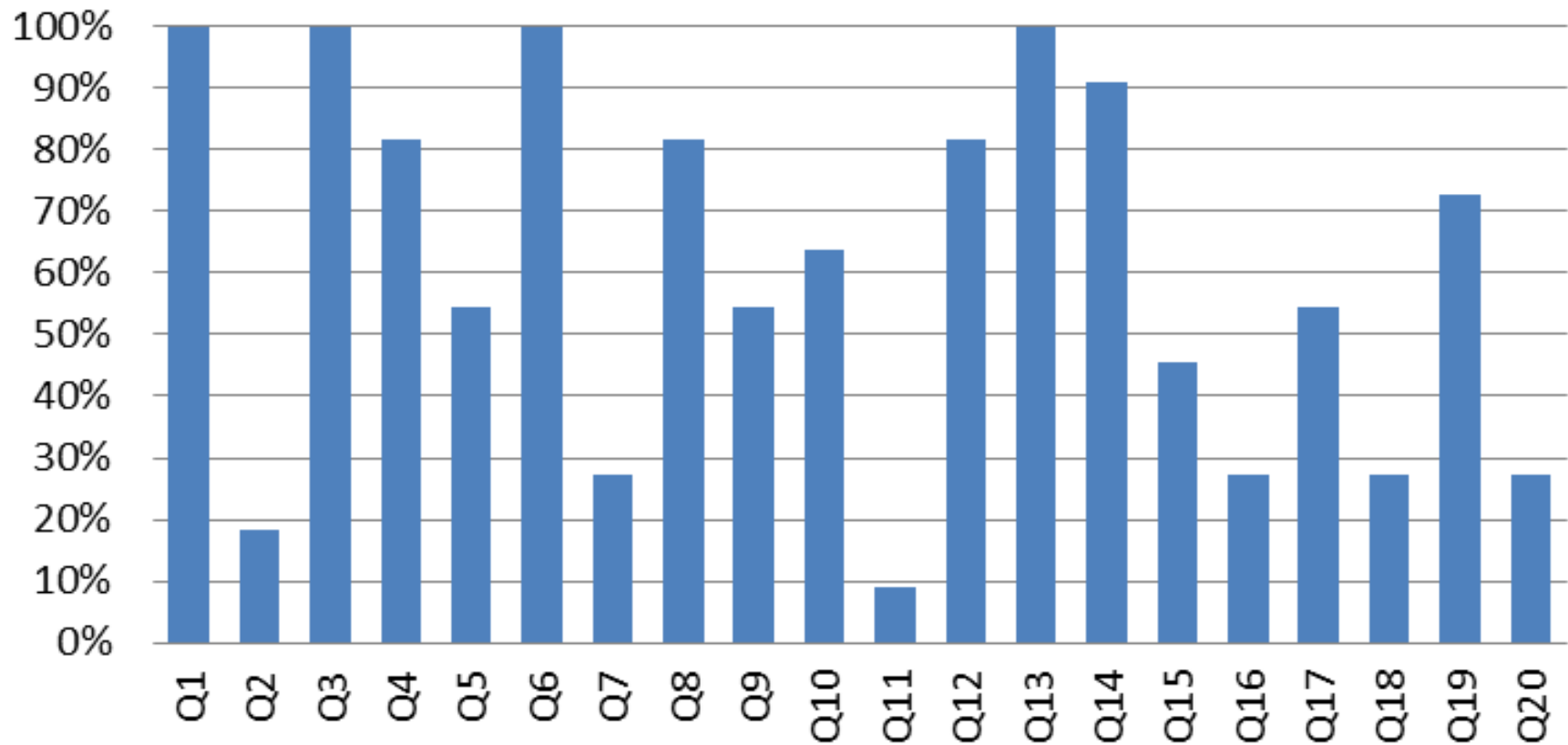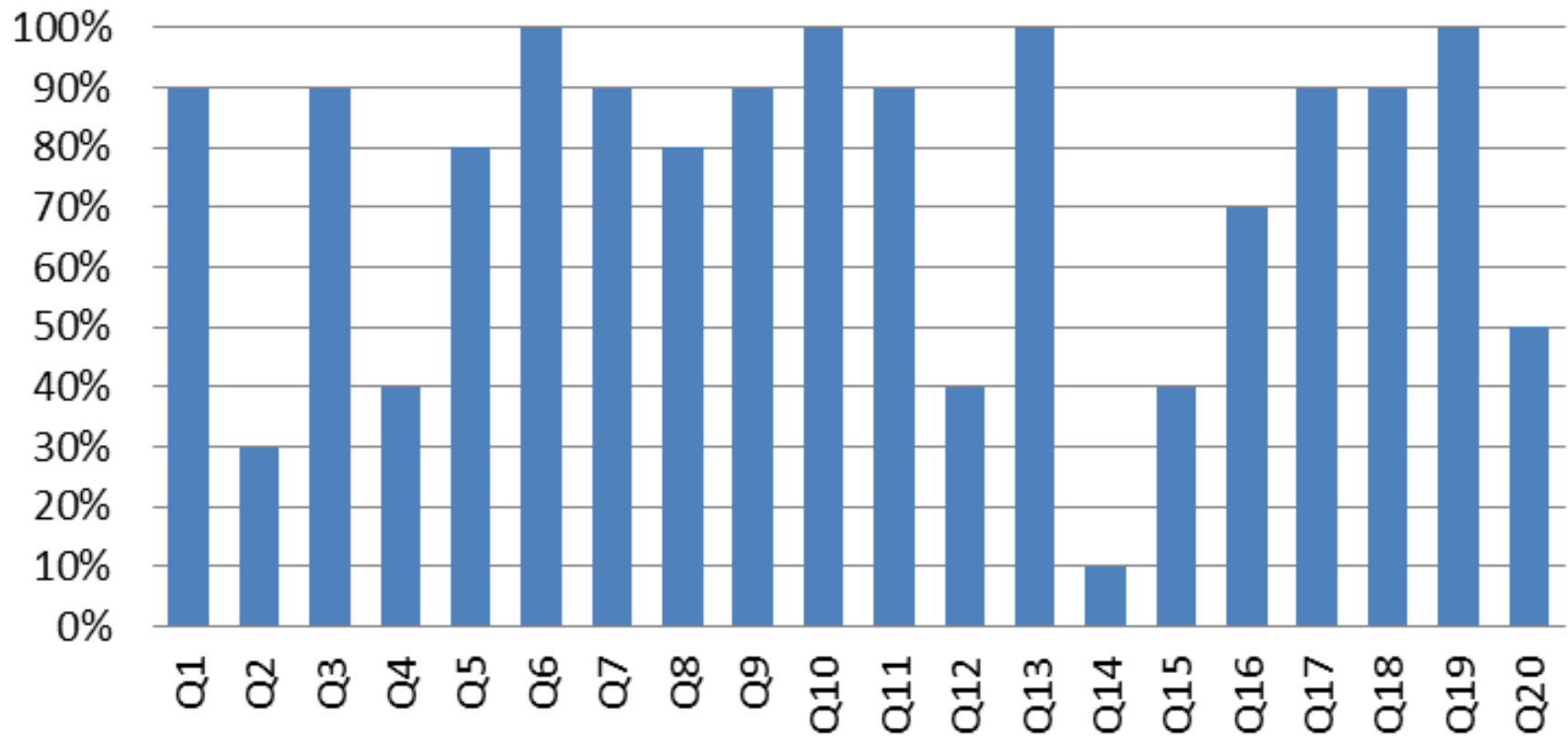- – MCQ test given to incoming PG students in subject discipline (ME *n=15,* EPE *n=16,* MCE *n=21, CNT n=5*)

