2021 Annual Teaching Plans

TECHNOLOGY

Senior Phase

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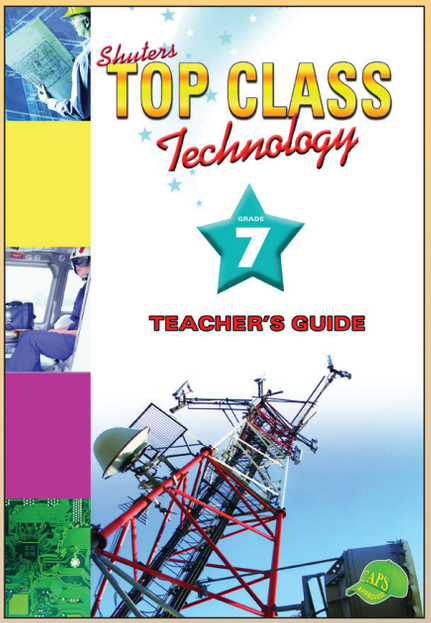
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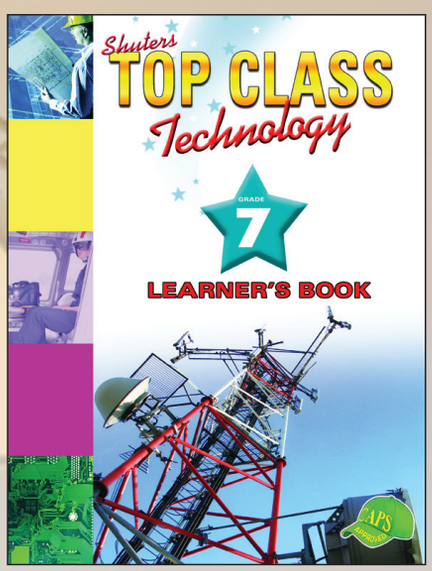
TEACHER'S GUIDE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LEARNER'S BOOK

Topic	Content	Time allocation	**Where to find it in** *Top Class Technology Grade 7*		
			Unit	LB	TG
Design Process Skills	**Introduction: what is technology?** • Definition scope – *who does technology in the 'world of work'?* • How we will be working – the development of a technology task • How we will be working – the development of a technology task – Design considerations – Fitness-for-purpose	Weeks 1–2	Unit 1: Design process skills	1–12	1–7
Communication Skills	**Introduction to graphical communication** • Purpose of graphics: develop ideas and communicate ideas • Conventions: outlines (thin/dark); construction lines (thin/feint); hidden detail (dashed) scale; dimensioning • Sketch: free-hand sketching • Working drawings: two-dimensional drawing of one face of an object using conventions (dark lines; feint lines; dashed lines; dimensions; scale). • Graphic techniques • 3D oblique: front view with depth at 45˚ (use squared 'quadrant' paper); oblique projection used to assist with interpretation, and with drawing single VP perspective	Weeks 3–4	Unit 2: Communication skills	13–25	8–13

Mechanical Systems and Control	**Simple mechanisms** • Levers – mechanical advantage: simple quantitative treatment – no calculations using moments. Examine the relationship between load, effort and their distances from the pivot. • First-class levers: characteristics (fulcrum/pivot placed between effort and load). • First-class levers may give a mechanical advantage or not – depending on pivot position. • Case study: first-class levers with mechanical advantage: ma > 1; ma = 1; ma < 1 **Second-class levers:** • Characteristics (load is placed between effort and fulcrum); give real examples. • Learners demonstrate models of second-class levers, which always give a mechanical advantage. • Third-class levers: characteristics (effort is placed between load and fulcrum): give real examples **Practical Investigation: Levers and linkages** • Examine simple linked first-class levers (e.g. pair of scissors; pair of pliers; hedge trimming shears). • Examine simple linked second-class levers (e.g. office punch, nut crackers). • Examine simple linked third-class levers (e.g. most office staplers, pair of tweezers). • Examine more complex linkages (e.g. linkages with more than one pivot)	Weeks 5–6	Unit 3: Simple mechanisms	26–33	14–20
			Unit 4: Investigation skills	34–38	21–25

Topic	Content	Time allocation	**Where to find it in** *Top Class Technology Grade 7*		
			Unit	LB	TG
Mechanical Systems and Control Impact of Technology Design Skills	**Scenario:** Impact of technology – emergency workers use "Jaws-of-Life" system to rescue trapped accident victims. **Pneumatics and Hydraulics** • Using pneumatics and hydraulics to obtain a mechanical advantage. **Practical Investigations: Teacher demonstration** • Force transfer between two equal syringes filled with 1) air and 2) water. • - Force transfer between two unequal syringes filled with 1) air and 2) water. • Learners develop a working model of a hydraulic-syringe powered, linked-lever rescue device using simple materials. • Write a design brief, specifications and constraints. • Draw a 3D drawing of the idea in oblique projection using dark and feint lines.	Weeks 7–8	Unit 4: Investigation skills	39–47	21–25
Design Skills	**Draw working drawing in 2D** showing one view with dimensions to scale	Week 9	Unit 2: Communication skills	13–25	8–13
Revision	Consolidation of work done in Term 1: • Class exercise on drawings • Class exercise on different classes of levers • Revision on pneumatics and hydraulics to give mechanical advantage	Week 10			

