Strand:	Materials for Production	**Sub-Strand:**	Smart and Modern Materials

BASIC 9

WEEKLY LESSON PLAN – WEEK 9

Content Standard:	B9.2.3.1 Demonstrate understanding of using smart and modern materials for making products/artefacts				
Indicator (s)	B9.2.3.1.1: Discuss reasons for using smart and modern materials for making products/artefacts		**Performance Indicator** Learners can use smart and modern materials.		
Week Ending	**01-12-2023**				
Class	B.S.9	**Class Size:**		**Duration:**	
Subject	Career Technology				
Reference	Career Technology Curriculum, Teachers Resource Pack, Learners Resource Pack, Textbook.				
Teaching / Learning Resources	Metal foam, titanium, LCD television, Poster showing smart and modern materials.		**Core Competencies:**	• Communication and Collaboration. • Critical Thinking and Problem Solving. • Creativity and Innovation.	

DAY/DATE	**PHASE 1 : STARTER**	**PHASE 2: MAIN**	**PHASE 3: REFLECTION**
WEDNESDAY	Learners brainstorm to describe the properties of smart and modern materials.	1. Assist Learners to identify examples of smart and modern materials. 2. Show Learners pictures and videos on how some examples of smart and modern materials are used. 3. Learners brainstorm to identify types of smart and modern materials. 4. Discuss with the Learners about the importance of using smart and modern mateirals. **smart/modern material;** Modern materials are developed through the invention of new or improved processes, for example, as a result of 'man' made materials/ingredients or human intervention, in other words not naturally occurring changes. They are altered to perform a particular function. Many smart and modern materials are developed for specialised applications but some eventually become available for general use. **Types of smart material** ❖ Piezoelectric – On applying a mechanical stress to these materials it generates an electric current. Piezoelectric microphones transform changes in pressure caused by sound waves into an electrical signal. ❖ Shape memory – After deformation of these materials they remember their original shape and return back to its original shape when heated .Applications include shape memory stents – tubes threaded into arteries that expand on heating to body temperature to allow increased blood flow.	Learners in small groups to discuss and compare the uses of smart and modern, and compliant/resistant materials for production. **Exercise;** Write 10 examples of smart and modern materials.

		❖ Thermo chromic – These are the materials which change their color in response to changes in temperature. They have been used in bathplugs that change color when the water is too hot. ❖ Photo chromic – These materials change color in response to changes in light conditions. Uses include security ink sand dolls that 'tan' in the sun. ❖ Magneto rheological: it is a fluid that fluids become solid when placed in a magnetic field. They can be used to construct dampers that suppress vibrations. These can be used for buildings and bridges to suppress the damaging effects of,	
THURSDAY	Show Learners pictures and videos of how to care for smart and modern materials.	1. Demonstrate for the Learners to observe on how a smart and modern material is used. 2. Learners brainstorm to describe the applications of smart and modern materials. 3. Assist Learners to explain the importance of using smart and modern materials. **Applications of Smart Materials** ✓ Smart Materials in Aerospace Some materials and structures can be termed 'sensual' devices. These are structures that can sense their environment and generate data for use in health and usage monitoring systems (HUMS). To date the most well established application of HUMS are in the field of aerospace, in areas such as aircraft checking. ✓ Smart Materials in Civil Engineering Applications However, 'sensual structures' need not be restricted to hi-tech applications such as aircraft. They could be used in the monitoring of civil engineering structures to assess durability. Monitoring of the current and long term behavior of a bridge would lead to enhanced safety during its life since it would provide early warning of structural problems at a stage where minor repairs would enhance durability, and when used in conjunction with structural rehabilitation could be used to safety monitor the structure beyond its original design life. ✓ Its properties which enable them for civil engineering application are Repeated absorption of large amounts of strain energy under loading without permanent deformation. Possibility to obtain a wide range of cyclic behavior -from supplemental and fully reentering to highly dissipating- by simply varying the number and/or the characteristics	Through questions and answers, conclude the lesson. **Exercise;** State 5 importance of smart and modern materials.

		of SMA components. Usable strain range of 70% Extraordinary fatigue resistance under large strain cycles Their great durability and reliability in the long run. **STRUCTURAL APPLICATION OF SMART MATERIALS** ✓ Reducing waste Producers are forced to consider the entire life of a product at the design stage and customers are increasingly demanding more environmentally sensitive products. Innovative use of smart materials has the potential to reduce waste and to simplify recycling. ✓ Electronic waste – Electronic waste is the fastest growing component of domestic waste in the UK. Electrical equipment requires that it should be processed before disposal to remove hazardous and recyclable materials. Disassembly of product is expensive and time consuming but the use of smart materials could help to automate the process. Research in this active disassembly has been carried out by UK companies. Active Disassembly Research Ltd. One example uses fasteners constructed from shape memory materials that can self release on heating. Once the fasteners have been released, components can be separated simply by shaking the product. By using fasteners that react to different temperatures, products could be disassembled.	

Name of Teacher: **School:** **District:**