Results

- – All generally normally distributed. Means:- ME=59.3%, EPE=60.2%, MCE=56.3%
- – Using a pass mark of 50% - 93.3% (14/15) passed ME, 66.7% (14/21) passed EPE and 81.3% (13/16) passed MCE
- – Using an "Independent samples test" none of the means were statistically significantly different between UG and PG students
- – Overall the UG students performed similarly to the PG students
- – There were some statistically significant differences on individual questions.

UG and PG student knowledge

Mechanical Engineering — bar chart comparing PG Results (blue) and UG Results (red) across questions Q1 to Q20.
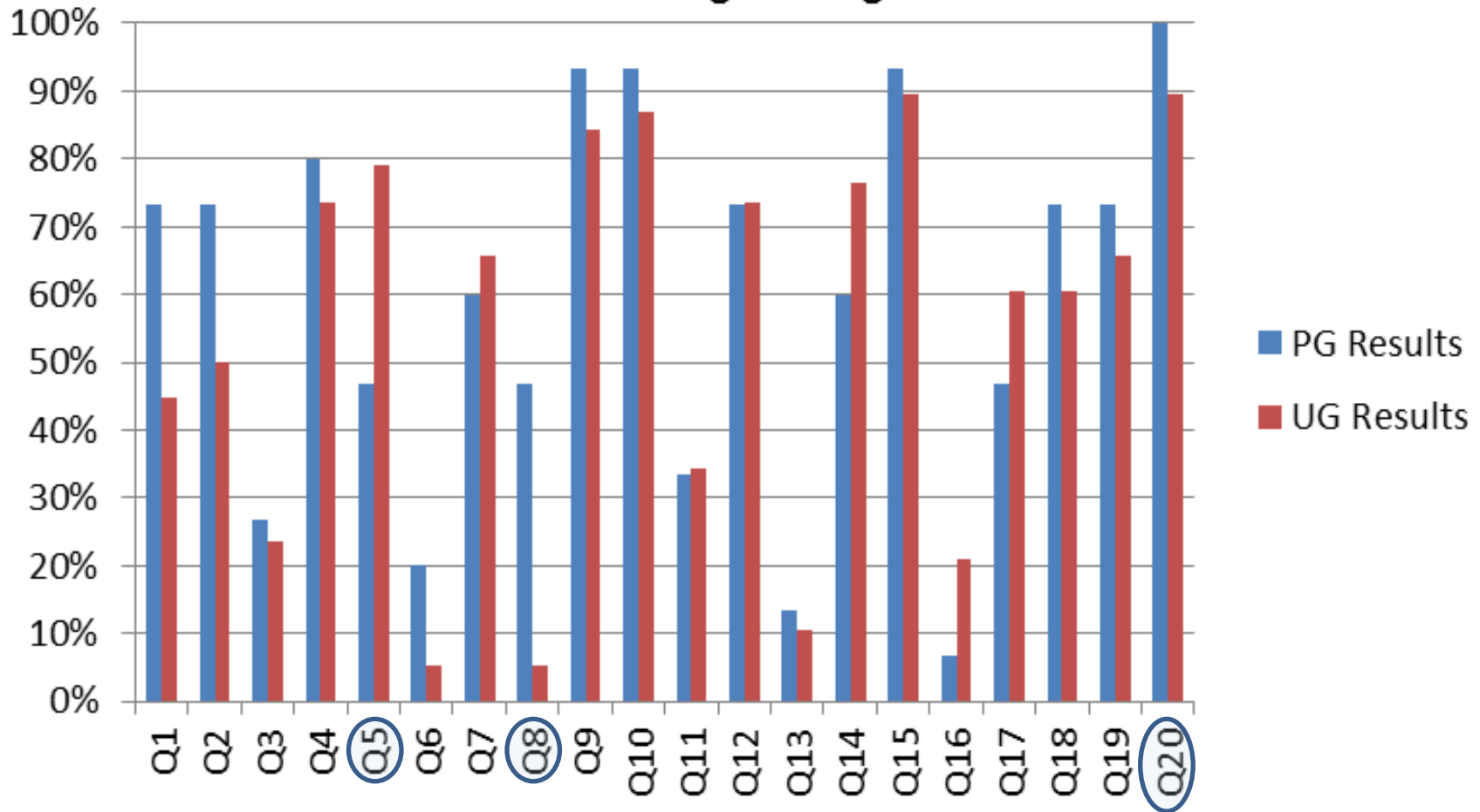
UG and PG student knowledge

