STEM LABORATORY FOR SCHOOLS IN GANDAKI PRADESH AND BEYOND

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SUMMARY

Integrated STEM education based on an interdisciplinary approach has gained popularity in recent decades. For the implementation of STEM education in academia, STEM Labs are the foundation where students will get hands-on experience and develop necessary skills. In the context of Nepal, STEM education STEM Lab is still very unfamiliar terms in the teaching-learning sector which might be due to negligence or lack of awareness. This master plan is designed to promote STEM education integration in the academic sector and strengthen the Laboratory settings of schools of Gandaki Province. The report has summarized the essential components for developing a STEM Lab in Nepal, STEM Club formation and its objective, and curriculum for training trainers on STEM Lab. Guidelines for design, sample floor plan, the detailed material list required for lab with cost estimation are described briefly in this report. Evaluation parameters for overall STEM performance have also been highlighted in this report. Therefore, this report will be an essential document to guide the academic sector regarding STEM laboratory design, the implication of stem club formation, and organizing training for teachers, which cumulatively become a driving force for STEM education in Nepal.

INTRODUCTION

With the advancement of Science and Technology around the globe, the momentum of the interdisciplinary workforce has been increasing in recent times. STEM education is a multidisciplinary approach to learning where rigorous academic concepts are coupled with real-world lessons as students apply Science, Technology, Engineering, and Mathematics in contexts that make connections between school, community, work, and the global enterprise enabling the development of STEM literacy. STEM emphasizes collaboration, communication, research, problem-solving, critical thinking, and creativity skills that students need to succeed in today's world regardless of specific interests or career goals. Many studies have suggested Integrated STEM as a distinct subject possibly taught using project-based learning, problem-based learning, and community-based after-school programs and through the formation of STEM education centres. STEM Labs are meant to provide hands-on learning experiences to the students who can fit with the existing curriculum. The collaborative and cooperative laboratory learning environment has the potential to support knowledge construction. The current science laboratory mainly comprises a 'cookbook' procedure for students to follow without engaging them in thinking and reflecting to make sense of the activities. But the laboratory activities should be more 'hands-on' and 'minds-on' for developing students' conceptual understanding effectively, where 'Hands-on' denotes the manipulation of physical objects and 'minds-on' implies thinking to relate observations to fundamental scientific ideas. Studies have highlighted the increasing trend of the STEM approach over the last fifteen years and most of the articles have discussed the importance of training for teachers. Professional development for teachers and proper training in STEM education is the driving force of STEM education. Hence, the focus on in-service programs and specific training for subject knowledge, inquiry-based interactive teaching methodologies, technology-friendly skills, and knowledge assessment practices to meet the teacher's current needs is of great importance. In Nepal, the traditional mono-disciplinary approach is more prevalent in the academic sector, due to which the STEM lab concept still becomes an untapped notion for schools. Therefore, it becomes necessary to emphasize the integrated STEM approach and STEM Lab design for the schools in Nepal to meet the global challenges of the 21st century.

GUIDELINES FOR LABORATORY

1. ROOM REQUIREMENTS

Size

The laboratory should be designed to accommodate 24 students, excluding teachers. The laboratory floor area should be 43 square feet for each student. The minimum standard area should be 1032sq. feet.

1.1 Doors

Each room should have a main entrance and an emergency exit. The doors should have ventilation on their top. The width of the emergency exit should not be less than 3 feet and 6 inches.

1.2 Windows

The recommended area of the openings is one-fifth of the floor area for proper natural lighting and ventilation. Windows should be provided on at least two sides of the room for appropriate natural light and ventilation. The sill level should be at least 2 feet 6 inches above the floor level, and the lintel level can be extended up to the beam.

1.3 Electricity

Concealed conduit wiring hidden inside the wall slots with the help of plastering. A single emergency shut-off switch in each science lab/classroom that will break all the circuits should be provided. The emergency switch shall be highly visible and be readily accessible to the teacher but not easily reached by students.

1.4 Plumbing

Open plumbing system on the surface of the wall. CPVC pipes of half-inch diameter can be used to supply water to each sink and a pipe of one-inch diameter can supply water to the showerhead. There should be two separate gate valves for supplying water to the sinks and the showerhead.

1.5 Gas supply

Branches from mains to each burner with check valves to prevent the reverse flow.

