My research describes:

- Evidence of applied anthropometry
  - *in a first year assignment relating to a transport device and production of a package drawing*
- Threshold concepts
  - *via a questionnaire identifying previous ergonomics knowledge*
- How designers think about anthropometry
  - *via a questionnaire and evidence of coursework*

- Aims of work
- The way designers think
- Threshold concepts
- The 1st year Design assignment
- Ergonomics introduction lecture
- Measuring exercise
- Anthropometric databases
- Questionnaire design
- Results of questionnaire
- Results of assessment
- Conclusions and Recommendations

Contents

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- To investigate the use of applied ergonomics
- To integrate ergonomics into the design process
- To try new methods of representing users within different vehicles
- To develop a questionnaire to gather data about students' understanding and application of ergonomics
- Interpret the results of the questionnaire in terms of integrating ergonomics within a design brief and potential future teaching content

Aims of work

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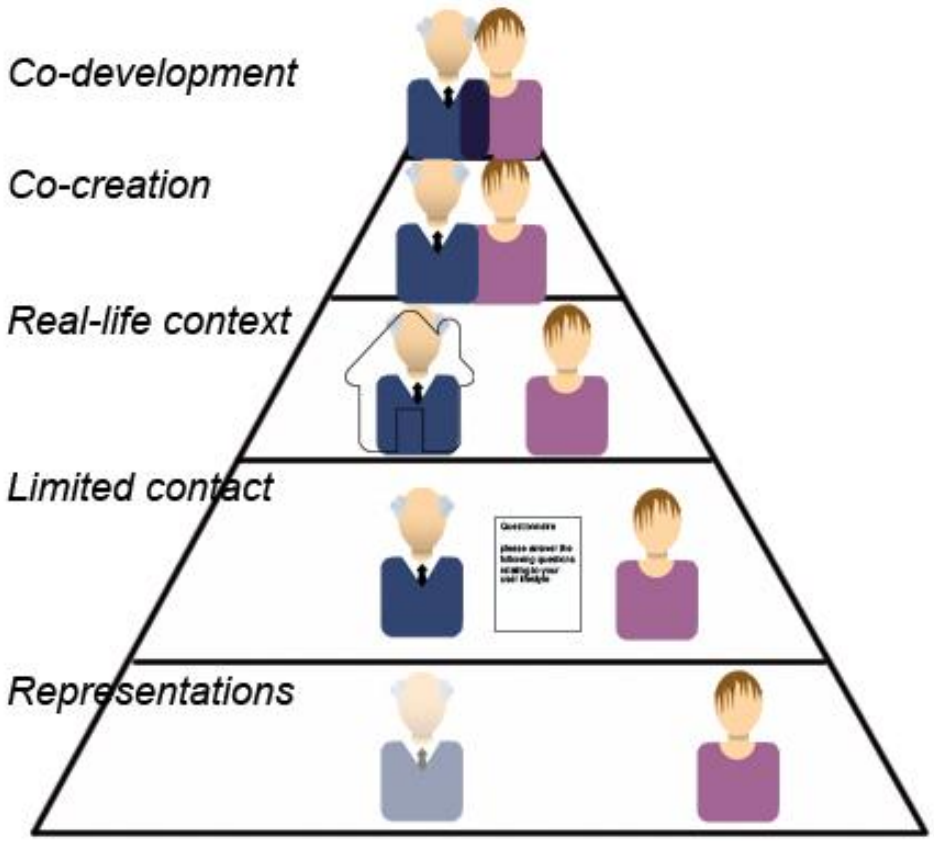

Pyramid of user led design methodologies, (Lindsay 2003)
Referenced in Bichard, J., Coleman, R., Lee, Y. 2008, Designing with users, how?: http://www.hhc.rca.ac.uk/cms/files/2.pdf

- This pyramid shows that at the lowest level designers tend to design for themselves and imagine other users' experiences from their own perspective or assumptions
- Whilst it is important for design students to not design from their own assumptions (Myerson, 2007) it is also important to recognise that there has to be a procedural and transitional phase in learning knowledge and threshold concepts

The way designers think

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Image: Idea go / FreeDigitalPhotos.net

Threshold concepts ‘can be considered as akin to a portal, opening up new and previously inaccessible way of thinking about something.’

Meyer and Land (2003)

Threshold Concepts

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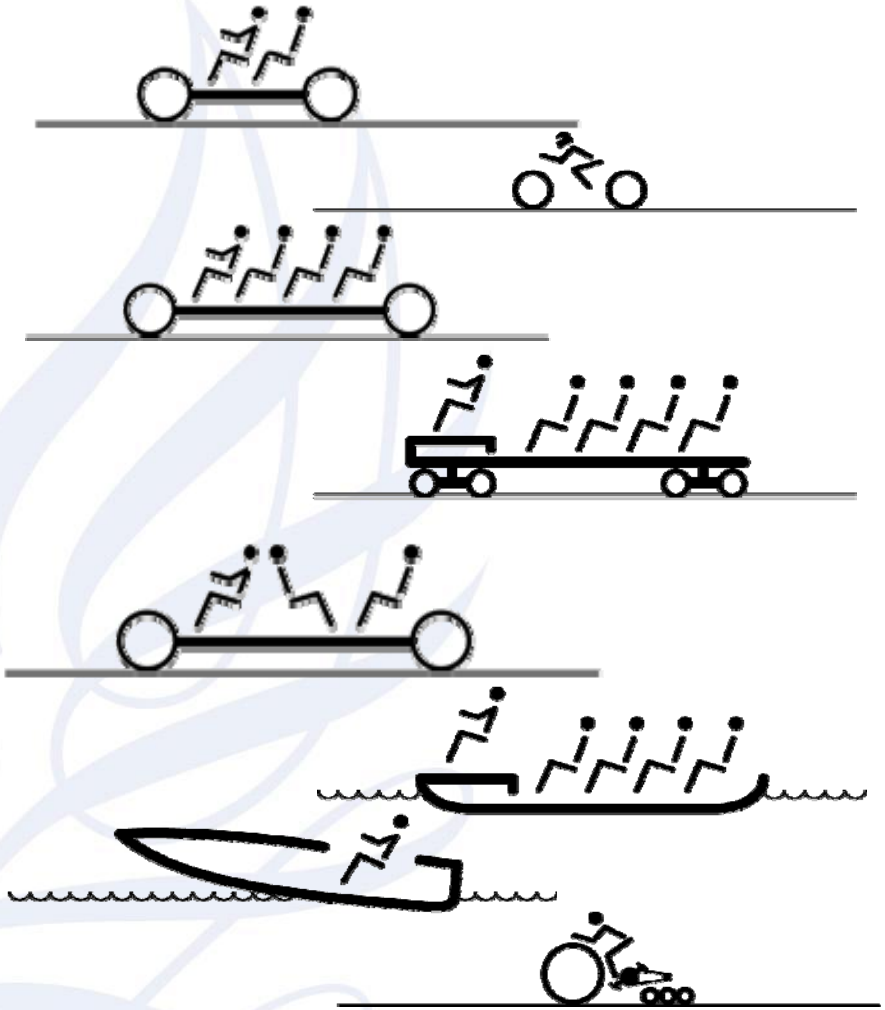

- Project brief: Create a vehicle or boat around yourself
- 20 years into the future i.e. 2030
- Vehicle should not carry more than 100 people

The 1st year Design assignment

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- Gaining a basic understanding of different ways that the human body can be described that is of use to designers
- How percentiles describe dimensional information about the space constraints involved in designing for people
- Understanding how to use percentile information in different design scenarios
- Illustrating some examples of using anthropometry to solve some basic design problems