Electrical Power Engineering
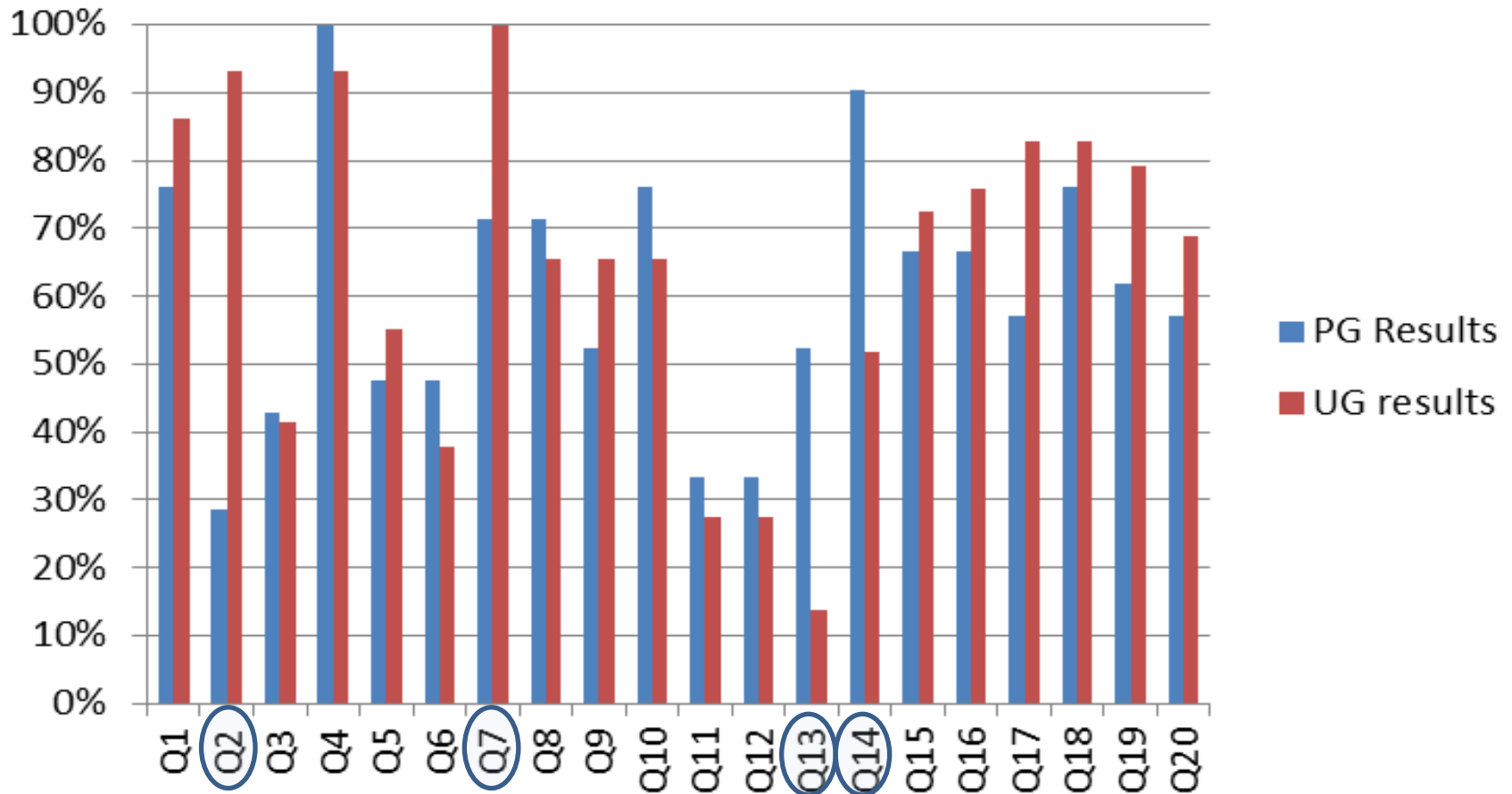
Microelectronics and Communication Engineering

Northumbria UG students had between 80-90% similar knowledge to those entering the three PG programmes