2. INTERIOR REQUIREMENTS

2.1 Furniture

2.1.1 Teachers Area

A raised platform should be made that can accommodate a teacher's desk and a chair. At the back, the writing board should be mounted on the wall. The recommended dimension of the teacher's desk is 5'X2'6 "X2'6".

2.1.2 student's desk and chairs

- **Desk**

  Costume-made wooden desk on wheels, metal framed with waterproof, chemical resistant Phenolic resin laminate top; commonly known as Formica on the market. Each desk should not be designed for more than four students. Following recommendations can be followed:

  Table Size: 6'X3'X2'6"'

  Edges: Round

  Surface finish: Formica laminates (1-1.3mm thick)

- **Chair**

  Costume-made wooden chair with a squared-shaped seat, metal legs, and two spindles (platform to rest legs) at a different height. A hole at the centre of the chair is recommended so that it can be lifted, holding from there. Sharp edges should be avoided. Following recommendations can be followed:

  Seat size: 14"X14"

  Height: 2'

2.1.3 Storage cabinets

At least four numbers of storage cabinets should be provided to store the materials of Physics, Chemistry, Biology, and DIY. Following recommendations can be followed:

Size: 5'X1'6"

Height: Full floor height, i.e., from floor level to ceiling

Material: wood

Opening type: sliding or hinged type with recessed handles

Depth of a shelf: not more than 12 inches

Biology Storage cabinets may incorporate specimen display racks.

2.2 Display Cabinets

A display cabinet should be provided to display various items for demonstration.

2.3 Exhibition/Writing Boards

Three to four numbers of movable boards should be provided. They can either be used as exhibition boards or as student writing boards.

2.4 Flooring

Cement concrete flooring or polyvinyl flooring can be used. Use of floor carpets should be avoided.

2.5 Ceiling

In the case of RCC structure, a normal cement concrete painted with suitable colour can be used, and in the case of truss structure, a false ceiling of plywood or Gypsum board can be used.

2.6 Paints

Paints that can be wiped clean will not readily absorb liquids and can prevent microbial growth are recommended. Emulsion vinyl paints and acrylic paints can be options.

2.8 Electricity Fixtures

At least six numbers of electrical outlets should be mounted on the walls. They should be near to the students working table.

2.9 Sanitary Fixtures

Single bowl sinks made of ceramic, steel, or polypropylene is recommended. There should be at least six numbers of sinks for the student. An additional sink may be provided to the teachers. These sinks should be near to the students working desks.

2.10 Burners

At least six Bunsen burners should be provided for the students. The burners should be placed in such a way that they are near to each student's working table. LPG can be used for supplying the gas to burners.

2.11 Fume hoods

Chemicals with significant inhalation hazards should only be opened inside fume hoods and experiments generating corrosive and toxic gases should only be performed inside fume hoods. A chemical fume hood with a ducted outlet or an exhaust fan for evacuating the gases accumulated in the hood should be used. There should be the provision of lighting inside the fume hood. A fume hood having storage cabins is recommended.

2.12 Preparation Platform

Preparation areas should have enough space for placing different practical equipment. Following recommendations can be followed.

Top width: 2'

Surface finish: Rough Ceramic tiles (50-70mm thick)

Height: 2’7”

Storage cabinets can be made below the work surface for storing chemicals and equipment.

3. SAFETY REQUIREMENTS

3.1 Fire Safety

There should be at least two fire extinguishers placed at two different locations inside the laboratory. Powder type ABC fire extinguisher is recommended.

Some woolen blankets should be stored so that they can be used for protecting persons during a fire and as fire inhibitors.

Sand should be stored in buckets for metal fire.

3.2 First Aid

Each laboratory should have a first aid kit consisting of essential medicines, antiseptic lotions, creams, bandages, sterilized cotton, Dettol, etc.

3.3 Shower and Eye Washes

Each laboratory should have a safety shower to protect persons from chemical splashes and burns and eyewash to flush away the hazardous substances into the eyes.

They should be within 25 feet of each working area.

There should be the provision of a continuous water supply for at least fifteen minutes once activated.

3.4 Waste Boxes

Various categories of wastes should be collected in separate boxes.