Structures Investigation Skills	Definition and purpose of structures to contain, protect, support, span. • Classification of structures: natural and man-made. • Types of structures: shell, frame, solid – learners complete a worksheet. • Investigate: a cell phone tower – a frame structure • Case study: examine existing towers strengthened by triangulation, including pylons, windmills and mine headgear.	Weeks 1–2	Unit 5: Structures	48–55	35–39
Structures Evaluation and Investigation Skills	Evaluate: worksheet on the advantages and disadvantages of telephone systems. Landline vs. mobile. learners complete a table Action research: to stiffen materials / structures • Practical activity 1 – Stiffen a structural material by tubing individual activity • Practical activity 2 – Stiffen a structural material by folding individual activity • Practical activity 3 – stiffen a frame structure by triangulation individual activity	Weeks 3–5	Unit 7: Action research: stiffen materials and structures	60–65	44–46
Structures Investigation, Impact of technology, Design Skills	• Case study: study photographs of existing cell phone towers noting structural elements, reinforcing techniques and design issues such as visual pollution, stability, base size and centre of gravity. • Class discussion: how designers consider the needs of society in terms of technology while considering the impact on society and on the environment. • Case study – existing designs 1: examine the features of a school desk; write the design brief with specifications for a school desk. • Case study – existing designs 2: examine an existing product (FM radio/cell phone), list its features and then write a design brief with specifications for that product	Weeks 5–6	Unit 5: Investigate a cell phone tower – a frame structure	56–59	35–39

Topic	Content	Time allocation	**Where to find it in** *Top Class Technology Grade 7*		
			Unit	LB	TG
Structures Design Skills	**Scenario**: Cell phone towers are everywhere and are built using materials to ensure stability, strength and rigidity (stiffness). • Write the design brief • Sketch initial ideas – Draw one idea using oblique projection – Draw the other idea using single vanishing point perspective.	Week 7–8	Unit 8: Investigating design issues	66–75	47–51
Design and Making Skills	Making: includes working drawings, choosing materials and tools • Each learner lists the resources to be used • Each learner draws a working drawing for the cell phone tower showing one face in 2D	Weeks 9–10		76–83	47–51
Revision	**Revise** challenging topics and or concepts of the term • More practical examples on stiffening structures • Strengthening by triangulation	Week 11			

Electrical Systems and Control Investigation Skills	**Investigate: What is magnetism?** • Practical investigation: Different types of permanent magnets – bar and horseshoe. • Practical demonstration by the teacher on magnetic and non – magnetic metals. • Case study: Recycling scrap metals	Weeks 1–2	Unit 9: Magnetism	84–87	61–63
			Unit 10: Testing materials and recycling	88–91	64–65
Electrical Systems and Control Investigation Skills	• Simple electric circuits. Demonstrate a simple electric circuit with an energy source (cell), switch, conductor and a light bulb or buzzer. Sketch the circuit showing how to use component symbols. • Circuit diagram: Each learner draw a circuit diagram using the correct symbols for components. • Demonstration lesson: A simple electromagnet. Make a simple electromagnet made by winding insulated copper wire around an iron nail. When an electric current flow in the wire coil (solenoid) a magnetic field is created and this is amplified by the iron core. Switching the current off causes the magnetic field to fade away. (Note: electromagnetism is a key to a wide range of technologies making up our modern world.)	Weeks 3–4	Unit 11: Simple electric circuits	92–99	66–71

Topic	Content	Time allocation	**Where to find it in** *Top Class Technology Grade 7*		
			Unit	LB	TG
Mechanical Systems and Control Design and Investigation Skills	Introductory lesson: All complex machinery consists of combinations of simple mechanisms. Machines can be designed to give the user a "mechanical advantage". • Introduce learners to cranks and pulleys • The crank – an adaptation of a second-class lever. • The pulley – a type of wheel and axle. • Revise: – What is mechanical advantage? – Strengthening frame structures	Weeks 5–6	Unit 12: Mechanical systems and control	100–107	72–76
Investigation and Design Skills	Learners must use their knowledge of structures and the drawing skills developed in earlier tasks, together with their new knowledge of magnetism, electric circuits and electromagnets, as well as their new knowledge of cranks and pulleys to design and make a crane using an electromagnet to sort metals in a scrapyard. • Case study: Examine pictures of cranes in order to get ideas to be used in the learner's own designs. • Write a design brief with specifications and constraints for a crane with electromagnet. • Sketch two possible designs for a suitable crane using single VP perspective. • Draw a circuit diagram for the electromagnet (with a light to show when it is on).	Weeks 7–8		108–116	72–76
Investigation and Design Skills	• Revision: Revise the 3D oblique drawing technique; line types; scale; dimensions. • Drawing: Each learner uses the oblique technique to draw an idea for the crane chosen from the two ideas sketched the previous week. The idea should be drawn on squared paper (quadrant) using pencil and ruler.	Weeks 9–10			
Electrical Systems and Control Design and Communication Skills	**Revision:** • Magnetism • Simple electric circuits • Crank and pulley • Mechanical advantage	Week 11			

Processing Investigation and Design Skills	• Learners investigate emergency situations that can lead to refugees: – Find out what situations commonly result in people becoming refugees. – Find out what initial problems are typically faced by refugees. – What mix of people will usually be present? – What are their needs for shelter? (Shelter will be addressed in the mini-PAT) – What are their needs for food and water? • Processing food: emergency food • Investigate the types of food that can be supplied to occupants of a refugee camp. • Design brief: learners write a design brief giving specifications of the types and quantities of food needed for a population of 100 refugees.	Weeks 1–2	Unit 13: Investigating emergency situations	117–123	85–89