Northumbria UG students have similar strengths and weaknesses to those entering the three PG programmes
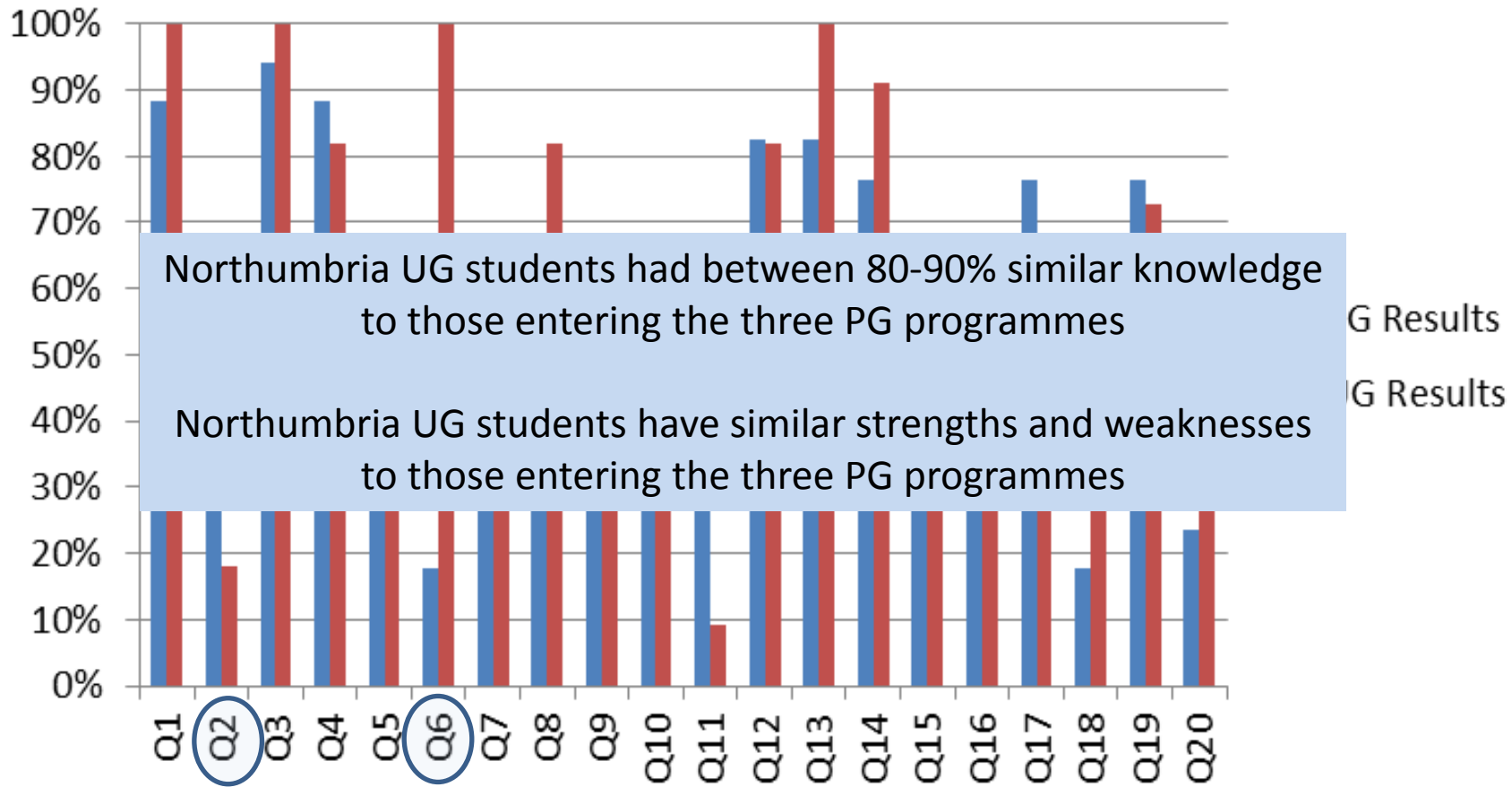
Process for PG students

– Test for relationship between the marks obtained in the MCQ test, Semester 1, Semester 2 and overall average

Results

– **Mechanical Engineering** – no correlation between test score and academic performance. Strong positive correlation between semester 1 and semester 2

– **Electrical Power Engineering** – there is a "moderate to strong" positive correlation between the MCQ test of knowledge and academic performance in semester 1, semester 2 and overall average

