An Investigation into The Validity of Student Research Tasters

Engineering Education Research Group

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The Engineering Education Research Group at the University of Warwick conducted an investigation into whether a week long rotation of the different research groups would be viable for the School of Engineering. The aim was to promote research as a career, give students a chance to get a taster of different areas before making a project choice, provide some training in research methods before starting 3rd year project and demonstrate the research strength and themes of the department to students.

Following a feasibility study, the research taster was deemed not possible and so the project turned to finding out more about student perceptions of research. A questionnaire was created and sent to students at the end of the academic year to assess how much the students were aware of the different research interests within the University and their desire to find out more. Further, focus groups were held with students undertaking research internships over the summer to understand the benefits.

With 215 student responses, 36% of students were unaware of any research group within the department and 84% of students were unaware of the university Global Research Priorities Themes. Students however were welcomed to know more about these themes with a large number of them wanting to develop their research skills. This can be seen as a 60% of the students did not know what area of engineering they wished to research for their final year project.

The department can therefore work on improving the awareness of the research throughout university and aid students in learning different research skills. More than 80% of the students are in favour of these activites giving them the opportunity to explore and develop their research interests. This will also benefit staff by finding potential research candidates.

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Introduction

The Engineering Education Research Group (EERG), within the School of Engineering (SoE), have a vision to engage with students and staff to develop key skills and competences within Engineering pedagogy. They have identified 'research-led teaching' as an important theme.

The Warwick school of Engineering is unique in being a unified department offering a general degree. Most institutions have a faculty of Engineering comprising different departments which align with the degrees and come together to teach common material. Instead, the Warwick degree reflects the unified and interdisciplinary approach to research by collectively defining curriculum and devolving the teaching to research streams.

The SoE have 14 different research groups including; Water, Electrical Power and Biomedical and Biological Systems. Additionally the University of Warwick have the Global Research Priorities (GRP) which includes 11 different multidisciplinary themes. It would be productive to know students' awareness of different research within the university and their interest, allowing staff to target specific keen students.

The working definition of 'research-led teaching' when applied to Warwick School of Engineering is therefore:

Research progresses at the boundaries and overlaps between disciplines. Following a common-two years of material defined by the QAA subject benchmark for Engineering as well as that judged relevant or important by a committee of the department, 3rd and 4th year teaching is allowed to strategically, thematically operationally align with the research streams which may be interdisciplinary. This is deemed to be a significant benefit of a Russell Group university education.

In previous meetings with students and staff, a lot of students raised a concern not knowing what area they wish to research for their third year project having been unable to identify strongly which modules belonged to which stream. As such, the EERG is investigating the viability of intensive project weeks following second year exams which will give students a chance to have a taster of different areas and be more informed about third year project choices. This project week will also include a celebration of previous 3rd year projects via a student conference which second years must attend and use to aid their decision.

It is thought that students do not understand how research relates to curriculum or how the department research structure influences the degree. An online questionnaire was created to assess student engagement at the end of the academic year, June-July 2016 to find out what students know about and whether they are interested in finding out more about research.

Students also have lots of information when it comes to finding a typical graduate job. However, finding a PhD and succeeding in an academic career is judged to be less important than 'a proper job'. The results of the questionnaire should demonstrate there are students within the department who want to engage with research although have a lack of awareness of the opportunities.

Methodology

A questionnaire with 7 questions was created;

1. Assessing whether students knew about any of the research themes within the department
2. What GRP themes do they know, if any?
3. Whether they can name any of the Research Centres within the University
4. The students personal thoughts on 8, Strongly Disagree-Agree questions
    a. If they knew about different research themes
    b. Whether the department gives information
    c. If they know what they want to do for their final year project
    d. How proactive they are attending any research seminars
    e. Whether they would like to attend a rotation of the departmental research groups
    f. If they want to further develop research skills
    g. If they want to attend more demonstrations and seminars
    h. If they are interested in a career in research
5. If they have been to any of the research webpages
6. What research themes they are interested in
7. Whether they wish to be contacted about Question 6

This questionnaire was created on the department's webpages using Sitebuilder and distributed to all SoE students via their university email. See Appendix A for the questionnaire form.