Topic	Content	Time allocation	**Where to find it in** *Top Class Technology Grade 7*		
			Unit	LB	TG
Processing Evaluation and Investigation Skills	• Design: List the ingredients of a meal that will be nutritious as well as tasty, and which can be prepared under conditions likely to be found in a refugee camp • Write down the sequence of manufacture for the process of preparing one item from the meal described in weeks 1 and 2. • Learners investigate clothing worn by people in specialised occupations like the emergency services, e.g. fire department, NSRI or dangerous professions. Learners must investigate the following: – Find out what textiles are used to make the clothing worn by fire fighters, or – Find out what textiles are used to make the clothing worn by members of the NSRI.	Weeks 3–4	Unit 14: Processing food: Emergency food	124–128	90–95
			Unit 15: Clothing in specialised occupations	129–135	95–98
Processing Impact of technology Indigenous technology and investigation skills	**Scenario**: Tragic shack fires or natural disasters like floods or earthquakes or political strife may create the need for emergency shelters to be erected for the victims. • Investigate: Learners investigate materials and building techniques used by indigenous people for constructing housing in rural South Africa. Materials used in such construction is typically readily available, appropriate and environmentally friendly. • Investigate: Learners compare materials and building techniques used by people setting up informal settlements. They compare these materials to those used by indigenous builders in terms of suitability, availability and environmentally friendliness. • Investigate: Learners find out what chemicals can waterproof a textile like canvas. • Investigate: Learners find out about the burning characteristics of various textiles.	Weeks 5–6		136–147	99–111
Processing Design Skills	• Design brief: Learners write an appropriate design brief with specifications for producing • a textile suitable for use in making an emergency shelter. • Design: Learners sketch design ideas for an emergency shelter that can be transported to and erected at a site where people have become homeless.	Week 7			
Revision	Revise Term 4 content	Weeks 8–9			
	Revise year	Week 10			

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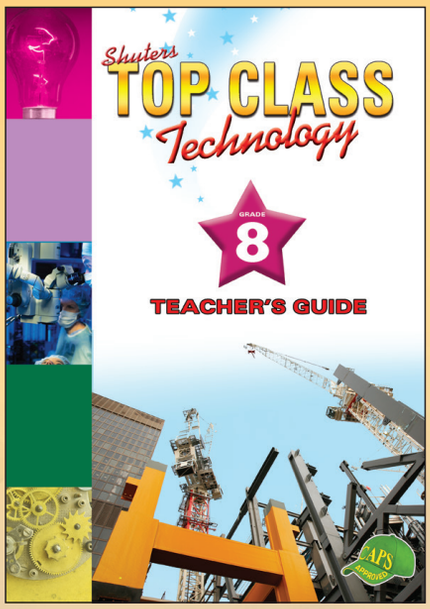
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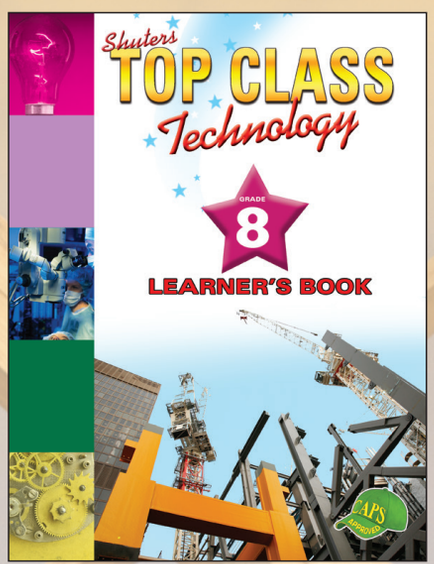
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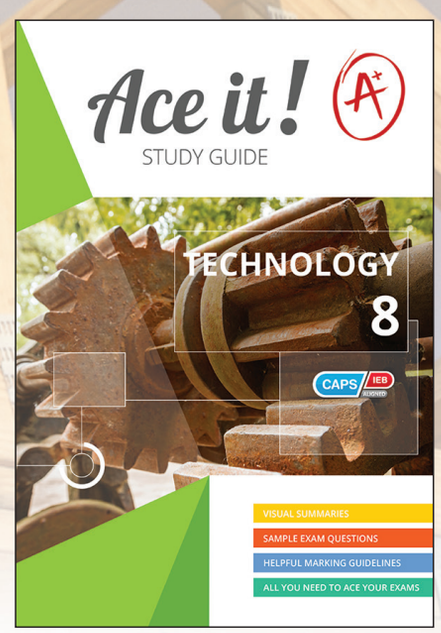
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Topic	Content	Time allocation	**Where to find it in** *Top Class Technology Grade 8*		
			Unit	LB	TG
Revision	• Learners complete the baseline assessment. • Teachers to discuss the content of the assessment with learners after completing the activity.	Week 1			
Structures	**Definition of frame structures.** • Purpose of structural members (components) in wood and steel roof trusses (king and queen post, strut, tie, rafter, tie beam). • Learners identify structural members and type of force (shear, torsion, tension, compression) acting on them in given frame structures. • Case study: Electrical pylons – use pictures of a range of pylon designs noting: • The variety of designs that solve the same problem effectively. • The use of internal cross-bracing and triangulation to provide stiffness. • Structural members under tension/compression (worksheet). **Structural members** • Structures that span over space: • Beams: steel I-beams (girders), concrete lintels; beam and column bridge. • Alternative bridge supports: suspension bridges; cable-stayed bridges. • Arches: arches in buildings, bridges, dam walls. • Cantilevers: simple cantilever, cable stayed cantilever. Structural failure – the three most likely ways structures fail are: • Fracture of a member – due to lack of strength • Bending (flexing, buckling) – due to lack of stiffness (rigidity). • Toppling over – due to lack of stability (top heavy, narrow base)	Weeks 2–3	Unit 1: Frame structures	1–13	1–7
			Unit 2: Structural members	14–27	8–16