Ergonomics introduction lecture

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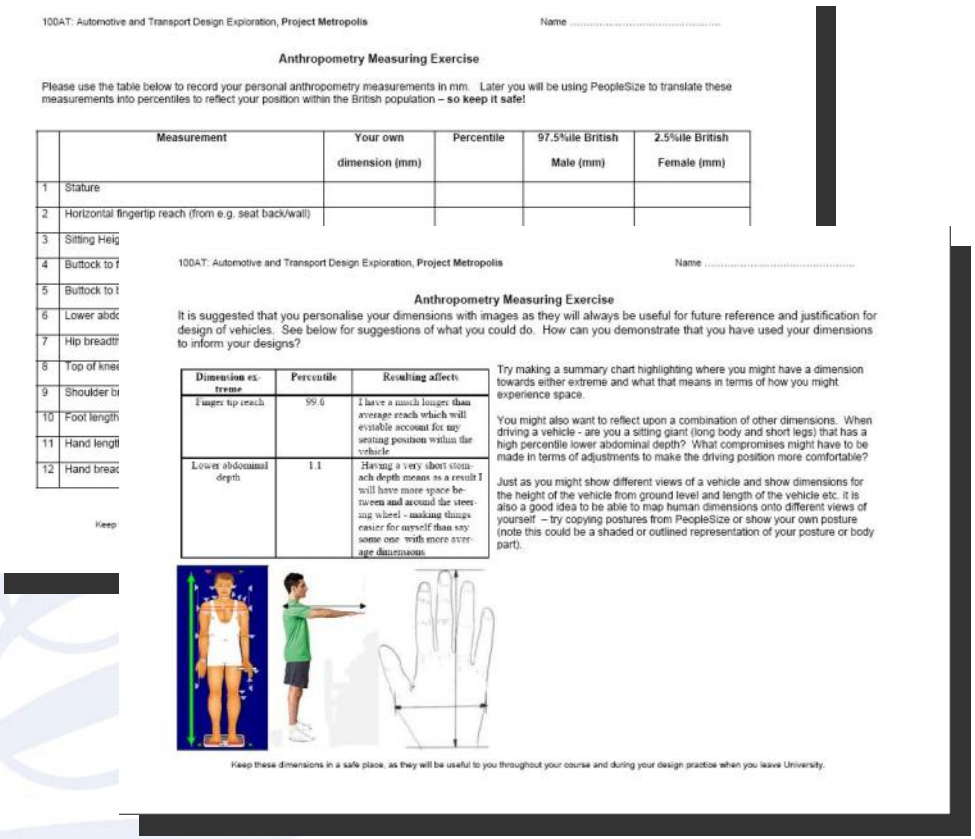
	Dimension (mm)	Percentile
Stature	1582	27
Horizontal Fingertip reach (from e.g. seat back / wall)	780	13
Lower abdominal depth (max)	194	1
Sitting height, sitting (max)	874	71
Buttock to back of knee (popliteal tendon) sitting	448	10
Buttock to front of knee, sitting	526	1
Shoulder breadth (deltoid)	379	0.01
Top of knee, sitting	468	11
Hip breadth, sitting (max)	330	0.5
Foot length	224	9
Hand length	173	50
Hand breadth including thumb	84	7



100AT: Automotive and Transport Design Exploration, **Project Metropolis** Name .....

Anthropometry Measuring Exercise

Please use the table below to record your personal anthropometry measurements in mm. Later you will be using PeopleSize to translate these measurements into percentiles to reflect your position within the British population – **so keep it safe!**

	Measurement	Your own dimension (mm)	Percentile	97.5%ile British Male (mm)	2.5%ile British Female (mm)
1	Stature				
2	Horizontal fingertip reach (from e.g. seat back/wall)				
3	Sitting Heig				
4	Buttock to f				
5	Buttock to l				
6	Lower abdc				
7	Hip breadth				
8	Top of knee				
9	Shoulder bi				
10	Foot length				
11	Hand length				
12	Hand breac				

Keep

100AT: Automotive and Transport Design Exploration, **Project Metropolis** Name .....

Anthropometry Measuring Exercise

It is suggested that you personalise your dimensions with images as they will always be useful for future reference and justification for design of vehicles. See below for suggestions of what you could do. How can you demonstrate that you have used your dimensions to inform your designs?

Dimension extreme	Percentile	Resulting affects
Fingertip reach	99.6	I have a much longer than average reach which will evitable account for my seating position within the vehicle
Lower abdominal depth	1.1	Having a very short stomach depth means as a result I will have more space between and around the steering wheel - making things easier for myself than say some one with more average dimensions

Try making a summary chart highlighting where you might have a dimension towards either extreme and what that means in terms of how you might experience space.

You might also want to reflect upon a combination of other dimensions. When driving a vehicle - are you a sitting giant (long body and short legs) that has a high percentile lower abdominal depth? What compromises might have to be made in terms of adjustments to make the driving position more comfortable?

Just as you might show different views of a vehicle and show dimensions for the height of the vehicle from ground level and length of the vehicle etc. it is also a good idea to be able to map human dimensions onto different views of yourself – try copying postures from PeopleSize or show your own posture (note this could be a shaded or outlined representation of your posture or body part).

Keep these dimensions in a safe place, as they will be useful to you throughout your course and during your design practice when you leave University.

- Static anthropometry collected
- Twelve different dimensions appropriate to those associated with informing the driving position
- Data sheet provided to record personal data and that of UK nationality
- Reflection encouraged and suggestion for students to personalise their data by illustrating themselves with their dimensions/percentiles

Measuring exercise

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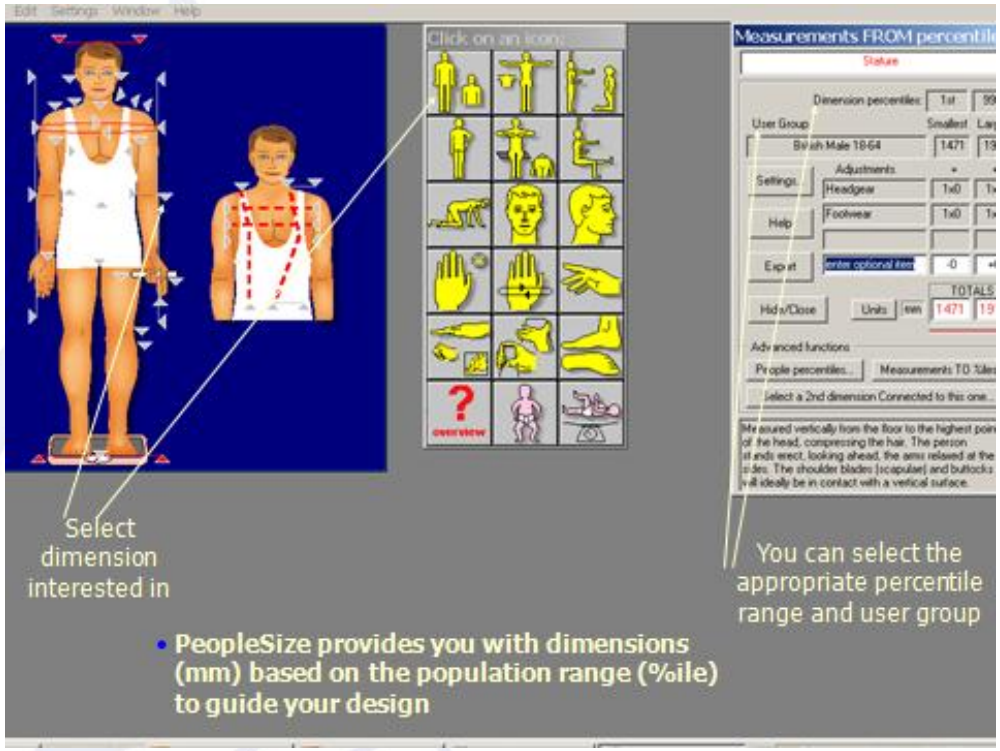

- PeopleSize 2000
- Visual anthropometry software developed by Open Ergonomics Ltd
- Pictorial/diagrammatic representation of all measurements
- Accommodates different genders, nationalities and age groups