Results

See Appendix B for full breakdown. When asked about what other research centres are within Warwick, 61 students wrote Warwick Manufacturing Group (WMG) and a couple of students wrote Jaguar Land Rover and Tata Steel.
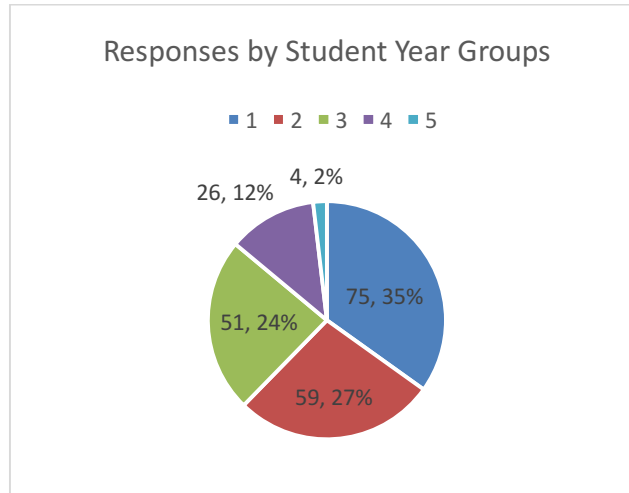

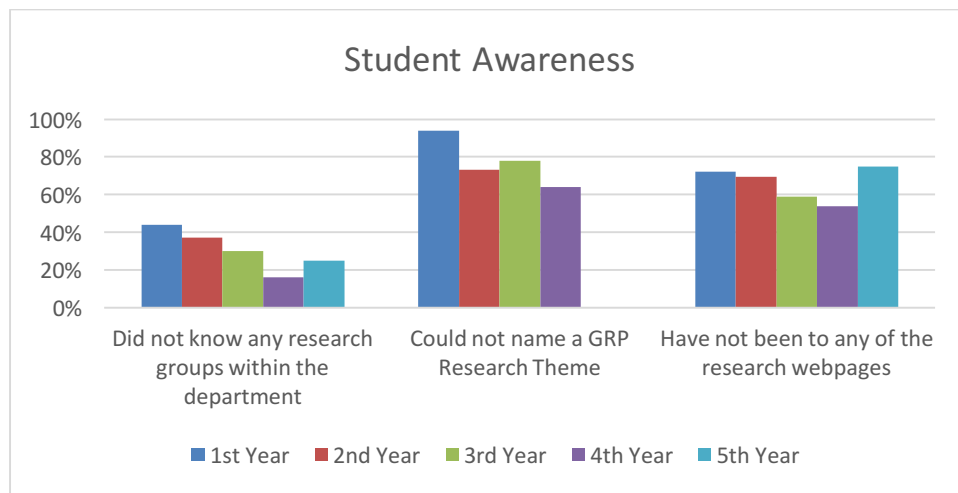**Figure 1 Infographic of responses by Student Year Group; total of 215.**