Communication skills	• Purpose of graphics: develop and communicate ideas. • Conventions: outlines (thick/dark); construction lines (thin/ feint); hidden detail (dashed); centre lines (chain dash-dot); scaling up and scaling down; dimensioning (in mm). • Working drawing techniques for planning: – Single view flat 2D drawing with dimensions, line types and scale. – Isometric – using underlying isometric grid (term 1) and simple instruments (term 3). • Artistic drawing: Double vanishing point perspective with colour, texture and shading. – Sketching – using pencil, ruler and blank paper. – Enhancing drawing to promote realism using colour, texture, shading and shadows	Weeks 4–5	Unit 3: Communication skills	28–43	17–21
Mechanical systems and control	• Revision: mechanical advantage. Well-designed machines give "mechanical advantage". • All complex machinery consists of combinations of simple mechanisms. – The wedge: e.g. inclined plane or ramp, door wedge, knife blade, etc. – The wheel and axle: e.g. from bicycle to shopping trolley. • Gears**:** (wheels with wedges for teeth): – Show how meshing of two spur gears causes counter-rotation. – Show how introducing an idler gear between two spur gears synchronises rotation of the driver and driven gears. • Gear ratios: – Show how different sized gears result in a change in the velocity ratio as well as an 'opposite' change in the force ratio – *if force increases, speed decreases, and vice versa*. • Mechanisms that change the direction of movement: – The Cam: show how a cam converts rotary motion into reciprocating motion. Compare an eccentric wheel and a snail cam. – The Crank: an adaptation of a second-class lever. Show how a crank converts rotary motion into reciprocating motion. • Graphic skills: Learners draw an artist's impression of one of each of the above mechanisms (cam and crank) in their books using colour, shading and texture	Weeks 6–7	Unit 4: Mechanical systems and control	44–52	22–28

Topic	Content	Time allocation	**Where to find it in** *Top Class Technology Grade 8*		
			Unit	LB	TG
Programme of Assessment Task 1	Assignment: Investigate and Design Learners work individually to design a structure utilising required structural components and mechanisms to suit the context provided. • Evaluate: learners examine information on several complex structures and list advantages and disadvantages in the designs. • Design: initial idea sketches. • Design: design brief with specifications and constraints. • Make: a 3D isometric projection of the idea with dimensions and drawn to scale. • Make: a working drawing in 2D showing one view with dimensions and line types. • Communicate: Individual presentations of plans. • Communicate: a sketch enhanced using two of colour, texture or shading	Weeks 8–10		53–61	29–37

Processing Investigation Skills	**The positive impact of technology:** many natural materials have been replaced in modern times by new or improved materials. Some new materials are environmentally friendly by being bio-degradable. • Case study 1: investigate the impact of plastic shopping bags on the environment. • Report: learners write a report evaluating the effectiveness of using thicker, bio-degradable plastic shopping bags which shoppers must buy	Weeks 1–2	Unit 5: The impact of technology	62–68	38–41
Investigation Skills Designing Skills	**Case study 2:** technology with a positive impact on society. • Investigate how wastepaper and cardboard are recycled to produce new products for the packaging industry. • Development: draw a development of an opened container. • Practical activity: a product requires packaging. Design various packaging for different purposes. The nature of the product determines the design and properties of the packaging material.	Weeks 3–4	Unit 6: Technology with a positive impact on society	69–75	42–46
Impact of technology Investigating Skills	**Case study 3:** technological products can have a negative impact • Investigate a technological product that can have a negative impact on society. • Class discussion: facilitate a class discussion on possible solutions that can counteract or compensate for the negative impact of the technology identified	Weeks 5–6	Unit 7: The negative impact of technological products	76–80	47–49

Topic	Content	Time allocation	**Where to find it in** *Top Class Technology Grade 8*		
			Unit	LB	TG
Structures Processing	**Revise:** forces that act on material – tension; compression; bending; torsion; shear. • Adapting materials to withstand forces – reinforcing concrete, plywood. • Selecting metal sections (I-beam, angle iron, T-bar, etc.) to withstand forces and to save material	Weeks 7–8	Unit 8: Structures	81–86	50–52
Design and Making Skills	Design: learners adapt a material or design a product that will solve the problem or reduce the impact or negative effects of the technology identified. • Design: learners sketch free-hand sketches showing two possible solutions. • Make (drawing): learners draw their chosen solution in 3D using isometric projection	Weeks 9–10		87–94	53–59
Revision	Revise challenging topics and or concepts of the term: • Practice more examples on developments • Types of forces • The negative impact that material have on the environment.	Week 11			

