

# Northumbria Research Link

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

David Bell

# 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)

# What knowledge should students have?



## 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  $n=10$ )

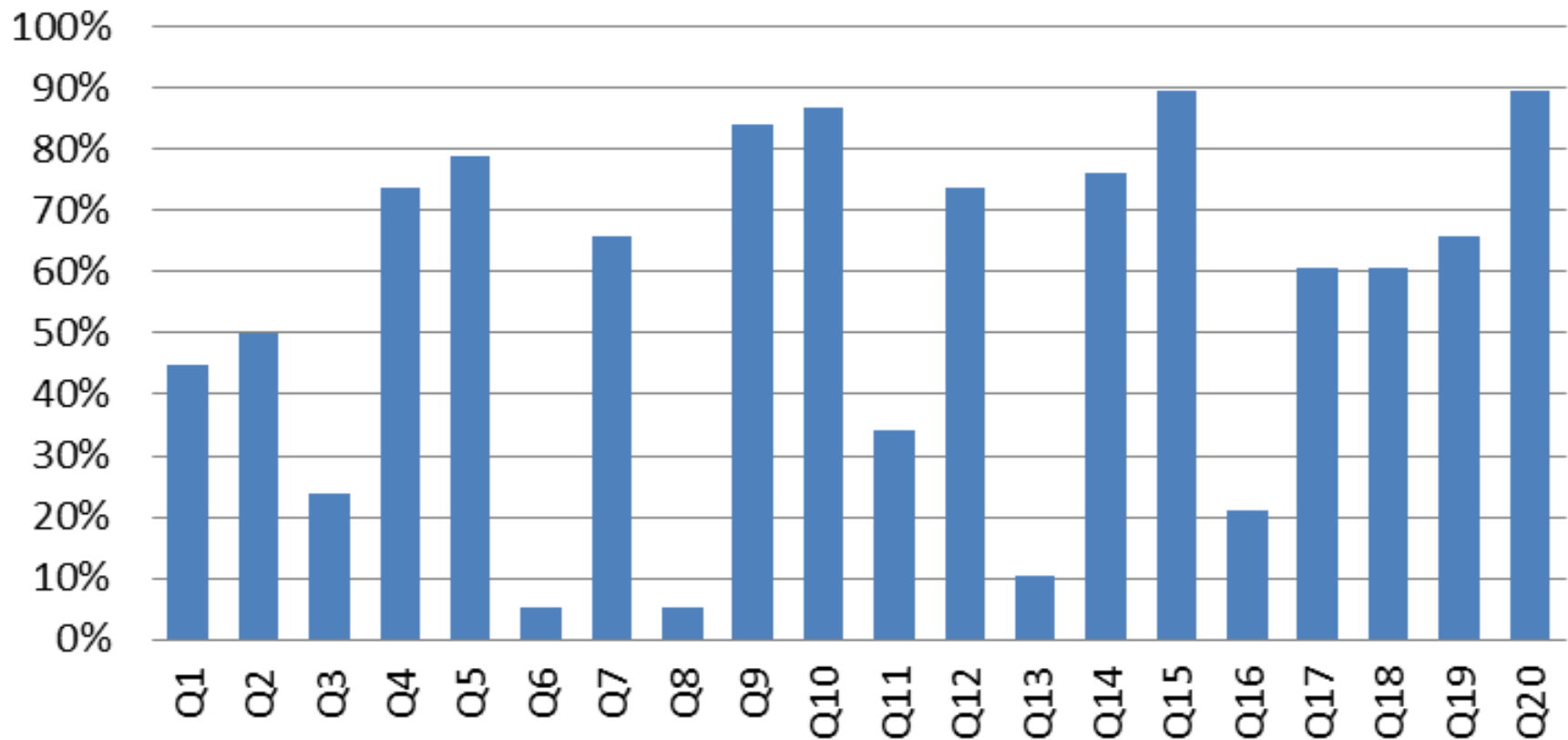
## Results

- 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

# What knowledge should students have?



## Individual questions answered correctly for MSc Mechanical