Figure 2 Results of Student Awareness
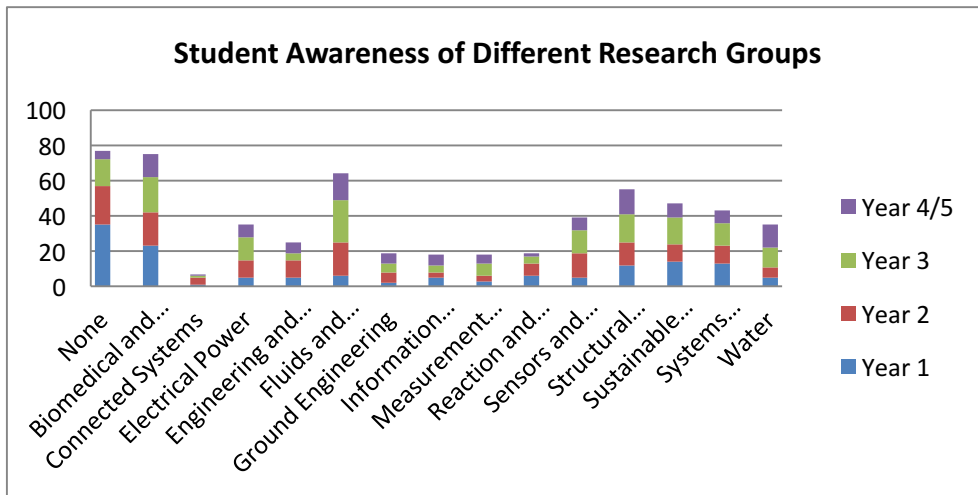
Figure 3 The number of students aware of the different research groups within the School of Engineering, alaphetical
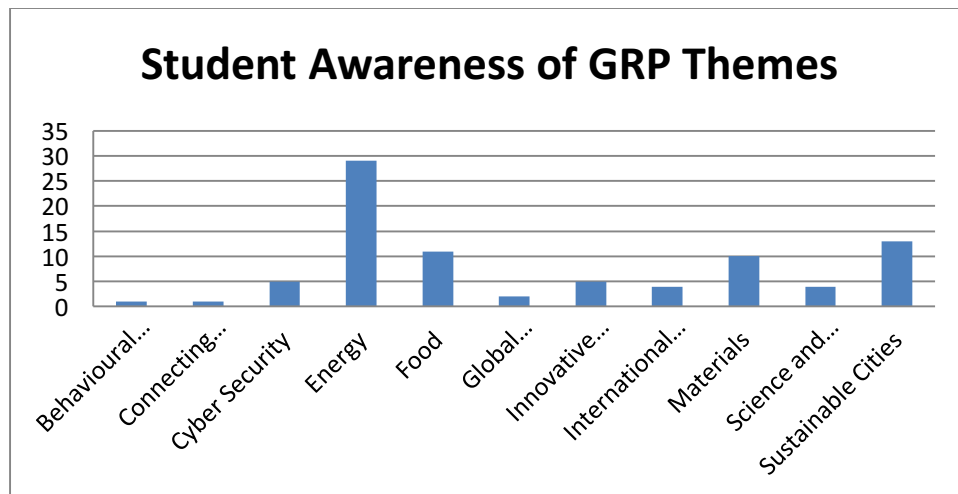

Figure 4 Student aware of the 11 GRP Themes at the University of Warwick
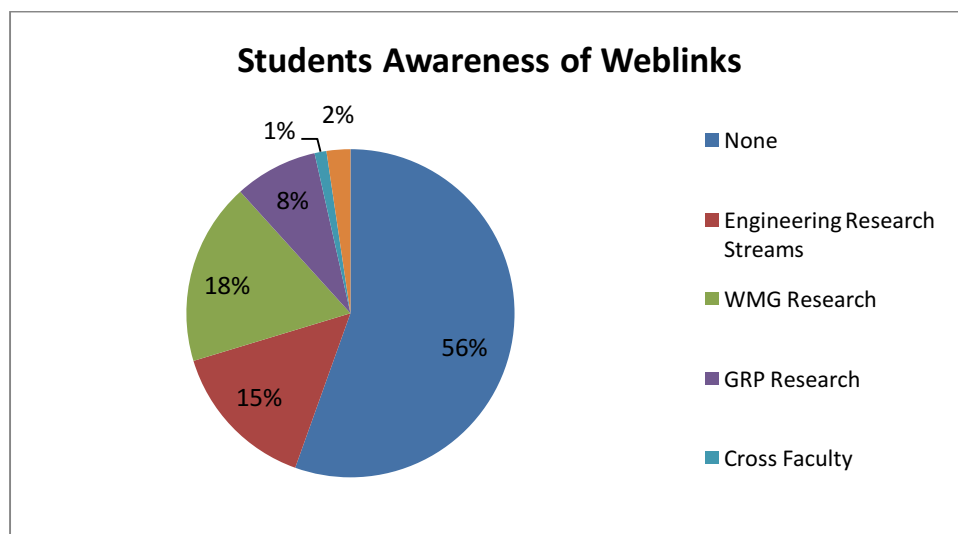