4. LAB UNIFORM AND SAFETY WEARS

4.1 Uniform

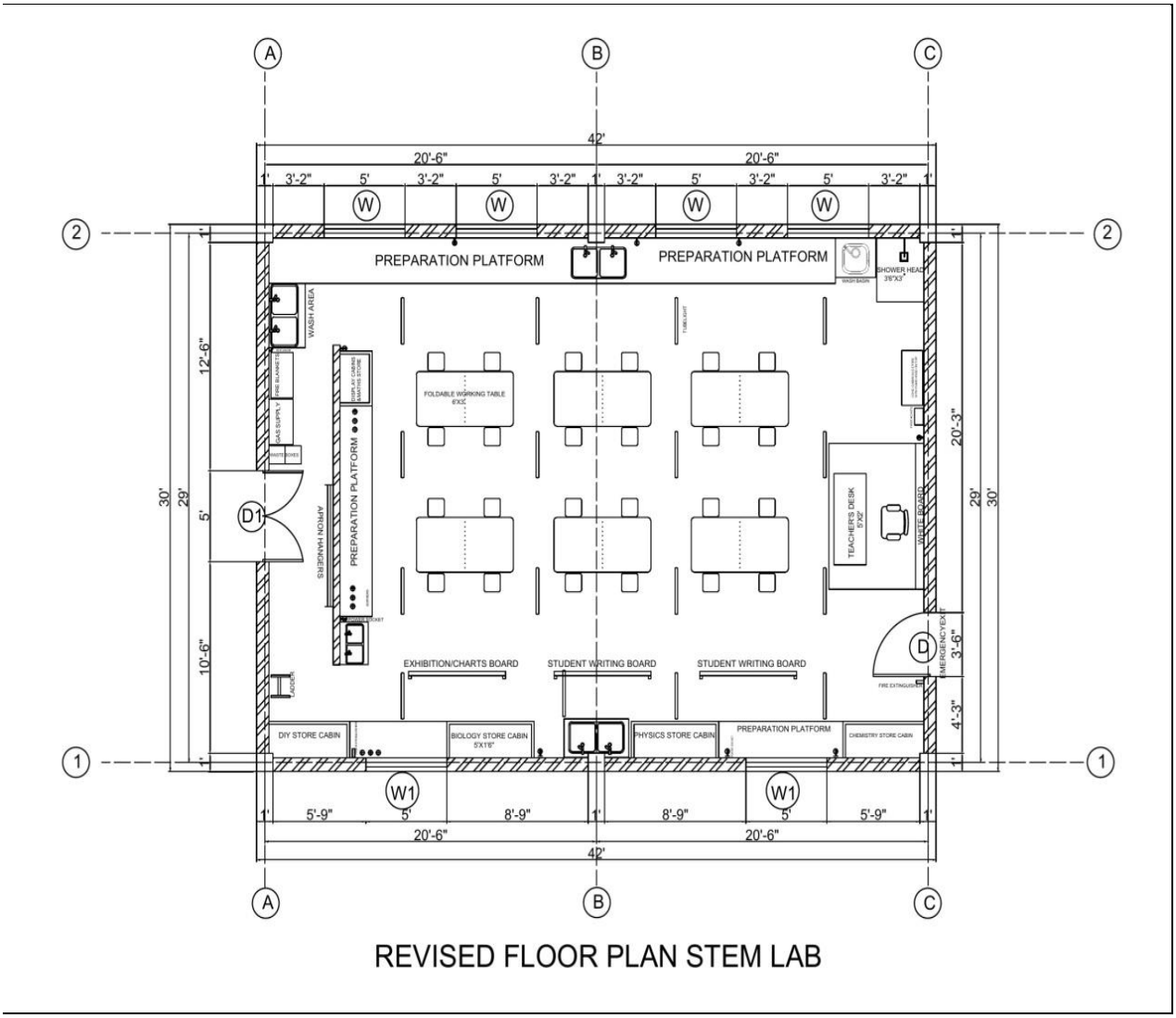
Before entering the laboratory, each student should compulsorily wear an apron. Coats and jackets can be hung on the apron hanger placed near entrances.

4.2 Safety Wears

While handling hazardous substances, everyone should wear masks, safety glasses, gloves, helmets, and PPEs.

Figure 1: Layout of a school-level STEM lab having all required facilities

Figure 2: Alternative layout of a STEM lab



REVISED FLOOR PLAN STEM LAB

Figure 3: Architectural floor plan of a STEM lab.