Anthropometric databases

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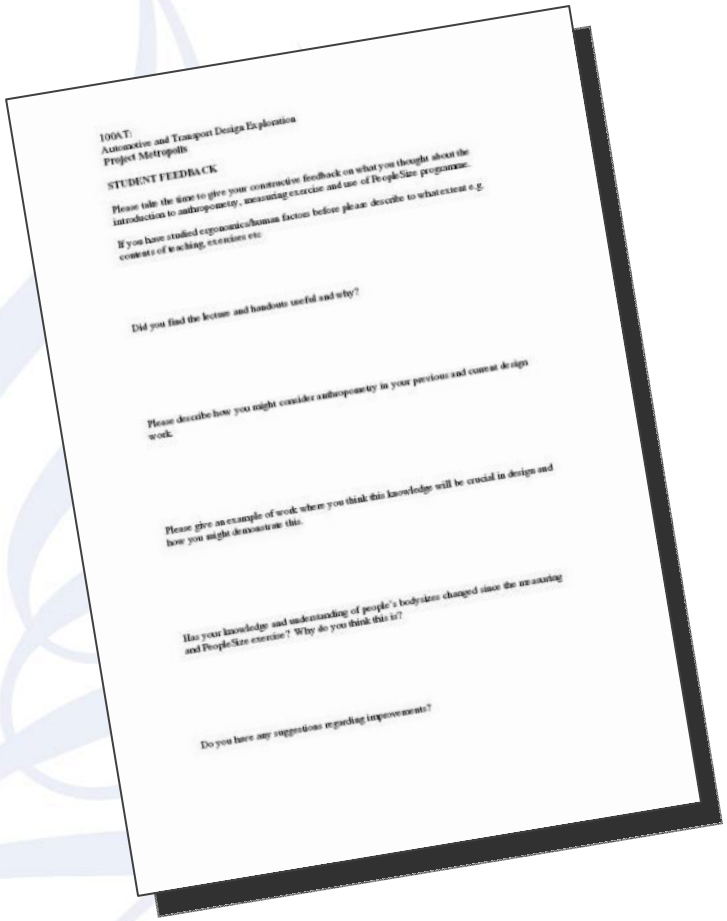

Distributed a week after the introduction lecture and measuring exercise to ascertain whether the students understanding of ergonomics had changed

QUESTIONS:

1. If you have studied ergonomics/human factors before please describe to what extent e.g. contents of teaching, exercises etc.
2. Did you find the lecture and handouts useful and why?
3. Please describe how you might consider anthropometry in your previous and current design work
4. Please give an example of work where you think this knowledge will be crucial in design and how you might demonstrate this
5. Has your knowledge and understanding of people's bodysizes changed since the measuring and PeopleSize exercise? Why do you think this is?
6. Do you have any suggestions regarding improvements?

Questionnaire design

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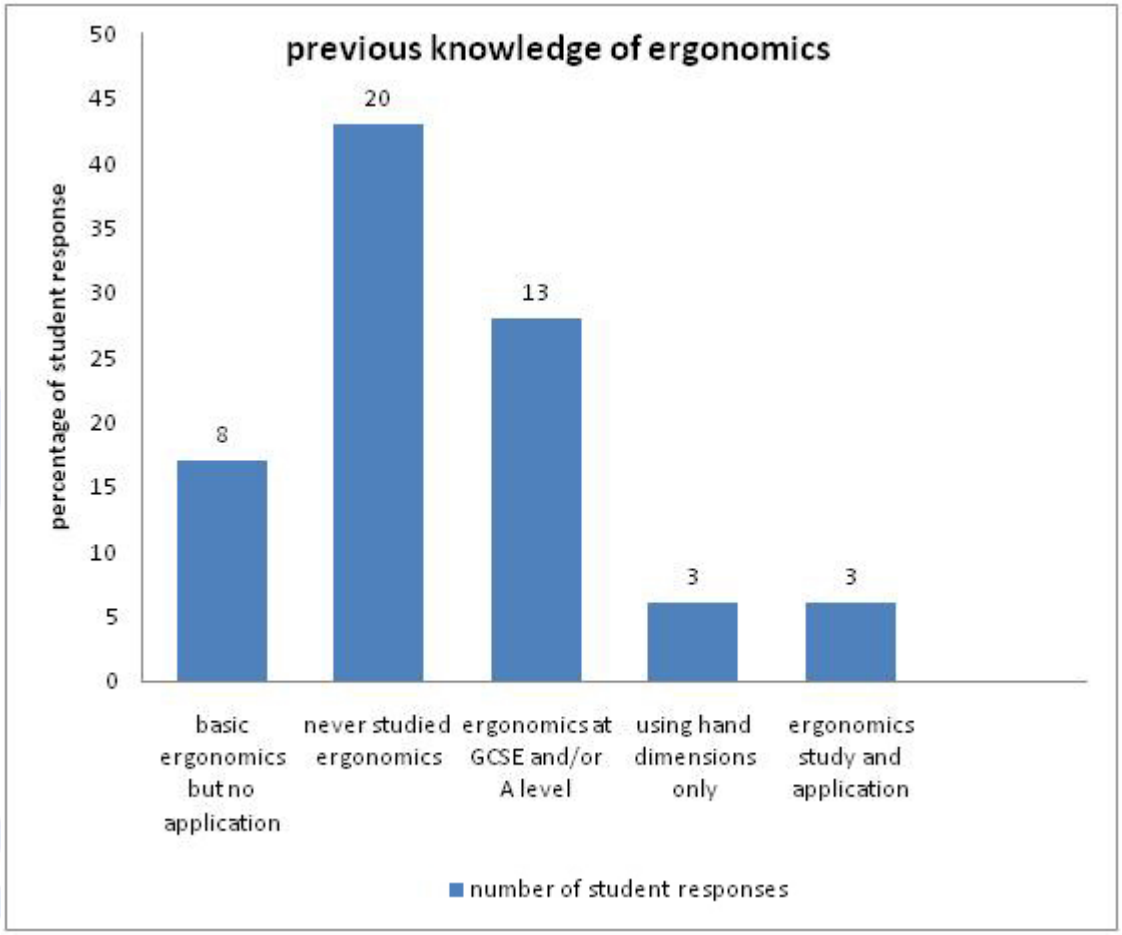

Q1. If you have studied ergonomics/human factors before please describe to what extent e.g. contents of teaching, exercises etc.

Comments ranged from:

"Very basic knowledge from design technology A level"

"Very basic from GCSE graphic design – how people interact with products"

"Self taught"

Results

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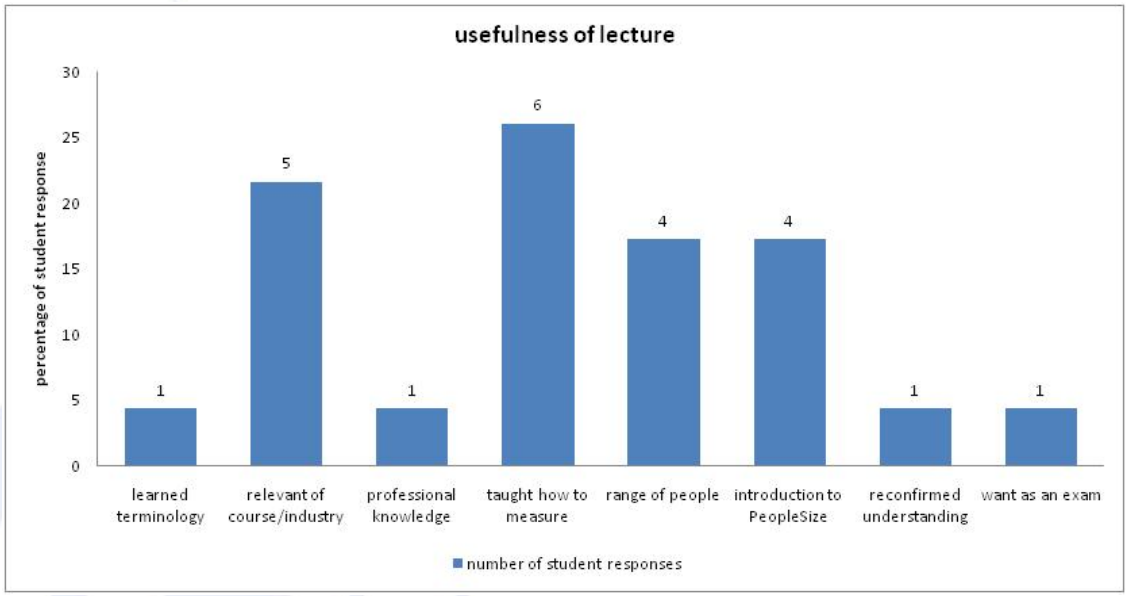


Q2. Did you find the lecture and handouts useful and why?