Engineering test

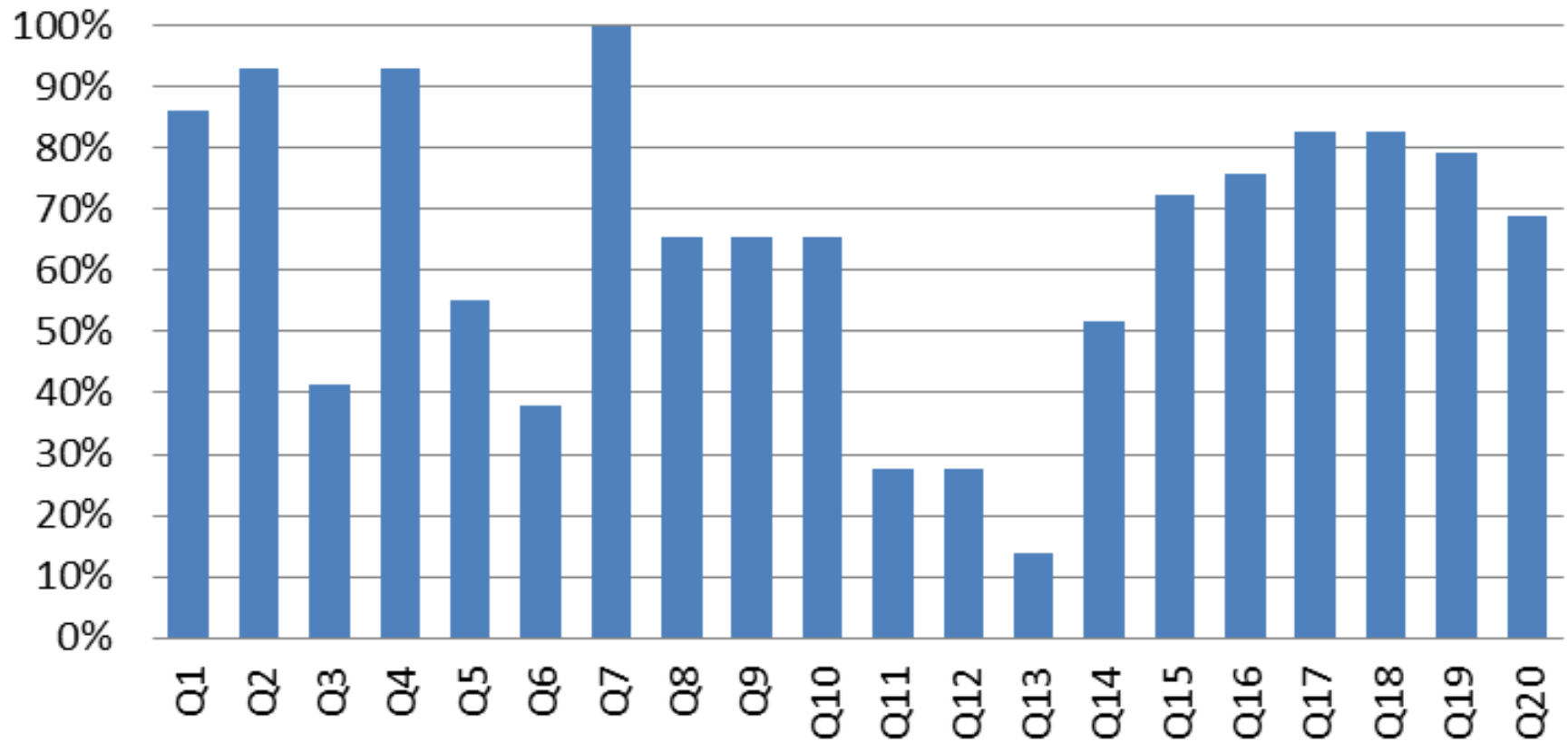




# What knowledge should students have?



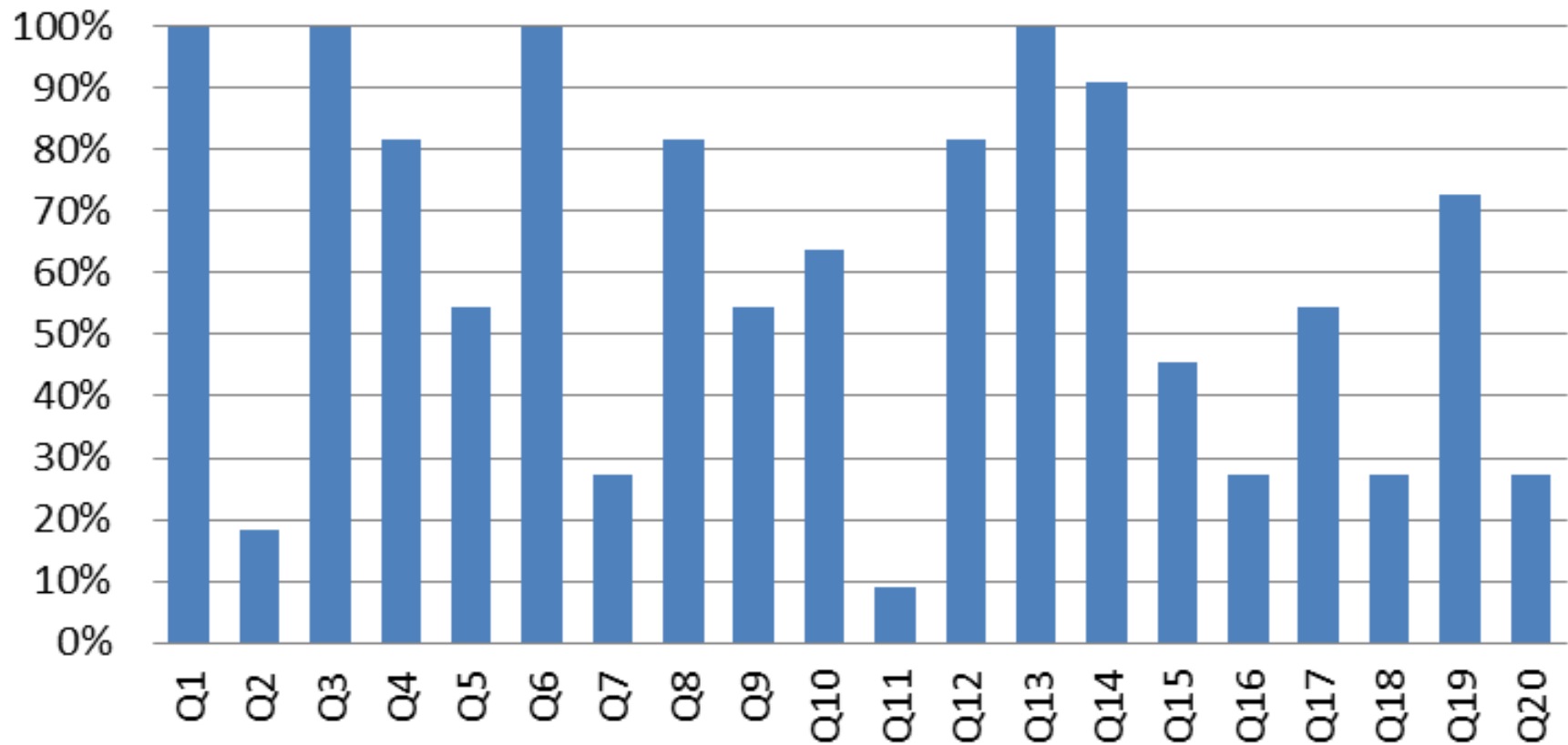
## Individual questions answered correctly for MSc Electrical Power Engineering test