MATERIALS LIST

Materials required for conducting curriculum-based science practicals and STEM activities are categorized based on science disciplines, availability, reusability, cost, etc. This section consists of the following list of materials:

1. Materials for conducting Physics, Chemistry and Biology experiments.
2. Mathematics materials
3. DIY/STEM materials
4. Materials for low budget
5. Locally available materials
6. Consumable and non-consumable materials

All of these items are listed in **ANNEX I**

COST ESTIMATE

Summary of Estimates			
PCBM			
S.N	**Expenses Head**	**Amount**	**Remarks**
1	Physics	458025	
2	Chemistry	104115	
3	Biology	48290	
4	Mathematics	44450	
	Total	**654880**	
DIY			
S.N	**Expenses Head**	**Amount**	**Remarks**
1	Power Fabrication	193550	
2	Robotics	71420	
3	Hand Tools	31045	
4	Clamp Joint Measurement Tools	26100	
5	Stationeries	11310	
6	Electric Station	45550	
7	Safety Gears	18000	
	Total	**396975**	
Furniture			
S.N	**Expenses Head**	**Amount**	**Remarks**
1	All Furniture	**462000**	

Total Sum= 1562309

Note: VAT and other charges are not included in the costs.

2/3% of the total cost should be allocated for miscellaneous items.

NRs. Fifty thousand can be given to schools for items not included in the list provided that they justify the equipment required for STEM lab. This will provide options for the school to select their repective area of interst for innovation.

Tentative: 20 lakhs

Quantity is for a group of 24 students conducting experiments at a time.				
Physics Materials List for Class 4-10				
S.N	**Item Description**	**Quantity**	**Rate** (Rs.)	**Amount**
1	Astronomical telescope	1	14000	14000
2	Ball Bearing set	7	1500	10500
3	Ball Pen's Cylinder With stand	7	75	525
4	Bar Magnets 4 inch	14	400	5600
5	Bar Magnets 3 inch	14	350	4900
6	Bar Magnets 2 inch	14	220	3080
7	Barometer	1	1450	1450
8	Bathroom scale	1	2500	2500
9	Battery 6 volt	7	750	5250
10	Beaker of 250 ml	14	200	2800
11	Bulb with holder	7	300	2100
12	Bunsen burner with stop cock	7	600	4200
13	Burner spirit	7	150	1050
14	Calorimeter set	7	800	5600
15	Cardboard	13	25	325
17	Clinical thermometer	7	180	1260
20	Compass Needle small	7	275	1925
21	Compass Needle big	7	550	3850
22	Compound microscope	7	12000	84000
23	Concave mirror	15	70	1050
24	Conductor Wires(packet)	1	1800	1800
25	Connecting Wires(metre)	5	20	100
26	Convex lens	15	70	1050
27	Convex mirror	15	70	1050
28	Cork rubber	10	25	250
29	Cover lid	15		
30	Cover slip(packet)	1	1750	1750
31	Newton colour disc	7	1000	7000
32	Disposable syringes of 10ml	15	10	150
33	Drawing board	15	650	9750
34	Dropper	30	10	300
36	Dry cell	30	40	1200
37	Dynamo	2	1550	3100
38	Eclipse Model (electric)	2	6500	13000
39	Electric bulb	7	150	1050
40	Eraser	few	10	200

41	Eureka can	7	150	1050
42	Fibre Tape (30metre)	2	650	1300
43	Conical Flask-250ml	7	350	2450
44	Forceps	7	160	1120
45	Galvanometer	7	750	5250
46	Glass		4300	4300
47	Glass cutter	7	1200	8400
48	Glass Piece(per metre)	12	120	1440
49	Glass rod	15	40	600
51	Glass slab	7	180	1260
52	Glass Tube(per metre)	15	15	225
53	Graph paper	10	10	100
54	Graphite rod (pencil lead)	28	275	7700
56	Hair pins protractor	7	200	1400
57	Hand lens	7	425	2975
58	Hard board	7	1150	8050
59	Hygrometer(digital)	2	1800	3600
60	Iron dust	1	600	600
61	Iron fillings	1	600	600
62	Iron nails			
63	Iron rod			
64	Lab balance(digital)	1	9000	9000
65	Laboratory Thermometer(alcohol & mercury)	14	350	
66	LED bulbs	7	200	1400
67	Lever bar	7		
68	Lever set	7	400	2800
69	Lever stand	7		
70	Loads	7	850	5950
71	Magnet(unshaped)	7	300	2100
72	Magnets of various type	7	300	2100
73	Magnifying glass	7	425	2975
74	Masking tape	7	70	490
75	Masses 2.5kg	7	1500	10500
76	Maximum and minimum thermometer	2	750	1500
77	Measuring Cylinder 250ml	7	850	5950
78	Measuring Cylinder 500ml	7	1600	11200
79	Measuring Cylinder 1000ml	7	2600	18200
80	Measuring Tape(50metre)	2	1200	2400
81	Metal ball	7	150	1050