100% of the students stated that the handouts were useful. In terms of the lecture contents 23 of the students gave additional feedback

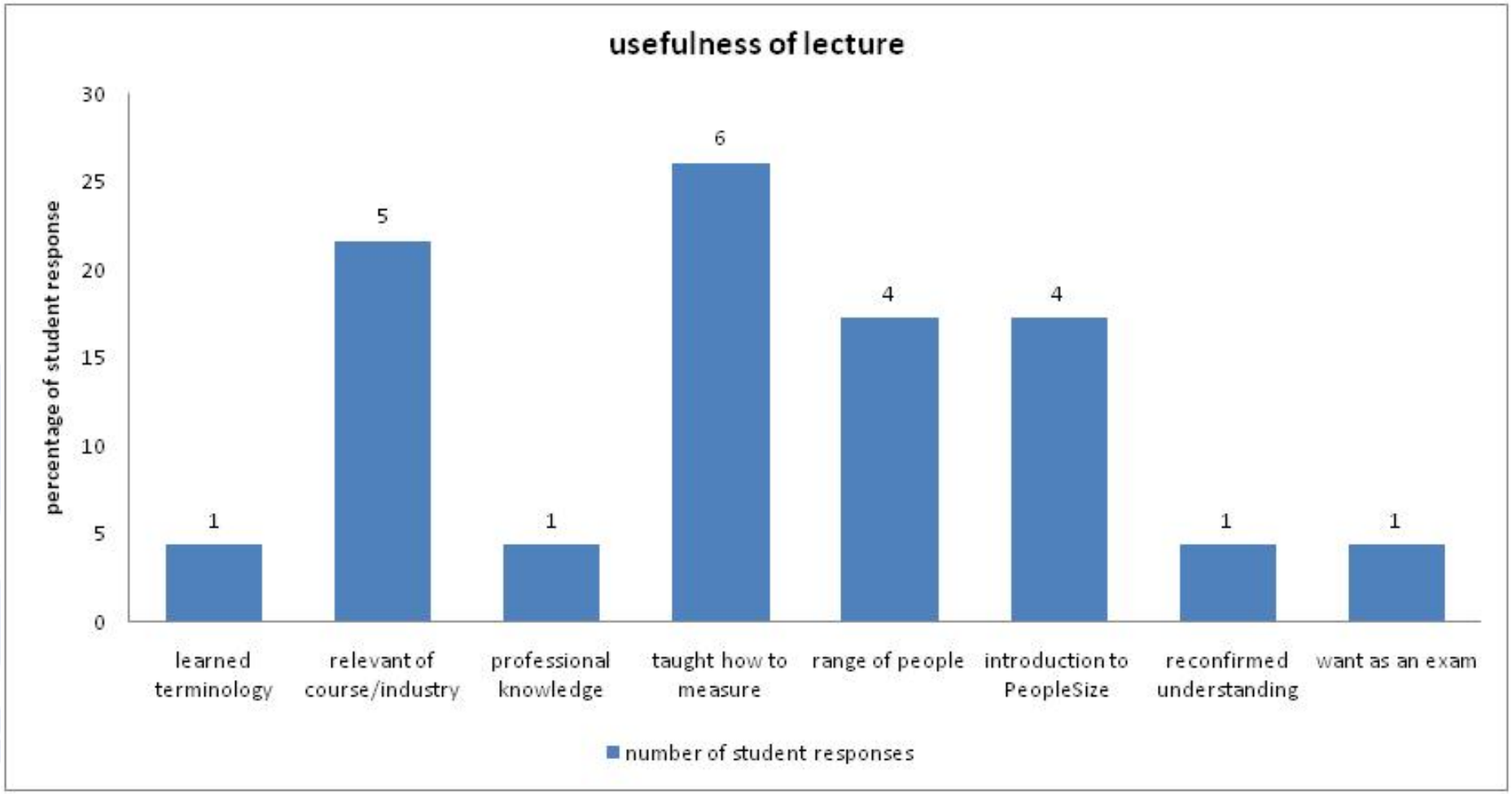
Comments ranged from:

"Yes, very I learned new things, not just about measuring people but also about my own body"

"Yes I have never studied ergonomics in detail before and I believe it is crucial for a good design to have correct proportions and make the user comfortable"

Results

Coventry University



Results

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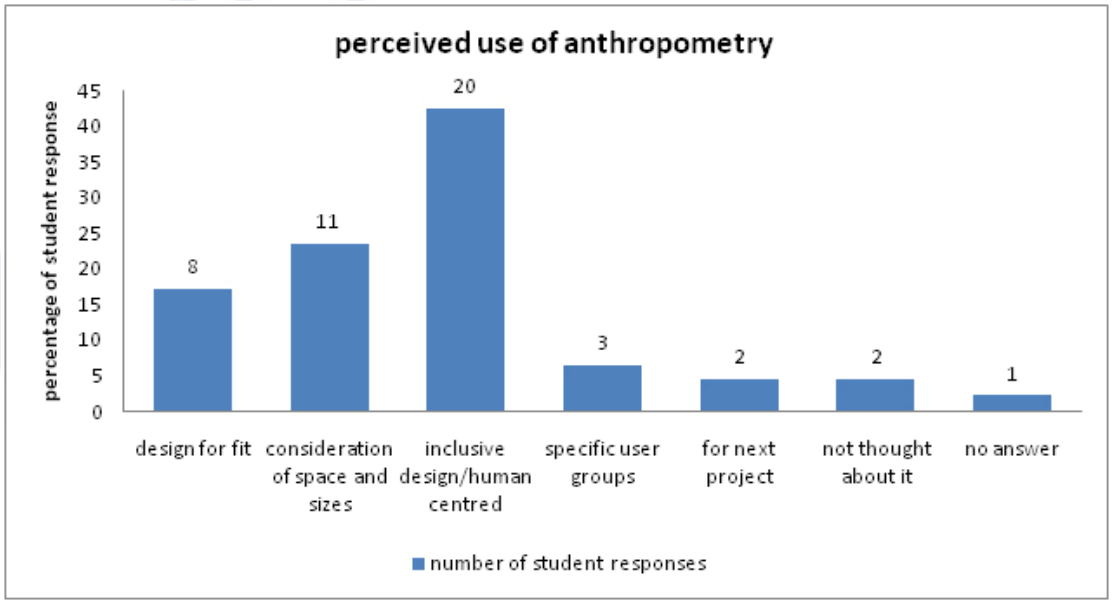


Q3. Please describe how you might consider anthropometry in your previous and current design work

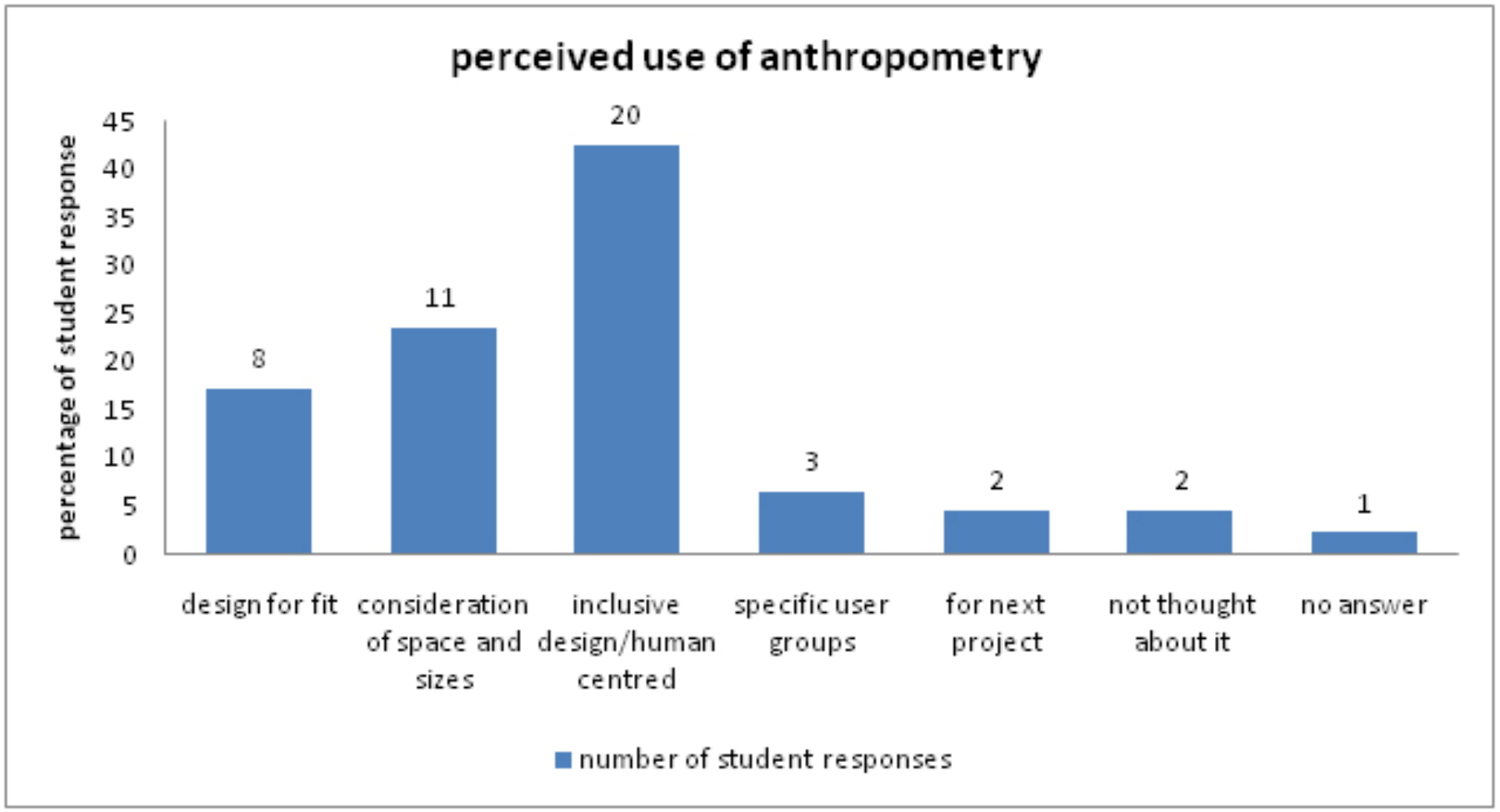
Comments ranged from:

"Accommodating space for all sizes of people is something I will have to do in the future. It is essential"

"Products will be useless unless they are the appropriate size and shape for the user to interact with. I will consider dimensions and allowances a lot more now"

Results

Coventry University



Results

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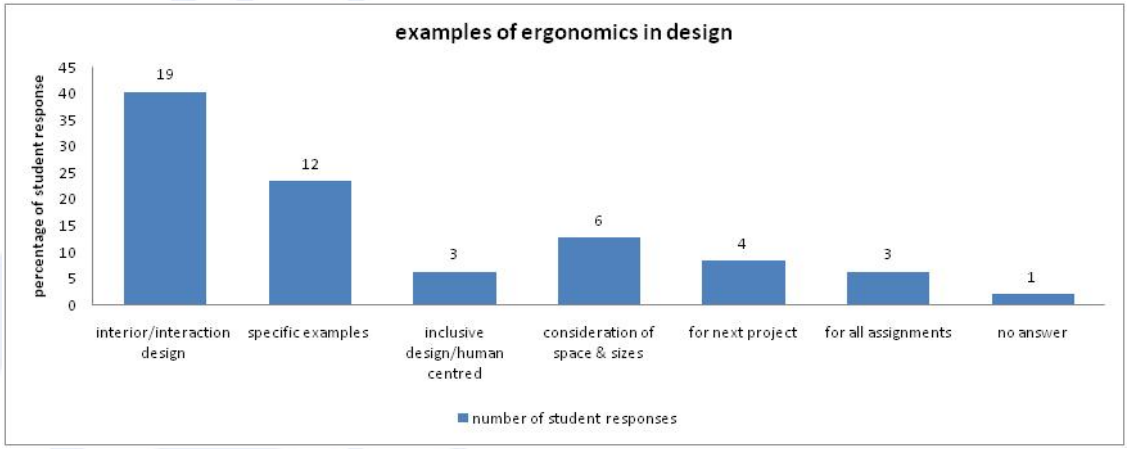


Q4. Please give an example of work where you think this knowledge will be crucial in design and how you might demonstrate this

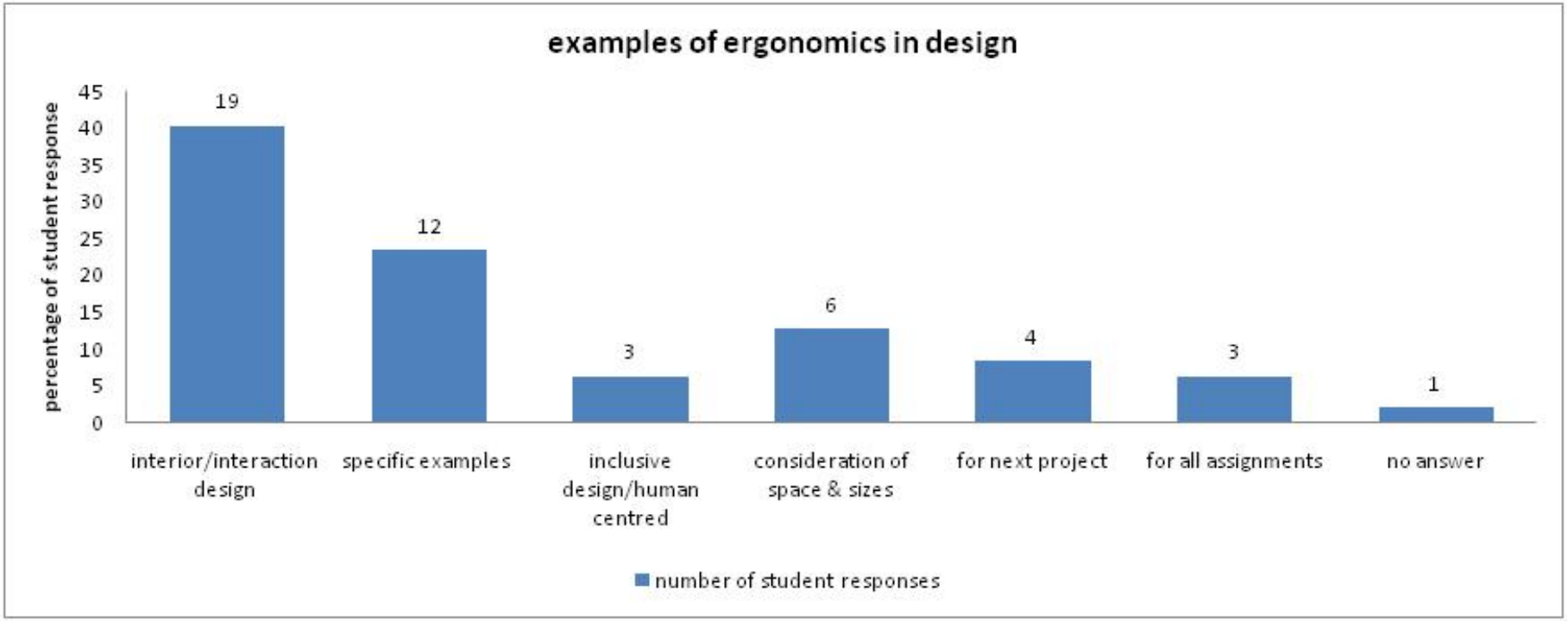
Comments ranged from:

"Looking at finalising the dimensions of my vehicle"

"I can build around my dimensions first and then design for a larger group"

Results

Coventry University



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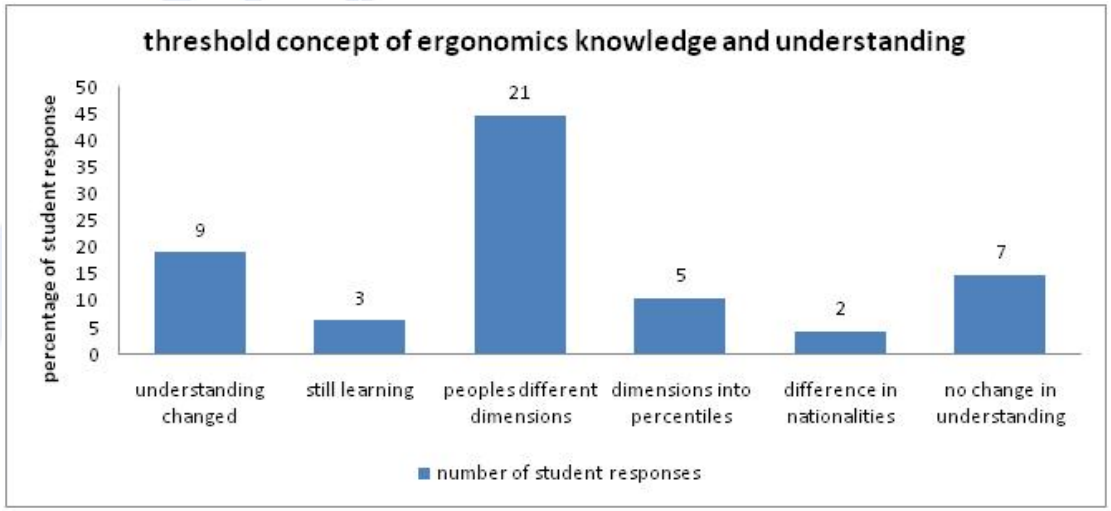


Q5. Has your knowledge and understanding of people's body sizes changed since the measuring and PeopleSize exercise? Why do you think this is?