Figure 5 Student awareness of weblinks listed
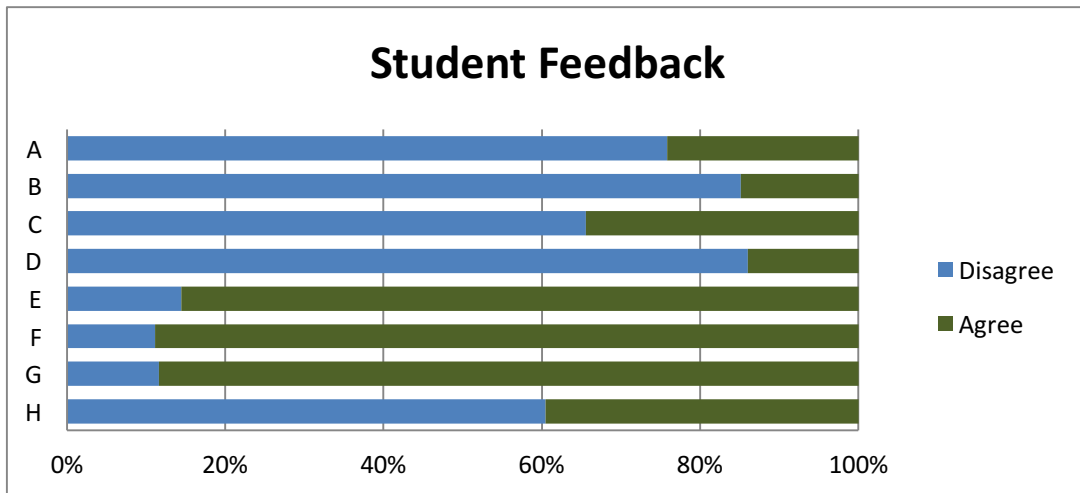
Student Feedback

Figure 6 Student feedback on their thoughts whether agreeing or disagreeing with the 8 questions
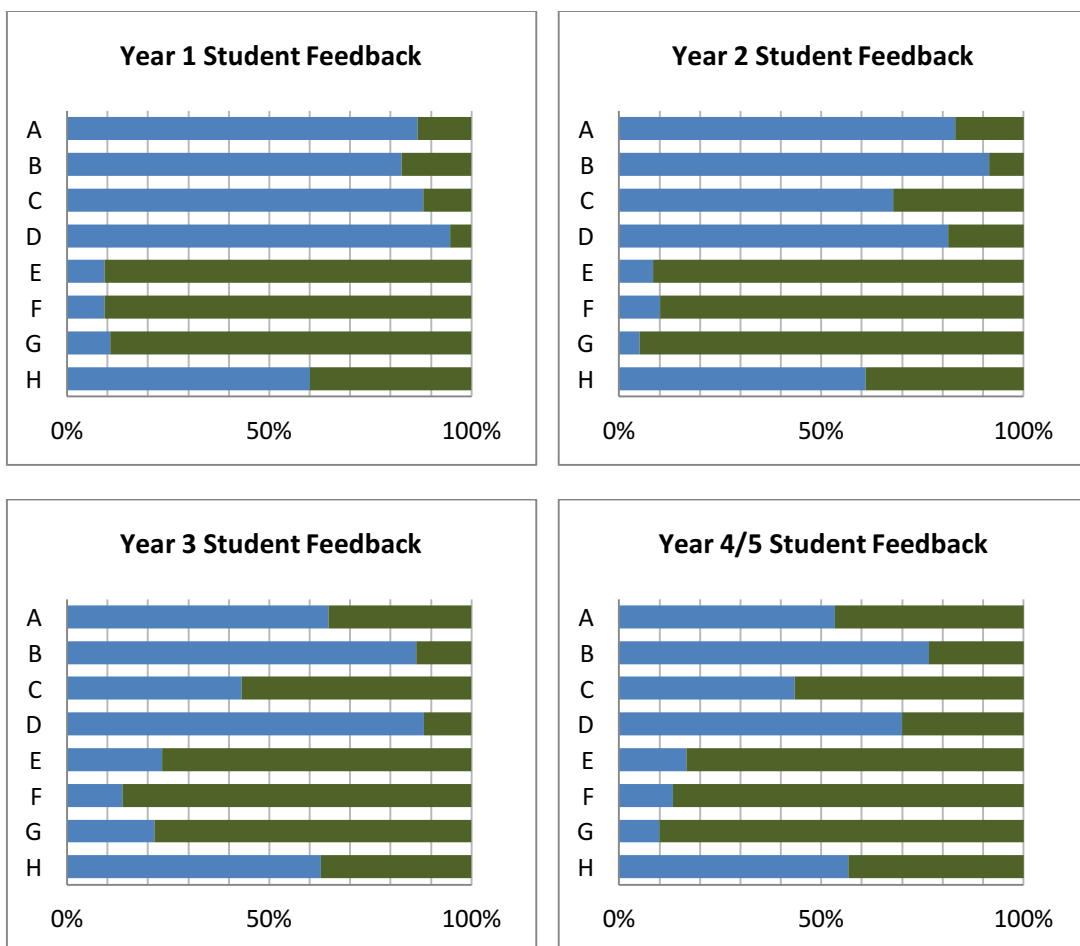

