Meden School Curriculum Planning							
Subject	D&T	**Year Group**	7	**Sequence No.**	3	**Topic**	Engineering Challenges

Retrieval	Core Knowledge	Student Thinking
What do teachers need **retrieve** from students before they start teaching **new content**?	What **specific ambitious knowledge** do teachers need teach students in this sequence of learning?	What real life examples can be applied to this sequence of learning to **development of our students thinking, encouraging them to see the inequalities around them** and 'do something about them!'
The following knowledge and understanding should be retrieved: Whilst our students may have a varied experience from their KS1/2 curriculum the National Curriculum for Science states that students should have experience of: ☐ planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary. ☐ using test results to make predictions to set up further comparative and fair tests. ☐ identifying the effects of air resistance, water resistance and friction, that act between moving surfaces.	The following ambitious knowledge needs to be taught: ☐ What is meant by the term Engineering. That it is the application of knowledge and scientific principles in order to design products and solutions that work in their intended application. ☐ Know that there are a wide range of Engineering sectors including mechanical engineering, automotive engineering, chemical engineering, electrical engineering, aerospace engineering, biomedical engineering etc. ☐ Know that engineers regularly use a repeating cycle of design, make, test, analyse, design, test …. In order to develop successful designs. (Example of James Dyson – over 1000 prototypes/models prior to initial production. ☐ Understand the nature and constraints of the first 'challenge' (helicopter drop) – see the PowerPoint for details ☐ Know how to make a 'standard design', and how to use this as a benchmark/control design. ☐ Know the need for logical and planned design iteration – making one change and testing in order to know/understand/assess the impact of that design change. ☐ Know that design work can be informed by looking at existing designs and borrowing ideas and inspiration. ☐ Know that designs can be informed by looking at the natural world for ideas and inspiration.	☐ Compare the 'air drops' of food aid in the two videos below. The difference of making use of air resistance, (apply to the helicopter challenge) and the harm of the unmanaged impact (apply to the crumple zone challenge) - World Food Programme aid air dropped at camp (https://www.youtube.com/watch?v=77adNcCVkSw) - Low-cost parachute for airdropping cargo – make particular reference to the 'crumple zone material' at the bottom of the package. (https://www.youtube.com/watch?v=VLh_EqZF0wU) ☐ Draw parallels between the marble run concept and the learning in relation to lifting a material to a higher level gives it potential energy and apply it to hydroelectric systems where water is pumped to a higher reservoir at times when electricity is in lower demand (e.g.: at night), ready to be released through turbines to meet times of higher demand. - (See the image in the curriculum folder with information about the proportion of businesses and homes with access to electricity in Sub-Saharan Africa.

	☐ Understand the concepts of 'air resistance' and 'drag'. Know that some products aim to reduce drag, (cars, aircraft) and know why. Know that some products seek to increase drag, (parachute, air brakes on cars/aircraft). ☐ Understand the nature and constraints of the second 'challenge' (marble run) – see the PowerPoint for details. ☐ Know the concept of potential energy, and how lifting the marble to a higher height, (the top of the run) increases its potential energy and that the job of the run is to release that energy in a controlled, (and slow) manner. ☐ Understanding of the terms gradient, velocity and friction. ☐ Be able to create and discuss the advantages and disadvantages of a variety of designs for transferring the marble from one rail to another. ☐ Be able to create and discuss the advantages and disadvantages of a variety of designs (other than reducing the gradient) for reducing the velocity of a marble as it moves along a rail. ☐ Understand the nature and constraints of the third 'challenge' (crumple zone) – see the PowerPoint for details. ☐ Know the concepts of kinetic energy and momentum, and how that energy is transferred to the passengers in an impact. ☐ Know that extending the time period over which the kinetic energy is being dissipated reduced the potential harm to the passengers in an impact. ☐ Know what crumple zones are on real cars and how they act in order to protect passengers. View one or two NCAPP crash tests on YouTube and explain how the crumple zones are seen acting and how their deformation absorbs the kinetic energy of the car ☐ Know what will be observed in a 'most successful' crumple zone design, (ie that it will have become fully crumpled just at the moment that the vehicle comes to a rest).	