82	Model/chart of solar system	2	400	800
83	Molymod balls	2	2000	4000
84	Nylon rope	few	200	
85	Plane Mirror with stand	7	150	1050
86	Aluminium plane sheet	7	300	2100
87	Plane surface board	7		
88	Plastic thread	few	140	
89	Pliers	7	400	2800
90	Power pack	7		
91	Protractor	7	300	2100
92	Pulleys	7	1150	8050
93	Radio	1	1100	1100
94	Rain gauze with cylinder	1	1050	1050
95	Ray box	2		
96	Retort stand	7	750	5250
97	Rubber band	few	350	
98	Rubber cork (big and small)	few	45	
99	Rubber pad	7	75	525
100	Scissors	7	200	1400
101	Screw driver	7	750	5250
102	Screw nail	few	2	
103	Simple pendulum	7	1400	9800
104	Spade	1	550	550
105	Spool	7	150	1050
106	Spring balance	7	280	1960
107	Stand and clamp	7	750	5250
108	Stands	7	250	1750
109	Stop watch(digital)	7	500	3500
110	String (approx. 1m) length	few	20	20
111	Switch box	7	350	2450
112	Thermometre		380	0
113	Thin pins	2 pkt	2	
114	Thumb pins	2	25	50
115	Tongs	7	150	1050
116	Torch light bulb	7	30	210
117	Tracing paper	few	650	650
118	Triple beam balance	7	6500	45500
119	Tuning forks	7	1500	10500
120	Watch glass	14	40	560

121	Weather cock	1		
122	Weighing balance	2		
123	Weighing masses set	7	750	5250
124	White enamel coated tin can,	7		
125	White sheet of paper	few		
126	Wire (Insulated per kg.)	1	2250	2250
127	Wooden thermometer	7	350	2450
128	Wooden board (soft)	7		
129	Wooden splinter	few		
130	Wooden stand	7		
			TOTAL:	**458025**

Chemistry Materials List for Class 4-10				
S.N	**Item**	**Quantity**	**Rate**	**Amount**
1	Methanol (500ml)	2	750	4
2	Aluminium foil	1	650	650
3	Aluminium piece	few		
4	Aluminium wire	few	650	650
5	Ammonia Solution(500ml)	2		
6	Ammonium Chloride(500ml)	2	690	1380
7	Ash water			
8	Beaker			
9	Calcium Bicarbonate(500ml)	1	550	550
10	Camphor	1	525	525
11	Potassium hydroxide(500 gm)	1		
12	Common Salt(500gm)	1	400	400
13	Conical Flask(250ml)	7	300	2100
14	Conical Flask(500ml)	7	400	2800
15	Copper plate	14	125	1750
16	Copper sulphate	1		
17	Copper wire(red and black)	20	20	400
18	Delivery tube		1150	1150
19	Dil. HCL (500ml)	5	550	2750
20	Dilute Sulphuric Acid(500ml)	5	550	2750
21	Ethanol(500ml)	1	750	750
22	Filter paper packet	10	200	2000
23	Funnel	7	225	1575
24	Gas jar	7	250	1750
25	Glycerine(500ml)	2	1350	2700