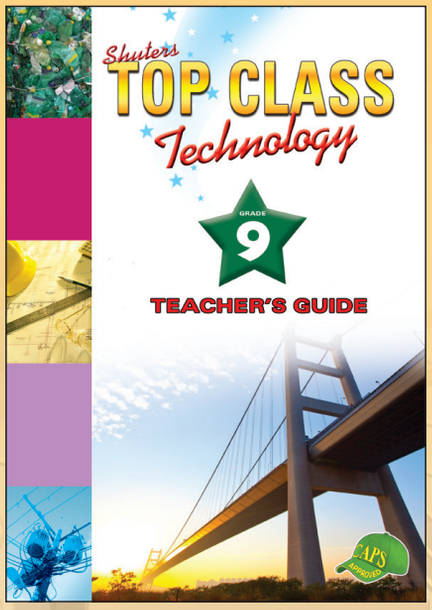
Mechanical Advantage Investigation Skills	**Calculate Mechanical advantage (MA)** • Levers: mechanical advantage calculations for levers using ratios. • Calculations using LOAD/EFFORT; load ARM/effort ARM; etc. • Gears: mechanical advantage calculations for gears using ratios. • Calculations using tooth ratios; gear wheel diameters; velocity ratios.	Weeks 1–2	Unit 10: Mechanical advantage calculations	107–114	65–69
Mechanical Systems and Control Communication Skills	**Represent gear systems graphically:** use circular templates and/or pair of compasses to draw gear systems with: • The driven gear rotating in the opposite direction to the driver (counter rotation). • The driven gear rotating in the same direction to the driver (include an idler gear). • The driven gear rotating faster than the driver (with and without an idler). • The driven gear rotating slower than the driver (with and without an idler). **Design brief**: learners write a design brief with specifications for a device that will use a combination of gears to achieve: • A mechanical advantage with force multiplication of three times. • An increase in output velocity of four times.	Weeks 3–4	Unit 11: Communication skills – gear systems	115–128	70–76

Topic	Content	Time allocation	**Where to find it in** *Top Class Technology Grade 8*		
			Unit	LB	TG
Mechanical Systems and Control Design and Investigation Skills	**Sketches (2D) showing gear systems** that: • Provide an output force four times greater than the input force (MA = 4:1). • Provide double the rotation rate on a driven axle at 90o to the driver axle. **System analysis** – bicycle gear system • Analysis of the gears used on modern bicycles – terminology: master/slave or driver/driven; chain wheel; cogs. **Systems diagrams:** • Analyse a mechanical system by breaking it into input-process-output. • Draw a Systems Diagram for a gear system with a mechanical advantage of 4:1. • Plan a mechanical system to produce a specific output. • Systems diagram for a gear train with the driven gear rotating faster than the driver	Weeks 5–6	Unit 9: Levers and gear systems	95–106	60–64

Impact of Bias of Technology Indigenous Technology Investigation Skills	Investigate and report on one of the following: • INVESTIGATE: The impact on the environment as a result of mining of: Acid mine drainage • INVESTIGATE: The impact on the environment as a result of mining of: dust pollution from mine dumps on residential areas • INVESTIGATE: Iron age technology: Indigenous mining of iron in South Africa before the modern era • INVESTIGATE: Bias in technology: Gender bias in career choice / opportunities related to mining. • INVESTIGATE: Lifting mechanisms (wire rope-driven mine headgear) in use at South African mines for raising people and ore. Sketch: initial idea sketches to meet the requirements given in the scenario. Design brief with specifications and constraints	Weeks 7–8	Unit 12: Impact of technology and bias in technology	129–135	77–80
Investigation and Design Skills	**Drawings for the shaft headgear** – each learner draws a: • 3D isometric drawing of the selected design giving dimensions and drawn to scale. • 2D working drawing showing one or more views with dimensions and lines. • Budget: individual learners prepare a realistic budget detailing expected costs of constructing a real mine shaft headgear, detailing valid prices of materials and labour costs of the range of workers who would be involved in designing and building such a device	Weeks 9–10		136–150	81–86
Design and Communication Skills	**Revision:** • Mechanical advantage • Rotation direction of gears • Elements included in a design brief • Importance of budgeting	Week 11			

Topic	Content	Time allocation	**Where to find it in** *Top Class Technology Grade 8*		
			Unit	**LB**	**TG**
Electrical Systems and Control Design Skills	• Revise: simple circuit components; input devices (electrochemical cell; generator; solar panel), output devices (resistor; lamp; heater; buzzer; motor); control device (switches). • Correct connections: short circuits. Electrical components and their accepted symbols. • Drawing electrical circuits using accepted symbols	Weeks 1–2	Unit 13: Electrical systems and control	151–160	87–91
Impact of Biases of Technology Evaluation Skills	• Energy for heating, lighting and cooking in rural and informal settlements. • Energy from illegal connections; ethical issues; safety considerations. • Class discussion: equitable sharing of resources – industry needs reliable power for job creation; schools need power for lighting and computing. • Written report: Learners write a balanced report on these issues. • Electrochemical cells • Advantages and disadvantages of series and parallel batteries. • Photovoltaic cells - advantages and disadvantages of solar cells.	Weeks 3–4	Unit 14: Energy for heating, lighting and cooking	161–165	92–93
Electrical Systems and Control Impact of Technology	• Generate electricity for the nation: Advantages and disadvantages of: • Thermal power stations (steam turbines – sources of heat: coal, gas, nuclear, sun). • Hydroelectric power stations (including pumped storage schemes). • Wind-driven turbines. • Alternating current; step-up and step-down transformers; distributing electric power across the country: the national grid	Weeks 5–6	Unit 15: Electrochemical cells	166–170	94–96