# What knowledge should students have?



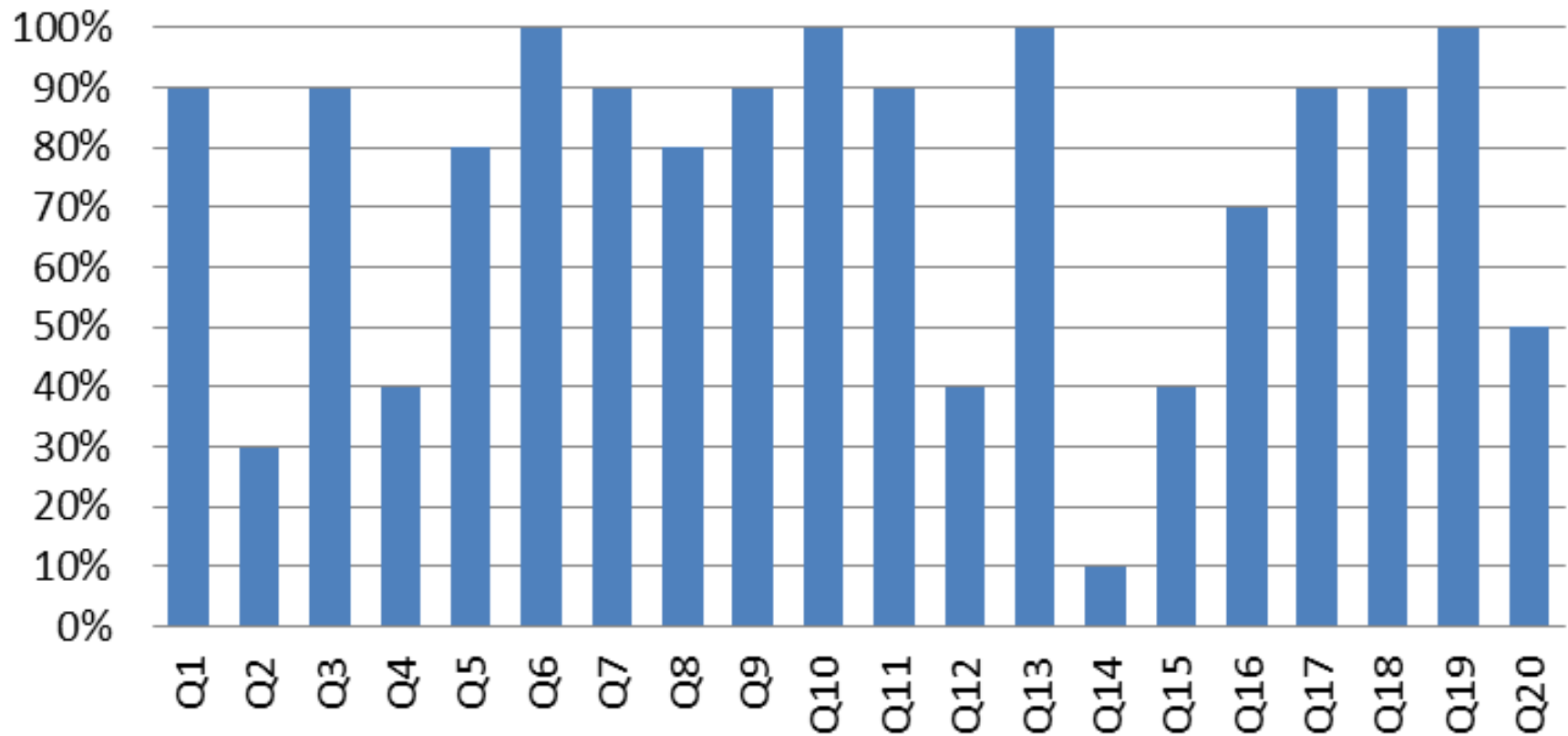
Individual questions answered correctly for MSc  
Microelectronic and Communications Engineering test