26	Hard glass test tube	7	75	525
27	Hollow cylindrical pipes	few	75	75
28	Hydrochloric Acid(500ml)	2	1050	2100
29	Hydrogen Peroxide(500ml)	2	780	1560
30	Iodine Solution(500ml)	2	450	900
31	Kerosene (1ltr)	1	140	140
32	Lemon solution	1	750	750
33	Lie Big Condenser set	7	3600	25200
34	Calcium Carbonate(500gm)	2	575	1150
35	Calcium Hydroxide(500ml)	2	550	1100
36	Litmus paper set	3	1200	3600
37	Magnesium Bi-Carbonate(500gm)	1	650	650
38	Magnesium ribbon	2	275	550
39	Manganese Dioxide(500gm)	1	650	650
40	Methyl orange	2	320	640
41	Periodic table chart	2	450	900
42	Petri dish	7	225	1575
43	Phenolphthalein	2	320	640
44	Porcelain basin	14	65	910
45	Porcelain dish	14	200	2800
46	Potassium Permanganate(500gm)	1	1600	1600
47	Potassium Permanganate Crystal(500gm)	1	1600	1600
48	Quick Lime(500gm)	1	800	800
49	Round bottom flask	7	380	2660
50	Smoke box	7		
51	Soap Solution(5ltr)	1	400	400
52	Sodium Hydroxide(500gm)	2	750	1500
53	Sodium Nitrite(500gm)	1	750	750
54	Spatula	7	80	560
55	Splinter	few		
56	Sulphuric Acid(500ml)	2	1050	2100
57	Test tube	50	30	1500
58	Test tube holder	7	60	420
59	Thistle funnel	7	85	595
60	Tripod stand	7	350	2450
61	Washing soda			
62	Water trough	7	380	2660
63	Wire gauze	14		
64	Woulfe’s bottle	7	550	3850

65	Zinc(500gm)	1	1800	1800
66	Zinc dust	1	2050	2050
67	Zinc plate	14	125	1750
68	Bee hive shelf	7	75	525
			Total:	**102619**

Biology Materials List for Class 4-10				
S.N	**Item**	**Quantity**	**Rate**	**Amount**
1	Samples specimen of bat (mammal)	1	1250	1250
2	Blotting paper	5	15	75
3	Blue ink	1	40	40
5	Crab	1	450	450
7	Digital pan balance	2	4500	9000
8	Epithelial tissues permanent slides	3	65	195
9	Hookworm	1	400	400
10	Hydrilla	1	400	400
11	Leech	1	450	450
12	Leisman's stain	1	650	650
13	Millipede	1	550	550
14	Model of eye	1	750	750
15	Model of human digestive system	1	1300	1300
16	Model of human skeletal system	1	4300	4300
17	Mouse	1	400	400
18	Mucor	1	450	450
21	Permanent slide of stages of plasmodium	3	80	240
22	Permanent slide of stages of spirogyra	3	80	240
23	Permanent slide of stages of amoeba	3	90	270
24	Permanent slide of yeast	3	60	180
25	Pila	1	550	550
27	Prawn	1	450	450
28	Round worm	1	450	450
29	Safranin(125ml)	2	400	800
30	Sample specimens of earthworm	1	400	400
31	Sample specimens of spider	1	450	450
32	Samples of monocot and dicot plants	1	150	150
33	Samples of non-flowering plants	1	400	400
34	Samples of stages of life cycle of mosquito	2	650	1300
35	Samples specimens of snail	1	450	450
36	Samples specimens of amoeba	1	90	90

37	Samples specimens of euglena	1	90	90
38	Samples specimens of octopus	1	650	650
39	Samples specimens of paramecium	1	90	90
40	Samples specimens of starfish	1	650	650
41	Sea horse	1	1400	1400
42	Specimen of fish	1	450	450
43	Specimen of flying lizard	1	600	600
44	Specimen of frog	1	450	450
45	Specimen of insects	1	450	450
46	Specimen of lizard	1	450	450
47	Specimen of pigeon	1	2600	2600
48	Specimen of rat	1	550	550
49	Specimen of snake	1	1400	1400
50	Specimen of stages of life cycle of butterfly	1	1080	1080
51	Specimen of toad	1	550	550
52	Specimen of turtle	1		
53	Specimens of ascaris	1	500	500
54	Specimens of cycas	1	450	450
55	Specimens of hydra	1	450	450
57	Specimens of tapeworm	1	600	600
58	Specimens of some vertebrates	5	450	2250
59	Specimens of sponge	1	450	450
60	Specimens stages of life cycle of silk worm	1	1050	1050
61	Spirit (in litres)	5	420	2100
62	Spirit lamp	7	150	1050
63	Unio	1	550	550
64	Glass slide	20	15	300
			Total	**48290**

Mathematics Materials List for Class 4-10				
S.N	**Item**	**Quantity**	**Rate**	**Amount**
1	Abacus	2	2500	5000
2	Base 10 blocks	7	2000	14000
3	Dice	7	650	4550
4	Geo board	2	1250	2500
5	Geometric box	2	1550	3100
6	Measuring tapes	2	650	1300
7	Solid objects	7	2000	14000
			Total:	**44450**