Electrical Systems and Control Design Skills	• Practical: learners draw circuit diagrams & connect circuits showing the effect of circuits with resistors connected in series and parallel. • Investigation: AND logic gate and simple cases where it is used. • Investigation: OR logic gate and simple cases where it is used. • Lesson: truth tables for AND & OR logic conditions	Week 7	Unit 16: Generation of electricity	171–193	97–100
Revision	Revise Term 4 Content	Weeks 8–9			
	Revise year	Week 10			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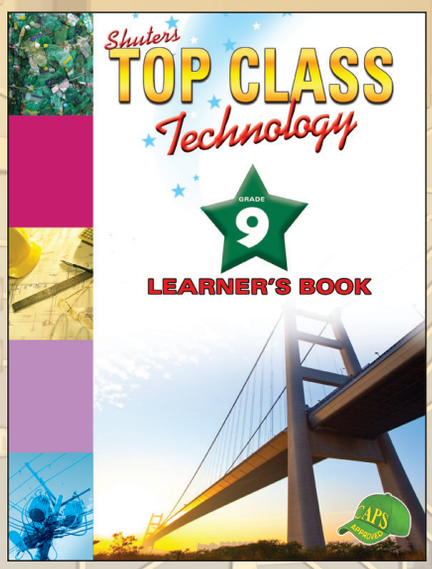
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Topic	Content	Time allocation	**Where to find it in** *Top Class Technology Grade 9*		
			Unit	LB	TG
Design	Learners complete the baseline assessment: • Conventions • Working drawing techniques for planning: – single view flat 2D drawing with dimensions, line types and scale – isometric – using underlying isometric grid	Week 1	Use **Top Class Technology Grade 7 and Grade 8**		
Design skills	• First angle orthographic projection: three-dimensional objects on flat paper. • Concept of drawing three different views: front, top and side. Simple cubes. • Line types: dark, feint, dashed, wavy, chain. Scale and dimensions. • More complex 3D objects drawn in orthographic projection with instruments. • Design problem: flight of stairs and wheelchair ramp. • Design brief specifying number of steps, height of stair risers, width and gradient of ramp, handrail, etc.	Weeks 2–3	Unit 1: First angle orthographic projection	1–10	1–7
	• Sketch the stair and ramp in 3D using isometric projection. • Draw a plan for the stair and ramp using first angle orthographic projection to an appropriate scale, using correct views, line types and dimensions according to convention.	Week 4	Unit 2: Design skills	11–16	8–11

Topic	Content	Time allocation	**Where to find it in** *Top Class Technology Grade 9*		
			Unit	LB	TG
Structures	• Forces can be static or dynamic, and loads can be even or uneven. • Strength of materials under the action of forces – metal cross-sections: • Tension (pulling); compression (pushing); bending of beams (compression and tension). • Torsion – using internal cross-bracing to resist twisting. • Properties of various construction materials: mass/density; hardness; stiffness; flexibility, corrosion resistance and prevention of corrosion.	Weeks 5–6	Unit 3: Structures	17–27	12–16
Investigation Skills Design Skills	**Investigate:** Provide the scenario so that learners can investigate the problem situation and various possible structures which could solve the problem(s) they identify. Analysis of existing products relevant to the identified problem in terms of fitness-for-purpose (including suitability of materials), safety for users, costs of materials and costs of construction. Realistic costs of real materials, labour, transport, etc. Textbook writers must supply useful resources for this. • Sketch initial ideas: each learner generates two possible ideas. • Evaluate and adapt: teams evaluate individual ideas and develop a final idea. • Design brief: learners write a design brief with specifications for the final idea. • Flow chart: teams discuss how to proceed, then each learner draws a flow chart.	Weeks 7–8		28–36	17–27
Making Skills Costing	• Working drawings: each learner draws the plan (or an aspect of the plan) using first angle orthographic projection with suitable scale, correct line types and dimensions. • Budget: costing of the "real-life" solution, including correct materials and labour costs Consolidation of work done in Term 1: • More examples of first angle orthographic drawings • Forces, strengthening of structures • Properties of construction materials • Design brief and budgeting	Weeks 9–10			

Mechanical Systems and Control Investigation Skills	• Revise: syringe mechanics using two equal sized syringes linked by a tube. • Force transfer between the syringes: – compressed air – pneumatic system – water – hydraulic system • Action research: learners experiment/teacher demonstrates with two different sizes of syringes linked by a tub and filled with hydraulic fluid. Learners experience force transfer with either force multiplication or force division. • Gases (like air) are compressible. Liquids are incompressible. Pascal's principle – pressure exerted on one part of a hydraulic system will be transferred equally, without any loss, in all directions to other parts of the system. • The hydraulic press (including simple calculations). • The hydraulic jack. • Investigation: Design considerations – fit-for-purpose: • Evaluate the design of the hydraulic jack. • Draw a systems diagram that describes how a hydraulic jack functions.	Weeks 1–2	Unit 4: Pneumatic systems and hydraulic systems	37–43	28–31
	• Action research: practical investigations: • Use a single wheel fixed pulley to change the direction of pull (MA = 1). • Use a single wheel moveable pulley to change the direction of pull (MA > 0). • Use a pulley block system (block and tackle) to determine the relationship between loadbearing ropes on moveable pulley wheels and M.A (force multiplication). • Investigate: learners find out about the following mechanical control systems: – Ratchet and pawl. – Disc brake. – Bicycle brake. – Cleat	Weeks 3–4	Unit 5: The hydraulic press and hydraulic jack	44–50	32–35