Figure 7 Breakdown of Student responses by year group

Table 1

	Thoughts
A	"I know about the different research themes within Warwick"
B	"The department gives me a lot of information about different research themes within Warwick"
C	"I know what area of research I would like to do for my final year dissertation/project"
D	"I proactively attend different research seminars"
E	"I would be interested in attending a mini research rotation to learn more."
F	"I would be interested in learning different research skills"
G	"I would like to attend more demonstrations and seminars within different areas of research"
H	"I am interested in a career in research"

Analysis

This questionnaire had several closed questions, trying to focus on whether a mini research rotation, to provide students a greater understanding of what different areas are within the University of Warwick.

Although this study was conducted at the end of the summer, 215 responses are approximately 18% of the engineering student population; there is a large positive response to showing students are interested in the research at the University of Warwick.

School of Engineering

Although 36% of students who answered the questionnaire did not know any of research themes within the SoE, the highest awareness is within Biomedical and Biological Systems at 54%. This is followed by Fluids and Modelling at 46% and Structural Engineering at 40% (see figure 3). The awareness of the different research groups vary greatly although this does not correlate with interests. Out of the 75 students who were aware of the Biomedical and Biological Systems group, 11 students have an interest in it with 2 unaware students wanted to know more. The student interest also ranges from aerospace engineering to sustainability and energy with 36 students stating an interest in the latter. This questionnaire demonstrates a wide variety of interests and well as an area that the University of Warwick does not cover; aerospace and aviation.

85% of the students being who knew what GRP stood for were able to name the Energy theme. This awareness strongly correlates with the adverts of the Energy GRP events throughout SoE. However, more work can be done to further promote these as only 13% of the responders were aware of the theme.

Student Thoughts

76% students felt they did not know about the different research themes within Warwick and 85% did not feel the department gives a lot of information about them. Moreover, more than 60% of the students are uncertain what they want to do for their final year project. Although this can be greatly assumed for first years, there is a high negative response for students at the end of second year, including those finishing third and final years (see figure 8). The school could therefore do a lot more to assist students in exploring different areas.