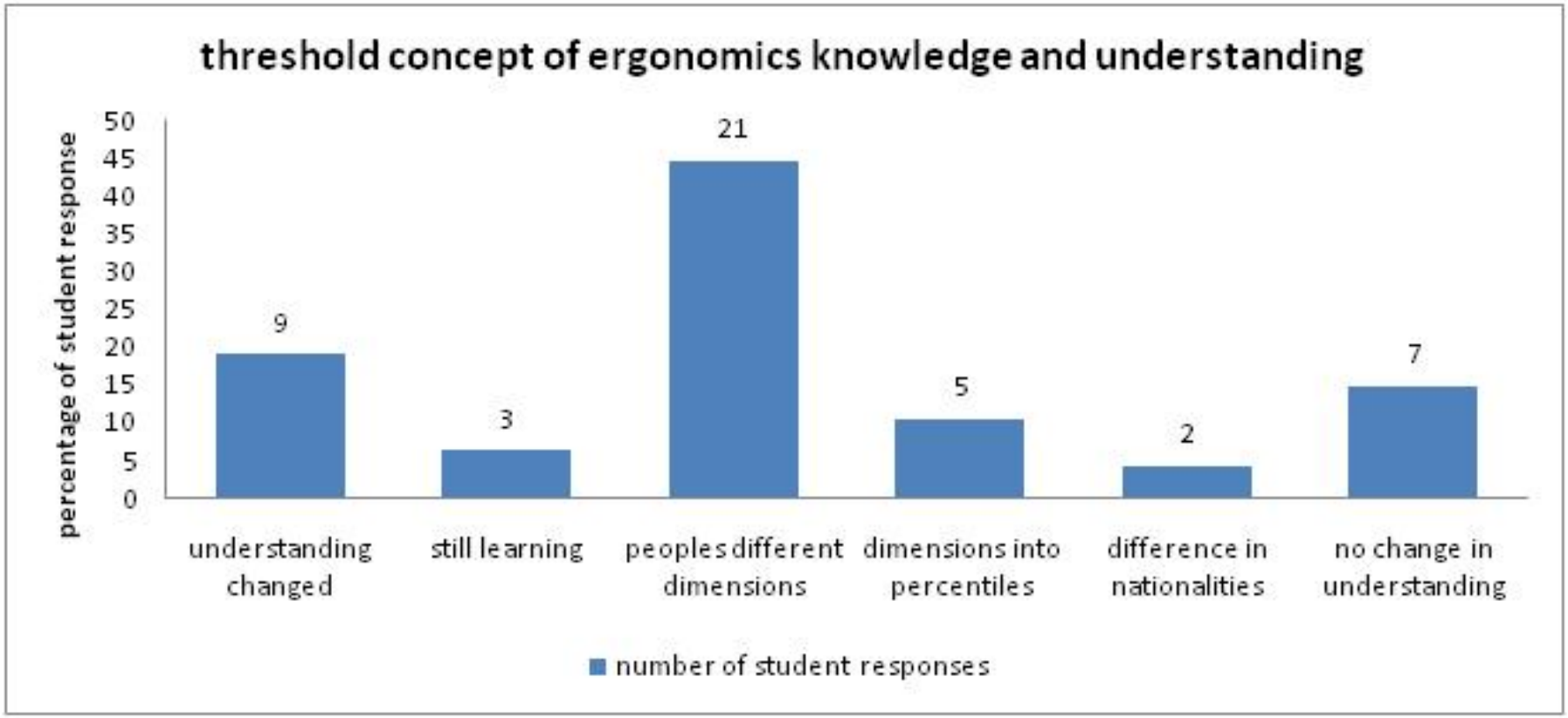
Comments ranged from:

"Not really although people on average are slightly bigger than I thought"

"Well not changed but given an in depth understanding to why some things like seats, handles are the way they are. This is due to the different sizes of people"

Results

Coventry University



Results

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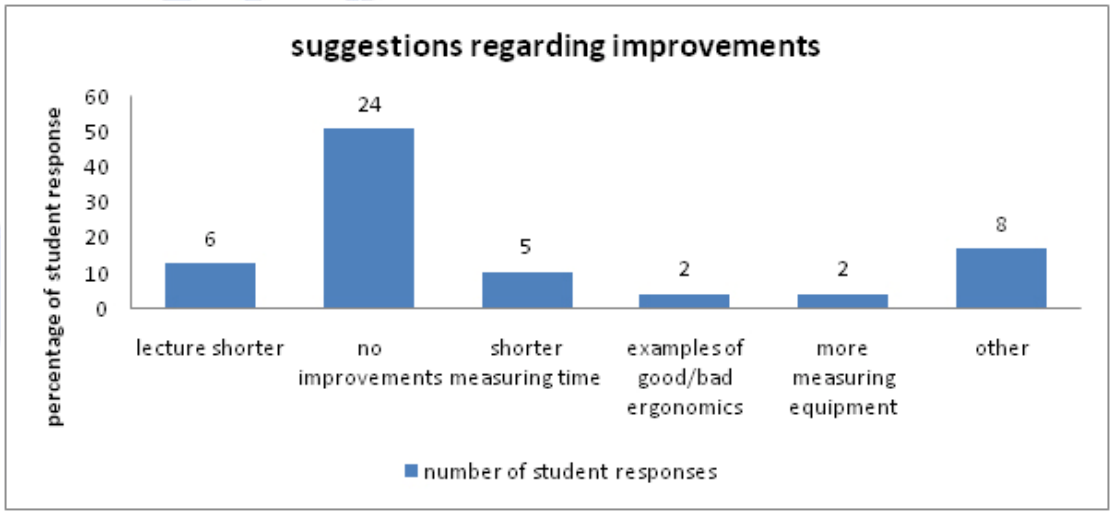

Q6. Do you have any suggestions regarding improvements?

There were 13 different suggestions, but just over half of the students did not offer any improvements

Results

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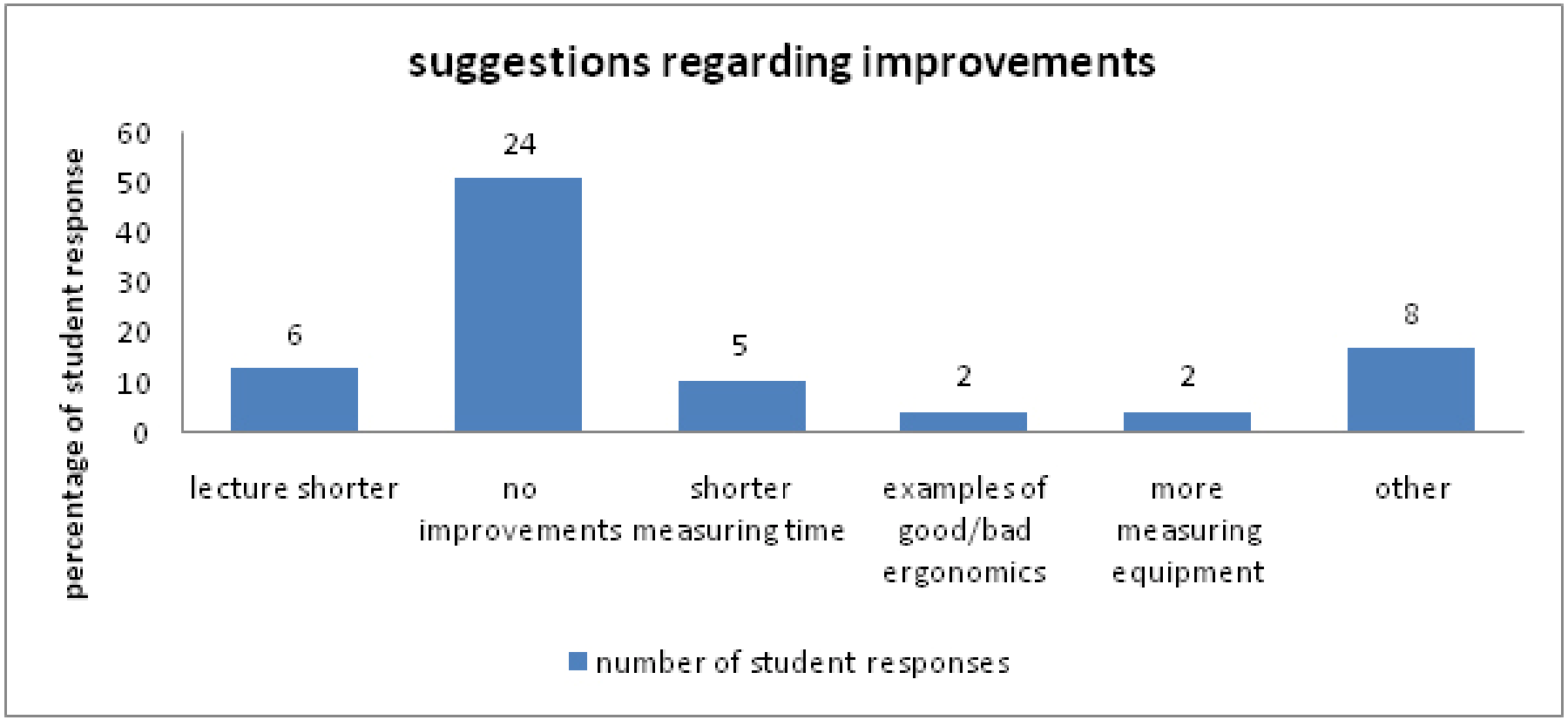