# What knowledge should students have?



## Individual questions answered for MSc Computer Network Technology test



# Correlation between knowledge and degree result



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

# 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  $n=5$  )

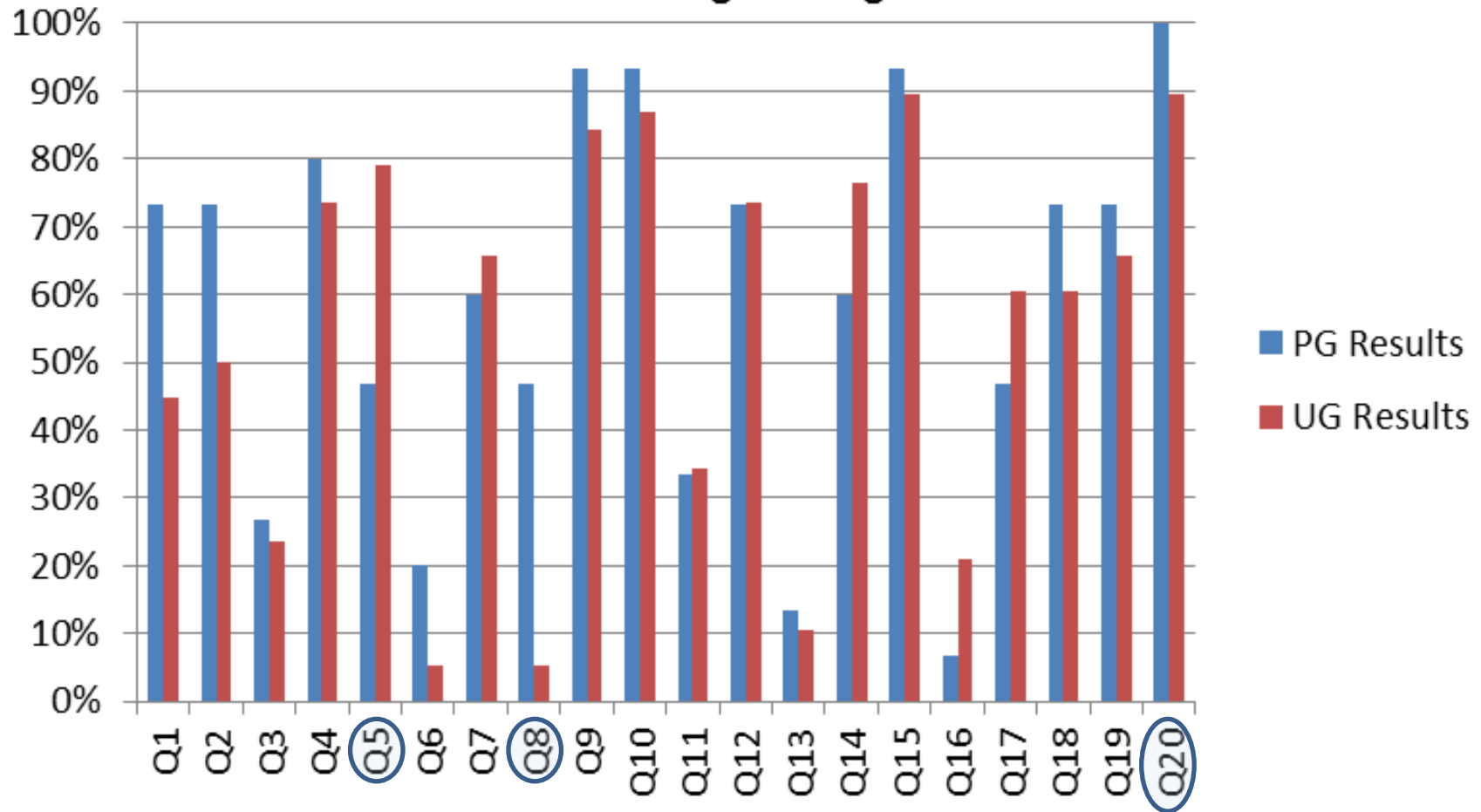
## Results

- 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