Topic	Content	Time allocation	**Where to find it in** *Top Class Technology Grade 9*		
			Unit	LB	TG
Mechanical Systems and Control Investigation Skills and Evaluation Skills	Lead learners as they revise the interactions of the following: • Spur gears of equal size counter-rotating. • Spur gears of unequal size counter-rotating – note velocity/force relationships. • Spur gears using an idler to synchronise rotation. • Lead learners as they find out about the interactions of the following: – Bevel gears of equal size – axis of rotation 90°. – Bevel gears of unequal size – axis of rotation 90° – note velocity/force relationships. – Rack-and-pinion gear system as found on automatic gates and steering racks. • Worm gear system for large reduction in speed and increase in force.	Weeks 5–6	Unit 6: Mechanical control systems	51–62	36–39
			Unit 7: Gears	63–70	40–42
Mechanical Systems and Control Investigation Skills Design and Making	Artistic Drawing: single vanishing point perspective. • Learners draw a 3D wooden object using single VP perspective. They enhance the drawing showing the texture of the wood grain, colour and shadows. • Learners use single VP perspective to draw an inside view of the classroom	Weeks 7–8	Unit 8: Evaluation skills and communication skills	71–80	43–45
Investigation and Design	Investigate the situation so that an appropriate machine can be designed to solve the problem, need or want given in the scenario. Investigate the possible mechanisms and controls to be used together to make the machine. • The design brief: each learner writes his/her suggestion for the design giving specifications and constraints. • Sketches: each learner produces two sketches of viable possible designs. And then decide on a final solution • Plan: working drawings • Learners produce drawings for their model/prototype using first angle orthographic projection. • Each learner draws a plan of the design OR, if it is very complex, one or more aspects of the design. Each learner must demonstrate her/his competency in using this drawing technique.	Weeks 9–10		81–89	46–54

Electrical Systems and Control Investigation Skills	**Revise 1: Component symbols** • Cells in series and parallel. • Lamps in series and parallel. • Switches in series (AND logic) and parallel (OR logic). • Current in the circuit – conventional current flows from positive to negative. **Revise 2: Simple circuits** • One cell, switch, two lamps in series. • Two cells in series, switch, two lamps in series. **Ohm's Law quantitatively:** *as voltage increases, current increases if resistance is constant.* Action research: testing Ohm's Law practically – measure the voltage (potential difference) and the current strength in each of the following circuits: – One cell connected to a 20W resistor – note the voltmeter and ammeter readings. – Two cells connected to the 20W resistor – note the voltmeter and ammeter readings. – Three cells connected to the 20W resistor – note the voltmeter and ammeter readings – Plot the readings on a graph and determine the relationship between potential difference and current strength while keeping the resistance constant	Weeks 1–2	Unit 9: Electrical systems and control	90–96	55–58

Topic	Content	Time allocation	**Where to find it in** *Top Class Technology Grade 9*		
			Unit	LB	TG
Electronic Systems and Control Investigation Skills	**Calculate values** • Switches: Manual switches controlled by the user, e.g. Push SPST, SPDT, DPDT • Diodes and LED (Light Emitting Diode): • A diode is a component that allows current to flow in one direction only. • A LED allows current to flow in one direction only and also gives off light and is often used as an indicator that a circuit is 'ON'. Resistor colour codes: – Low value resistors often have their resistance value printed on them in numbers. – Higher value resistors are coded using coloured bands. The first three bands give the value of the resistor in ohms. The fourth band is an accuracy rating as a percentage.	Weeks 3–4	Unit 10: Resistor colour codes	97–100	59–62
Electronic Systems and Control Investigation and Design Skills	• Transistors: only npn-type will be used at this level. • A transistor is a device that can act as a switch and it can amplify a small current • Sensors – important input devices: • LDR (Light Dependent Resistor) – a component whose resistance decreases with light [dark: high resistance; bright light: – low resistance]. with light [dark high resistance; bright light – low resistance]. • Thermistor: a component whose resistance varies with temperature. Two types exist: – – + t: resistance increases with increasing temperature. – – – t: resistance decreases with increasing temperature. • Touch or moisture detector: a component that can be bridged using a 'wet' finger, thus completing the circuit, indicating the touch. • Capacitors: a component that can store and then release electrical energy. • Simple electronic circuits: • Learners draw simple electronic circuits. • A given circuit must be incorporated into the design of a device that will use the electronics to address the problem, need or want.	Weeks 5–6	Unit 11: Electronic components	101–106	63–66

Investigate: Electronic Systems and Control Investigation and Design Skills	• The design brief: Each learner writes his/her suggestion for the design with specifications & constraints. • Sketches: Each learner draws the circuit diagram. Each learner produces a sketch in 3D showing the device that will use the electronic circuit	Weeks 7–8	Unit 12: Simple electronic circuits	107–109	67–71
Making Skills	Plans: working drawings • The learners produce plans for their device/model/ prototype using first angle orthographic projection. The plans should include a 3D "assembly" drawing in exploded view showing how the model fits together. • Each learner draws a working drawing of the design OR an aspect of the design.	Weeks 9–10		110–114	72–77
Revision	Revise Term 3 work	Week 11			