Results

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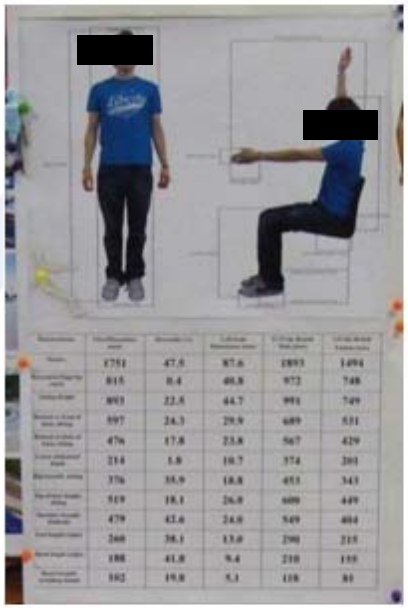

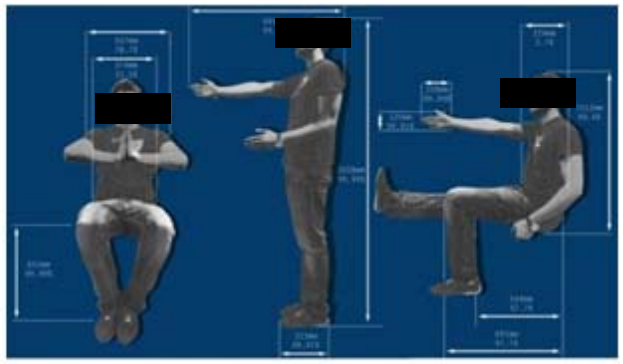

The vast majority of students chose to represent their measurements in a visual rather than tabulated way

Many of the students showed photographs of themselves in static postures corresponding to those illustrated in PeopleSize 2000

Some students showed dimensions alone whilst others showed dimensions and equivalent percentiles

Only a handful of students visually represented other mannequins' corresponding to male and female percentile extremes

Results of assessment:
Visual production of anthropometric data

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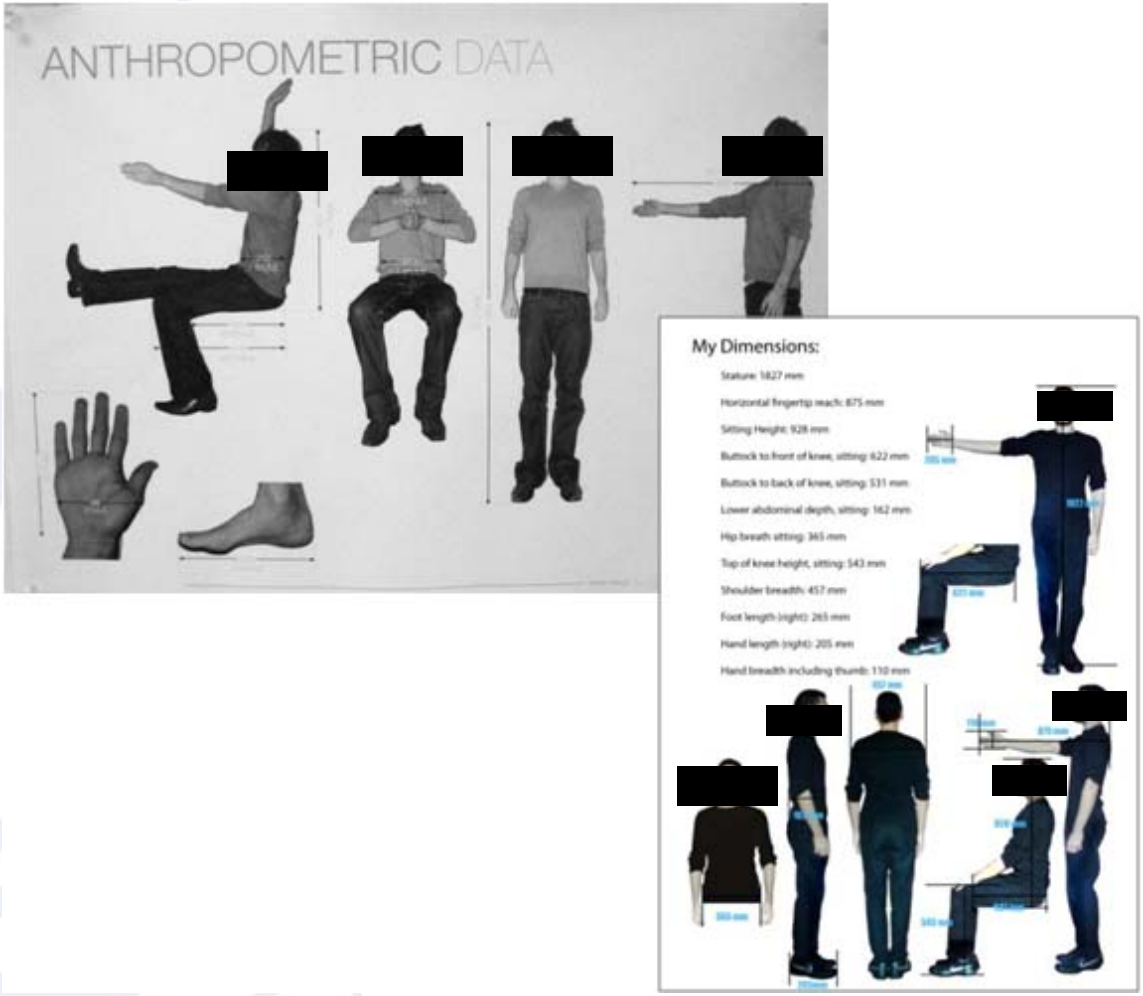

Some of the best examples showed:

- All static postures
- Reference to all the measurements taken

Results of assessment:
Visual production of anthropometric data

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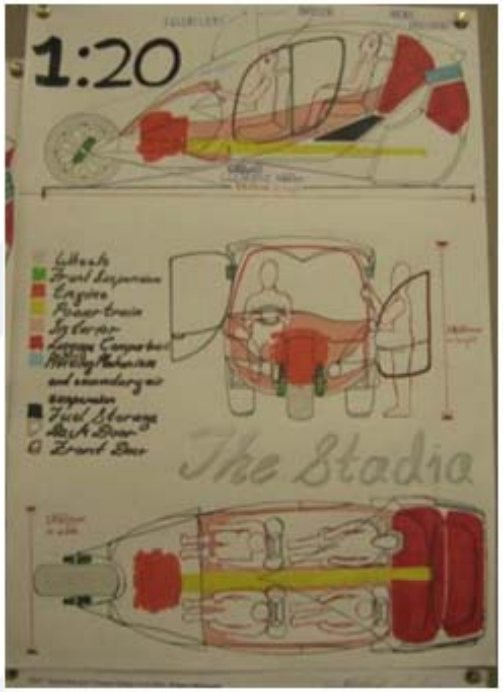