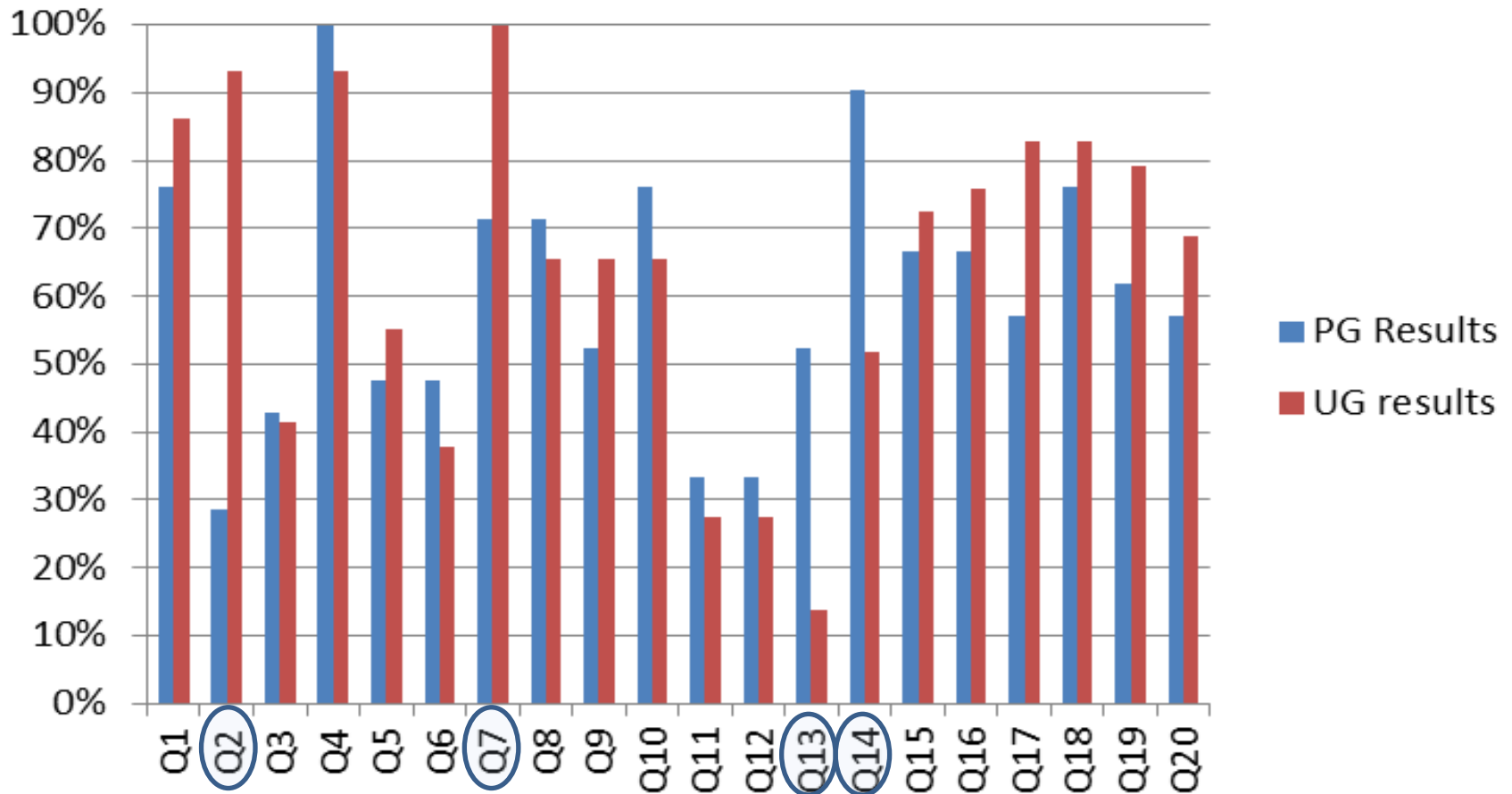
## Mechanical Engineering



# UG and PG student knowledge



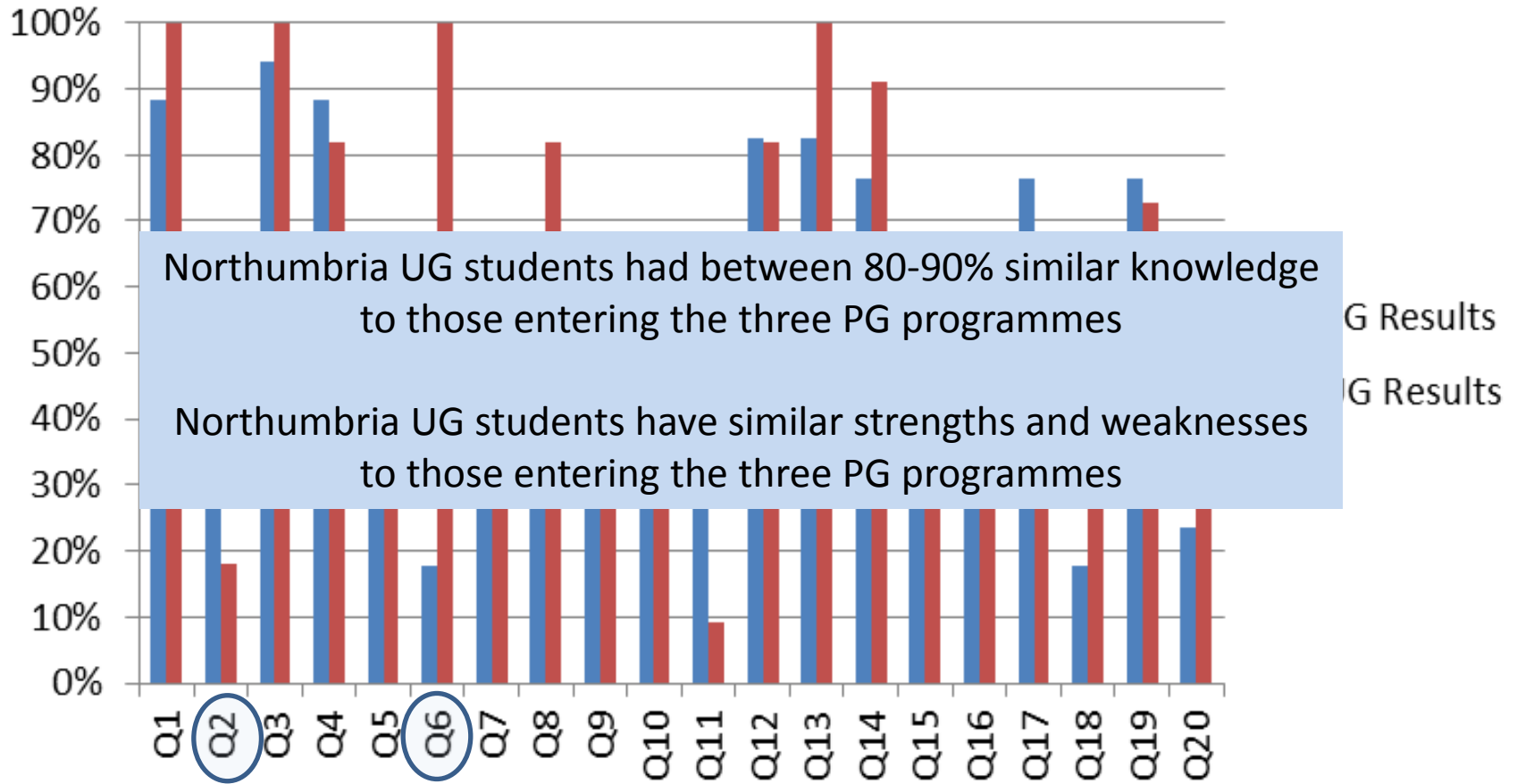
## Electrical Power Engineering



# UG and PG student knowledge



## Microelectronics and Communication Engineering







## 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

# Underpinning knowledge and academic success



## 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).

# Underpinning knowledge and academic success



## 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).

# Underpinning knowledge and academic success



## 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).

## Recommendations from research



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?