The department can work on this by promoting awareness of research throughout the degree, giving students an opportunity to undertake research and aiding students in learning different research skills. More than 80% of the students are in favour of these activites, giving the students opportunities to explore different research areas and assist staff members finding potential research candidates.
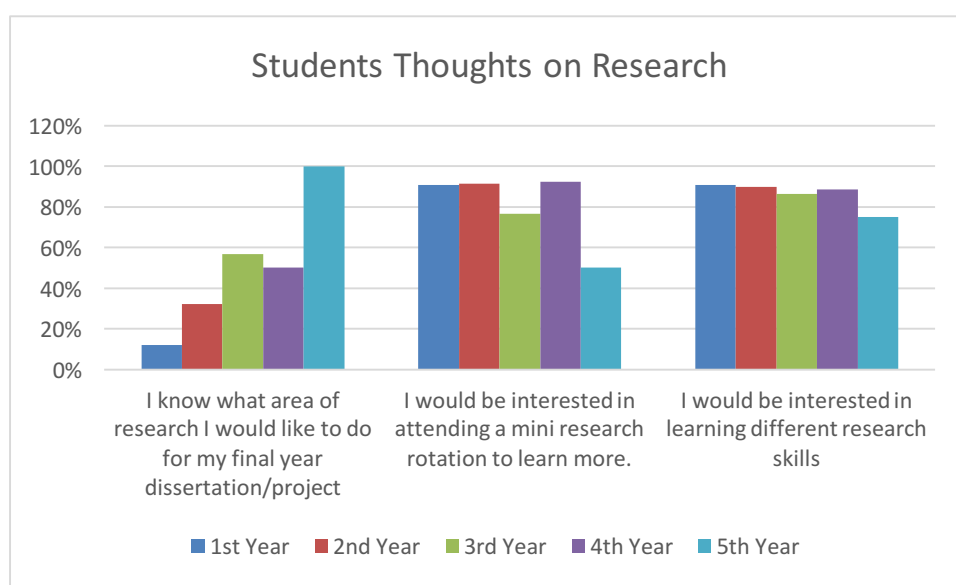

Figure 8 Student responses by year group, bar graph

With the variety of interests students have, 103 wish to be contacted in regards to their interests in future. The research group staff can target these students who wish to be contacted and further development the students' skills and the groups' awareness.

WMG Internship

Warwick manufacturing group provides a bursary to a large number of student projects each summer open to students across the University. Principally, these aim to increase conversion into PhD students from those who are successful. 5 interns were approached to discuss their motivation and experience. All interns interviewed had been working for 5 weeks (of 8) and therefore could articulate the research area and had a good idea of what the life of a PhD student might look like. 4 of the interns were more likely to apply for a PhD after the internship than before. They felt that a career in research would be 'exciting', 'well respected' and 'full of breakthrough' but also felt that they had no idea where to start or how to get a PhD. The intern with the best understanding would look at the university first and then choose a research area which sounded interesting and then

email potential supervisors. This was in contrast with the other interns who thought they would look on job sites for available PhDs (not realising that many PhDs are not advertised this way). All interns, however, could describe the process for getting a normal graduate job including the skills required.

Pedagogically, the internship can be thought of as 'Problem Based Learning'. Indeed, the interns thought that this was the best way to learn Matlab since they were immersed in problem solving where Matlab was the tool rather than the problem itself. They were also more likely to learn the theory when it was being used without guidance to solve problems (as apposed to being tested). One intern expressed his joy and surprise at being able to gain more knowledge than he thought himself capable of.

All interns could describe skills gained through the internship which would be useful for general study as well as specifically for projects: the ability to find information, read intently and digest it was the number 1 skill gained which would be applied in future. 3 interns mentioned programming skills gained as being very useful. Interns also expressed an interest in reading research papers for interest rather than learning and a desire to continue to attend journal clubs as part of their 3rd year project. All interns thought that school research seminars should be advertised to students.

One intern was especially positive about the focus on project deliverables rather than learning outcomes. Perhaps because the interns receive a bursary rather than course credit but he felt very motivated by producing something at each stage.

Conclusion

The School of Engineering has conducted an investigation on student's awareness of the different research groups within the department and University. Less than half the students are aware of these groups and the department can work on improving this awareness. On the other hand, students are interested in learning different research skills and learning more about the different research groups. This can be beneficial to both staff and students as it will allow staff to find potential research candidates and students to explore and develop their interests.

Students should be given the opportunity to learn some skills through research (rather than be taught them as stand-alone modules). This has advantages in motivation and in success of learning, especially for programming.