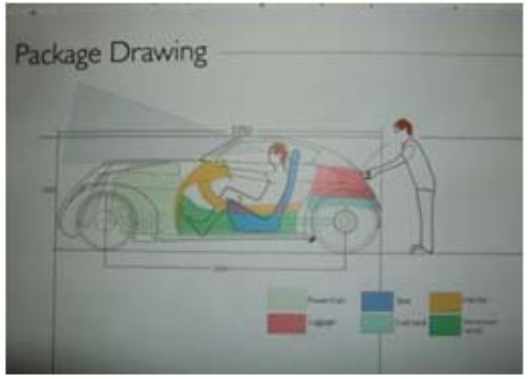

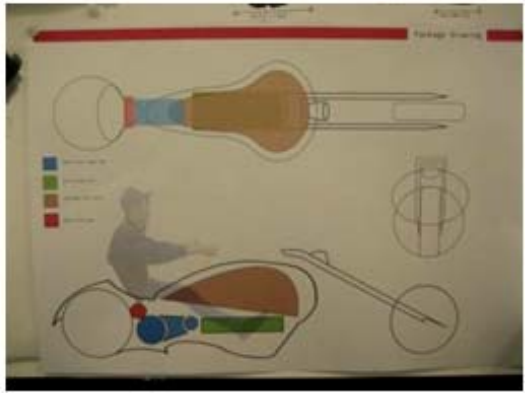

There was a significant difference in the quality of the package drawings presented. The majority of students visually represented their own dimensions in a mannequin style depiction interacting with their vehicle from a seated driving position

Not all students depicted all three views; with most showing just the side elevation combined with one other view

Results of assessment: Examples of package drawings

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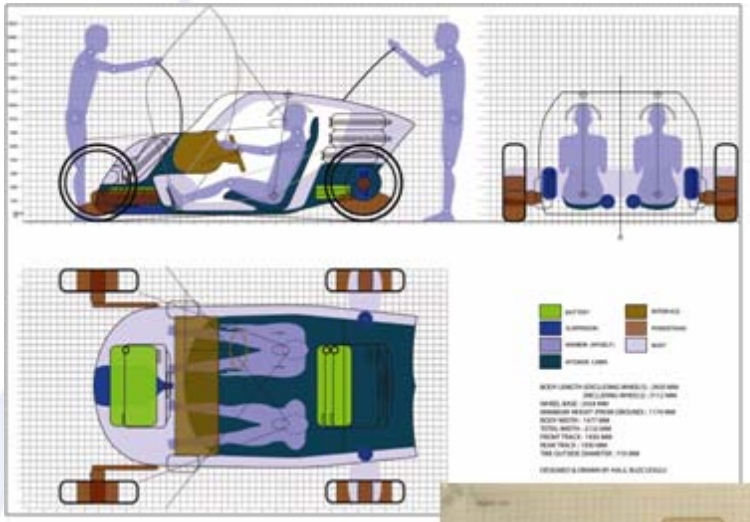

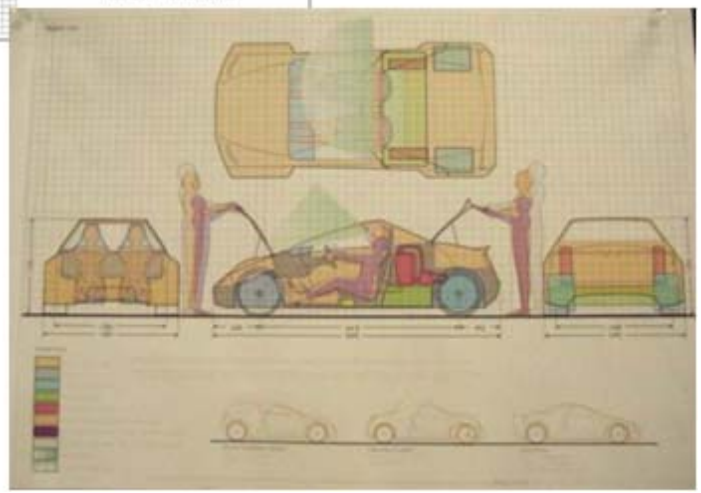

Some of the best package drawing examples showed the operational paths of doors, bonnets and rear panels in terms of considering access and egress requirements

Significant features:
- sight lines
- storage needs
- access/egress

Results of assessment:
Examples of package drawings

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- Given that just less than half of the students had previously not studied ergonomics, after the lecture students could associate ergonomics with providing data for a range of people and its application within industry
- The majority of students perceived their future use of anthropometry as being to accommodate a wider range of people within their designs
- Students mainly perceived that they would use ergonomics data for designing vehicle interior space and the interactions within that space

Conclusions

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- Whilst the majority of students stated their understanding of ergonomics had changed in terms of peoples dimensions this was not made conspicuous in their assessed work
- Students were able to demonstrate some level of understanding ergonomics in a visual way to support their own dimensions and percentiles
- Personal depiction could be at the cost of depicting percentile extremes

Conclusions

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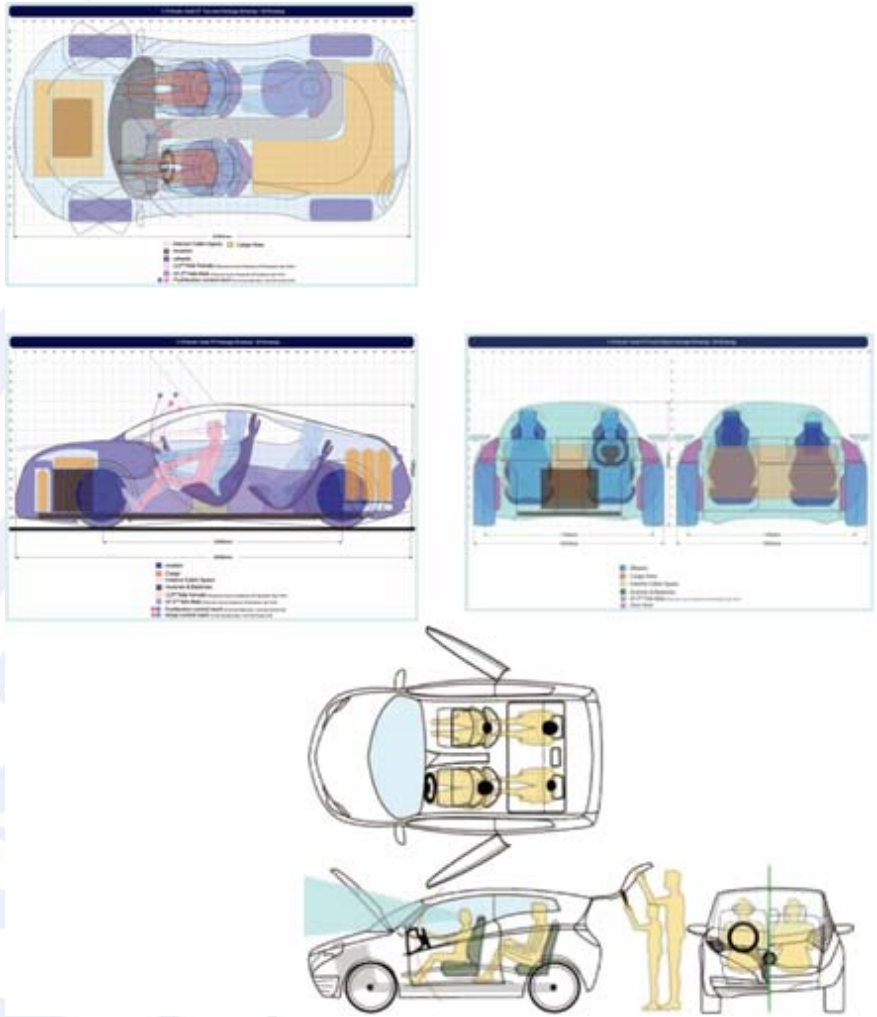

- To change the focus of the work in order for students to visualise and design for extremes of populations before their own dimensions are taken
- To better organise and extend the measuring exercise over a longer period of time

Recommendations

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