DIY Materials				
Power Fabrication Tools				
S.N.	**Items**	**Rate**	**Quantity**	**Amount**
1	3d printer	80000	1	80000
2	3d printer filament	5000	1	5000
3	Blower	3500	1	3500
4	Circular saw	7500	1	7500
5	Cordless drill	6500	1	6500
6	Desktop computer	50000	1	50000
7	Drill bit set	3500	1	3500
8	Grinder cutter	250	6	1500
9	Grinder machine	3800	1	3800
10	Grinder wheel	250	6	1500
11	Hand drill	4200	1	4200
12	Jigsaw	6000	1	6000
13	Planer	6500	1	6500
14	Planer cutter	425	6	2550
15	Welding machine	10000	1	10000
16	Welding Rod 1 pkts	1500	1	1500
			Total	**193550**

Electric Station				
S.N.	**Items**	**Rate**	**Quantity**	**Amount**
1	2amp power supply	2500	2	5000
2	5amp power supply	9000	1	9000
3	Caster wheel	100	10	1000
4	Component rack	3000	1	3000
5	Extension cord	1000	4	4000
6	Forceps	100	2	200
7	Glue gun	500	4	2000
8	Glue gun sticks	20	35	700
9	Iron stand	250	4	1000
10	Multimeter	1500	2	3000
11	Solder flux	150	4	600
12	Solder paste	50	4	200
13	Solder sucker/pump	250	4	1000
14	Solder wire	125	10	1250

15	Soldering iron	650	4	2600
16	Soldering station	9000	1	9000
17	Table lamp	1000	2	2000
Total				**45550**

Robotics Station

S.N.	Items	Rate	Quantity	Amount
1	Arduino	1000	10	10000
2	Battery 1.5 v	15	10	150
3	Battery 12 v	1500	2	3000
4	Battery 6 v	1000	4	4000
5	Battery 9 V	60	4	240
6	Battery box 1.5	120	10	1200
7	Battery cap 9v	20	4	80
8	Battery charger	1500	1	1500
9	Battery Lithium 5400mah	6500	2	13000
10	Bluetooth module	500	5	2500
11	Bread board	200	5	1000
12	Buzzer module	450	5	2250
13	Capacitor	25	40	1000
14	Charger	600	1	600
15	Charger	600	2	1200
16	Development & assembly	3000	1	3000
17	Infra-red sensor	250	5	1250
18	Jumper Wire (strips)(MM-MF-FF)	600	3	1800
19	L293D motor driver	500	5	2500
20	LDR / piece	30	30	900
21	LED / piece	5	100	500
22	Matrix board	150	5	750
23	Resistor pkts	500	2	1000
24	Robot chassis	1600	5	8000
25	Robot motor	300	10	3000
26	Servo motor	500	5	2500
27	Ultrasonic sensor	500	5	2500
28	Wheel	200	10	2000
Total				**71420**

Hand Tools

S.N.	Items	Rate	Quantity	Amount
1	Adjustable wrenches	750	2	1500
2	Align key set	345	1	345
3	Ball peen hammer	475	2	950
4	Centre punch	150	2	300
5	Claw hammer	500	2	1000
6	Combination pliers	550	2	1100
7	Files set	1000	2	2000
8	Hacksaw set	350	2	700
9	Handsaw	550	2	1100
10	Metal cutter scissor	500	2	1000
11	Mini hacksaw set	500	2	1000
12	Nails different size			2000
13	Nose plier	550	2	1100
14	Nut and Bolts, Different size	1500	3	4500
15	Rubber mallets	425	2	850
16	Screwdriver set	1000	2	2000
17	Screwdriver Set (small)	300	2	600
18	Sheet metal hammer	450	2	900
19	Sheet metal shears	1150	2	2300
20	Spanner set	1500	1	1500
21	Thread cutting die	500	2	1000
22	Thread cutting tape	250	2	500
23	Wire snips	750	2	1500
24	Wire strippers	650	2	1300
Total				**31045**

Clamp Joint Measurements

S.N.	Items	Rate	Quantity	Amount
1	Bench vise 6"	6500	2	13000
2	Blind rivet	2000	1	2000
3	Carpenter's square	300	2	600
4	G clamps 2"	300	5	1500
5	Metric Tape 5m	100	4	400