Students should also be introduce to PhD as a career early on and given the necessary information to apply for and succeed in one.

Appendix A – The Questionnaire form online

School of Engineering

| About | Research | Study | Partnerships | People | Intranet |

Groups A-Z » EERG » Student Research Taster » Questionnaire For Research Skills

Questionnaire For Research Skills

Year of Study *   [5 ▾]

Do you know about any of the following research groups in the School of Engineering?

- ☐ Biomedical and Biological Systems
- ☐ Connected Systems
- ☐ Electrical Power
- ☐ Engineering and Education Research Group
- ☐ Fluids and Modelling
- ☐ Ground Engineering
- ☐ Information Engineering
- ☐ Measurement and Machines
- ☐ Reaction and Materials Engineering
- ☐ Sensors and Devices
- ☐ Structural Engineering
- ☐ Sustainable Thermal Energy Technologies
- ☐ Systems Modelling and Control
- ☐ Water

Can you name any of the GRP within the University of Warwick? [   ]

Can you name any of the research centres within Warwick? [   ]

Thoughts*	Strongly Disagree	Disagree	Agree	Strongly Agree
"I know about the different research themes within Warwick"	○	○	○	◉
"The department gives me a lot of information about different research themes within Warwick"	○	○	◉	○
"I know what area of research I would like to do for my final year dissertation/project"	○	○	○	◉
"I proactively attend different research seminars"	○	○	◉	○
"I would be interested in attending a mini research rotation to learn more."	○	○	○	○
"I would be interested in learning different research skills"	○	○	○	◉
"I would like to attend more demonstrations and seminars within different areas of research"	○	○	○	◉
"I am interested in a career in research"	○	○	◉	○

Have you been to any of the following webpages?
- ☐ https://www2.warwick.ac.uk/fac/sci/eng/research/streams/
- ☐ https://www2.warwick.ac.uk/fac/sci/wmg/research/
- ☐ http://www2.warwick.ac.uk/research/priorities/
- ☐ http://www2.warwick.ac.uk/fac/cross_fac/
- ☐ http://www2.warwick.ac.uk/fac/sci/dst/

Are there any specific research themes that interest you? [   ]

Would you like to be contacted about the research themes you have interests in? *
- ○ Yes
- ◉ No

Appendix B – Complete Results

Research Group	Awareness (students/percentage)	Year 1	Year 2	Year 3	Year 4/5
None	77	35	22	15	5
	36%	47%	37%	29%	17%
Biomedical and Biological Systems	75	23	19	20	13
	35%	31%	32%	39%	43%
Connected Systems	7	1	4	1	1
	3%	1%	7%	2%	3%
Electrical Power	35	5	10	13	7
		7%	17%	25%	23%
Engineering and Education Research Group	25	5	10	4	6
	12%	7%	17%	8%	20%
Fluids and Modelling	64	6	19	24	15
	30%	8%	32%	47%	50%
Ground Engineering	19	2	6	5	6
	9%	3%	10%	10%	20%
Information Engineering	18	5	3	4	6
	8%	7%	5%	8%	20%
Measurement and Machines	18	3	3	7	5
	8%	4%	5%	14%	17%
Reaction and Materials Engineering	19	6	7	4	2
	9%	8%	12%	8%	7%
Sensors and Devices	39	5	14	13	7
	18%	7%	24%	25%	23%
Structural Engineering	55	12	13	16	14
	26%	16%	22%	31%	47%
Sustainable Thermal Energy Technologies	47	14	10	15	8
	22%	19%	17%	29%	27%
Systems Modelling and Control	43	13	10	13	7
	20%	17%	17%	25%	23%
Water	35	5	6	11	13
	16%	7%	10%	22%	43%

GRP Research Theme	Awareness (Students)
Behavioural Science	1
Connecting Cultures	1
Cyber Security	5
Energy	29
Food	11
Global Governance	2
Innovative Manufacturing	5
International Development	4
Materials	10
Science and Tech for Health	4