Topic	Content	Time allocation	**Where to find it in** *Top Class Technology Grade 9*		
			Unit	LB	TG
Processing: Indigenous technology Design skills	**Preserving metals** • Three methods: – Painting – Galvanising – Electroplating **Preserving food** • Three methods theoretically: – Storing grain – Pickling – Drying and/or salting	Weeks 1–2	Unit 13: Preserving metals	115–121	78–80
Processing Investigation and Design Skills	**Types of plastics and their uses** • Investigation: identification of plastic identifying codes and sorting for recycling. **Properties of plastics** • Reduce – reuse – recycle CASE STUDY: Remanufacturing waste plastic into pellets for re-use. • Systems diagram: Draw a systems diagram describing a plastics recycling project. • Case study: Moulding recycled plastic pellets into products. **Problem identification:** learners identify a need or want that can be satisfied by the making of a plastic item of their own design.	Weeks 3–4	Unit 15: Types of plastics and their uses	129–134	85–87
Processing Design Skills	• Case study: plastics used on modern motor cars. • Case study: plastics used around the home.	Weeks 5–6	Unit 16: Remanufacturing waste plastic into pellets for reuse	135–138	88–90
Design Skills	• Sketch: learners sketch their plastic item using isometric projection on grid paper. • Plan: learners draw their plastic item using first angle orthographic projection	Weeks 7–8		139–146	88–90
Revision	Controlled test	Weeks 9–10			

PROGRAMME OF ASSESSMENT

Grade 7		
Term	**Assessment task**	**Page references**
1	PAT 1	LB page 39 TG page 26
2	Controlled test	LB page 76 TG page 52
3	PAT 2	LB page 136 TG page 77
4	Controlled test	LB page 136 TG page 99

Grade 8		
Term	**Assessment task**	**Page references**
1	PAT 1	LB page 53 TG page 29
2	Controlled test	LB page 87 TG page 53
3	PAT 2	LB page 136 TG page 81
4	Controlled test	LB page 180 TG page 101

Grade 9		
Term	**Assessment task**	**Page references**
1	Investigation	LB page 28 TG page 17
2	Controlled test	LB page 81 TG page 46
3	Investigation	LB page 110 TG page 72
4	Controlled test	LB page 139 TG page 91

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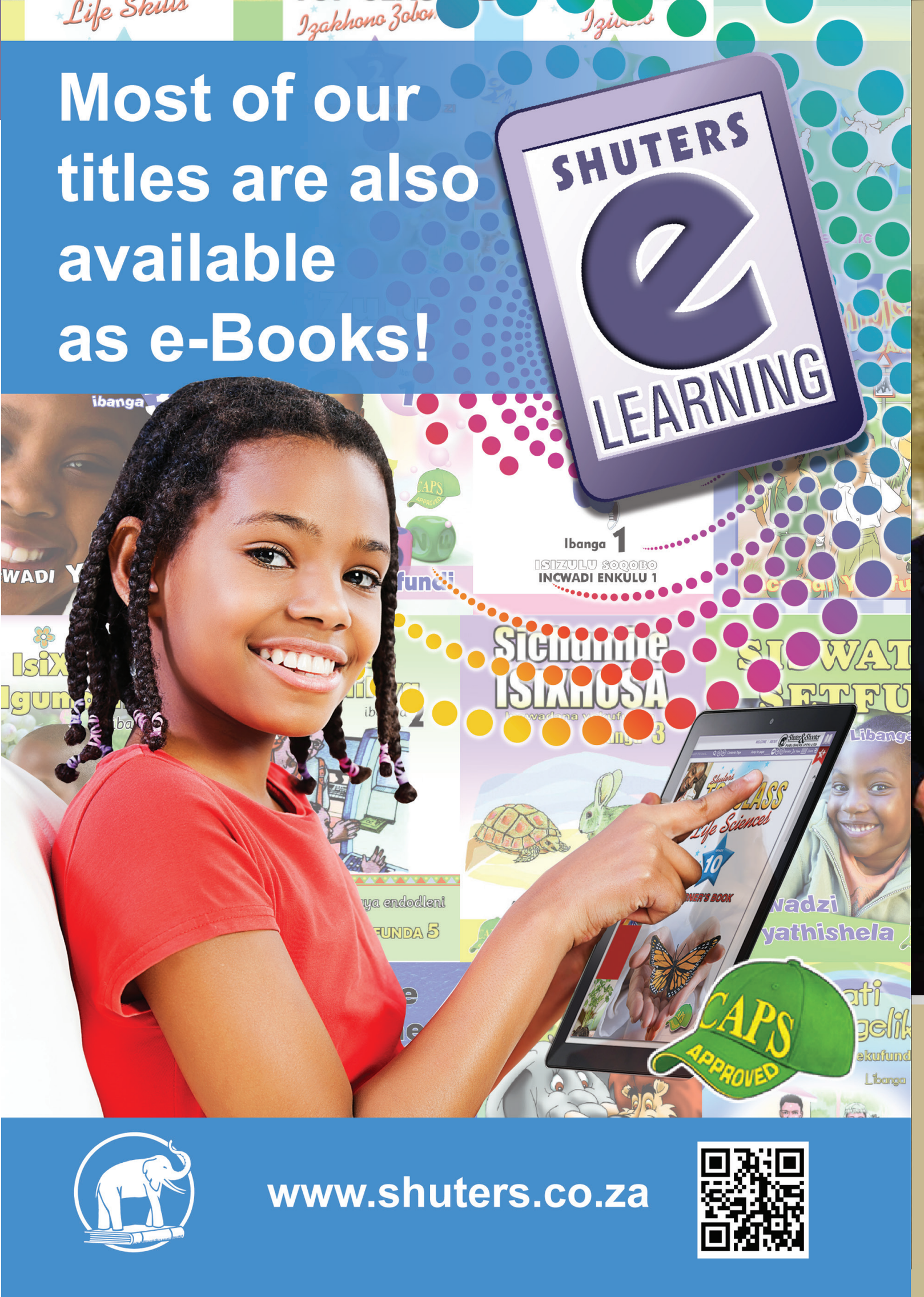

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