– **Microelectronic and Communications Engineering** - no correlation between test score and academic performance. Strong positive correlation between semester 1 and semester 2

Mechanical Engineering Correlations

		TEST	SEM_1	SEM_2	AVERAGE
TEST	Pearson's r	1	.292	.477	.465
	Sig. (2-tailed)		.291	.072	.081
	N	15	15	15	15
SEM_1	Pearson's r	.292	1	.816[**]	.945[**]
	Sig. (2-tailed)	.291		.000	.000
	N	15	15	15	15
SEM_2	Pearson's r	.477	.816[**]	1	.946[**]
	Sig. (2-tailed)	.072	.000		.000
	N	15	15	15	15
AVERAGE	Pearson's r	.465	.945[**]	.946[**]	1
	Sig. (2-tailed)	.081	.000	.000	
	N	15	15	15	15

**. Correlation is significant at the 0.01 level (2-tailed).

Electrical Power Engineering Correlations

		Test	SEM_1	SEM_2	Average
Test	Pearson's r	1	.685[**]	.787[**]	.762[**]
	Sig. (2-tailed)		.001	.000	.000
	N	21	21	21	21
SEM_1	Pearson's r	.685[**]	1	.883[**]	.965[**]
	Sig. (2-tailed)	.001		.000	.000
	N	21	21	21	21
SEM_2	Pearson's r	.787[**]	.883[**]	1	.975[**]
	Sig. (2-tailed)	.000	.000		.000
	N	21	21	21	21
Average	Pearson's r	.762[**]	.965[**]	.975[**]	1
	Sig. (2-tailed)	.000	.000	.000	
	N	21	21	21	21

**. Correlation is significant at the 0.01 level (2-tailed).

Microelectronic and Communication Engineering Correlations

		TEST	SEM_1	SEM_2	AVERAGE
TEST	Pearson's r	1	.255	.278	.215
	Sig. (2-tailed)		.341	.298	.425
	N	16	16	16	16
SEM_1	Pearson's r	.255	1	.723[**]	.953[**]
	Sig. (2-tailed)	.341		.002	.000
	N	16	16	16	16
SEM_2	Pearson's r	.278	.723[**]	1	.811[**]
	Sig. (2-tailed)	.298	.002		.000
	N	16	16	16	16
AVERAGE	Pearson's r	.215	.953[**]	.811[**]	1
	Sig. (2-tailed)	.425	.000	.000	
	N	16	16	16	16

**. Correlation is significant at the 0.01 level (2-tailed).

Electrical Power Engineering

- Test for relationship between UG degree on entry, MCQ test, semester 1 and semester 2 marks

Results

- Moderate to strong correlation between MCQ test, UG degree on entry, semester 1 and semester 2
- No relationship between the UG degree on entry with semester 1 and semester 2 marks

Conclusion

- Academic degree level is not a good predictor of academic success

Entry specification and academic success

Correlations between Entry degree, Semester 1, Semester 2 and TEST for Electrical Power Engineering students

		TEST	Entry Degree	Semester 1 average	Semester 2 average
TEST	Pearson's r	1	.537*	.685**	.787**
	Sig. (2-tailed)		.012	.001	.000
	N	21	21	21	21
Entry Degree	Pearson's r	.537*	1	.171	.346
	Sig. (2-tailed)	.012		.459	.124
	N	21	21	21	21
Semester 1 average	Pearson's r	.685**	.171	1	.883**
	Sig. (2-tailed)	.001	.459		.000
	N	21	21	22	21
Semester 2 average	Pearson's r	.787**	.346	.883**	1
	Sig. (2-tailed)	.000	.124	.000	
	N	21	21	21	21

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

1. Review current level of English required to study at PG level
2. Review the academic level required to study at PG level
3. Use the results from MCQ tests to review module content where a mark of less than 50% is scored by UG students
4. Use the MCQ tests as part of the admissions process rather than just depending on academic level
5. Use the methodology outlined to confirm the expectations of underpinning knowledge on all specialist programmes
6. Use the MCQ test to help identify shortcomings in student knowledge and provide appropriate interventions for students and feedback to supplier Universities

Thank you for listening!

Any questions?