Sustainable Cities	13

Website Links	Awareness (students)
School of Engineering Research Streams https://www2.warwick.ac.uk/fac/sci/eng/research/streams/	38
WMG Research https://www2.warwick.ac.uk/fac/sci/wmg/research/	46
GRP Priorities http://www2.warwick.ac.uk/research/priorities/	21
Cross Faculty Research http://www2.warwick.ac.uk/fac/cross_fac/	3
Diamond Science Technology http://www2.warwick.ac.uk/fac/sci/dst/	6

Thoughts	Strongly Disagree	Disagree	Agree	Strongly Agree	Blank
"I know about the different research themes within Warwick"	65	98	50	2	
"The department gives me a lot of information about different research themes within Warwick"	71	112	31	1	
"I know what area of research I would like to do for my final year dissertation/project"	55	86	59	15	
"I proactively attend different research seminars"	65	119	26	4	1
"I would be interested in attending a mini research rotation to learn more."	5	25	127	57	1
"I would be interested in learning different research skills"	3	20	123	68	1
"I would like to attend more demonstrations and seminars within different areas of research"	5	17	127	63	3
"I am interested in a career in research"	37	90	66	19	3

Thoughts First Year	Strongly Disagree	Disagree	Agree	Strongly Agree	Blank
"I know about the different research themes within Warwick"	28	37	10	0	
"The department gives me a lot of information about different research themes within Warwick"	17	45	13	0	
"I know what area of research I would like to do for my final year dissertation/project"	32	34	9	0	
"I proactively attend different research seminars"	25	46	4	0	

	Strongly Disagree	Disagree	Agree	Strongly Agree	Blank
"I would be interested in attending a mini research rotation to learn more."	4	3	49	19	
"I would be interested in learning different research skills"	1	5	45	23	1
"I would like to attend more demonstrations and seminars within different areas of research"	2	3	47	20	3
"I am interested in a career in research"	15	27	25	5	3

Thoughts Second Years	Strongly Disagree	Disagree	Agree	Strongly Agree	Blank
"I know about the different research themes within Warwick"	20	29	10	0	
"The department gives me a lot of information about different research themes within Warwick"	25	29	5	0	
"I know what area of research I would like to do for my final year dissertation/project"	15	25	17	2	
"I proactively attend different research seminars"	14	34	9	2	
"I would be interested in attending a mini research rotation to learn more."	0	5	35	19	
"I would be interested in learning different research skills"	1	5	31	22	
"I would like to attend more demonstrations and seminars within different areas of research"	0	3	34	22	
"I am interested in a career in research"	8	28	19	4	

Thoughts Third Years	Strongly Disagree	Disagree	Agree	Strongly Agree	Blank
"I know about the different research themes within Warwick"	13	20	17	1	
"The department gives me a lot of information about different research themes within Warwick"	22	22	6	1	
"I know what area of research I would like to do for my final year dissertation/project"	7	15	22	7	
"I proactively attend different research seminars"	21	23	6	0	1
"I would be interested in attending a mini research rotation to learn more."	0	12	29	10	
"I would be interested in learning different research skills"	0	7	31	13	

	Strongly Disagree	Disagree	Agree	Strongly Agree	Blank
"I would like to attend more demonstrations and seminars within different areas of research"	2	9	29	11	
"I am interested in a career in research"	10	22	17	2	

Thoughts Fourth/Fifth Years	Strongly Disagree	Disagree	Agree	Strongly Agree	Blank
"I know about the different research themes within Warwick"	4	12	13	1	
"The department gives me a lot of information about different research themes within Warwick"	7	16	7	0	
"I know what area of research I would like to do for my final year dissertation/project"	1	12	11	6	
"I proactively attend different research seminars"	5	16	7	2	
"I would be interested in attending a mini research rotation to learn more."	1	3	16	9	1
"I would be interested in learning different research skills"	1	3	16	10	
"I would like to attend more demonstrations and seminars within different areas of research"	1	2	17	10	
"I am interested in a career in research"	4	13	5	8	