6	Rivet gun	450	2	900
7	Spirit level	250	2	500
8	Spring clamp	100	2	200
9	Vernier caliper digital	3500	2	7000
Total				**26100**

Stationeries

S.N.	Items	Rate	Quantity	Amount
1	Adhesive tapes	450	10	4500
2	Colour paper (250)	560	1	560
3	Electrical tapes	20	10	200
4	Glue in Tube	250	6	1500
5	Masking tapes	80	10	800
6	Metal ruler long	125	6	750
7	Metal ruler small	100	6	600
8	Paper cutter	100	6	600
9	Scissor	100	6	600
10	Super glue	200	6	1200
Total				**11310**

Safety Gears

S.N.	Items	Rate	Quantity	Amount
1	Apron	600	10	6000
2	Gloves	500	10	5000
3	Helmets	400	10	4000
4	Protective glass	300	10	3000
Total				18000

STEM CLUB

परिचय:

विद्यार्थी र शिक्षक को समुह बाट स्टेम क्लब को गठन हुनेछ । क्लबका विद्यार्थीहरू कम्तिमा हप्ताको एक पटक भेला भई उपलब्ध औजार तथा उपकरण प्रयोग गरी विज्ञान, प्रविधि, ईञ्जिनीयरिङ, र गणितसँग सम्बन्धित समस्या हल गर्ने उपायहरूको खोजी गर्नेछन् । यसबाट विद्यार्थीमा अन्तर्निहित प्रतिभा प्रस्फुटनमा टेवा पुग्नुका साथै किताबी ज्ञानलाई व्यवहारमा उतार्ने कलाको अभ्यास गर्न गराउन सहज हुनेछ । शिक्षक-विद्यार्थी सिकाई भन्दा साथी-साथीबीच सिक्ने र सिकाउने वातावरणको विकास हुनेछ ।

यो क्लब ले विद्यार्थीहरुलाई विज्ञान र प्रविधिको माध्यमबाट व्यक्ति र समुदायको समस्या तथा चुनौतिहरूलाई नविन सोचका साथ समाधान गर्ने तथा विद्यार्थीहरूमा विज्ञान तथा प्रविधि सम्बन्धी अभिरुचिको विकास गर्नेछ ।

स्टेम क्लबको उद्देश्यस :

यो STEM CLUB ले विद्यार्थी-विद्यार्थीबीचको सिकाई सम्बन्धी अध्यापन विधिलाई अंगाल्दै निम्नलिखित उद्देश्यहरू राखेको छ:

१. विद्यार्थीहरूमा विज्ञान तथा प्रविधिको सिकाईको विकास गर्ने ।
२. विद्यार्थीहरूमा विज्ञान तथा प्रविधि बारे व्यक्तिगत अभिरुचिको विकास र प्रयोग गर्ने मञ्च उपलब्ध गराउने ।
३. विद्यार्थी-विद्यार्थीबीच र पदवर्ग रहित भावनाले सिकाई गर्ने संस्कारको विकास गर्ने ।
४. आविष्कारमूलक सिकाईको प्रवर्द्धन गर्ने ।

स्टेम क्लब को संरचना:

१ . शिक्षक

(Math Teacher, Science Teacher, Computer Teacher)- ३ जना

२ . विद्याथी

(Class 6, Class 7 , Class 8, Class 9, Class 10, Class 11, Class 12) – ७ जना

स्टेम क्लब सञ्चालन र कार्य सम्पादन

एक आपसबीचको सिकाईले पदवर्ग रहित सिकाई प्रणालीलाई प्रोत्साहन गर्नेछ जसमा विद्यार्थीहरू आफ्नो र आफ्नो साथीहरूको सिकाईका लागि आफैँ जिम्मेवार हुनेछन् । शिक्षकको अनुपस्थितिमा विद्यार्थीहरूले एकआपसमा अन्तरक्रिया गरी व्यक्ति विशेष र सामूहिक शैक्षिक लक्ष्यका निमित्त कार्यहरू गर्नुपर्नेछ । त्यसका साथै एकआपसबीचको सिकाई प्रणालीले विद्यार्थीहरूमा औपचारिक निर्देशन र मूल्याङ्कन नहुँदा पनि स्वयम् सिकाईप्रति जिम्मेवारी लिनका लागि प्रोत्साहन गर्नेछ । सामुदायिक विद्यालयहरुले यस प्रणालीबाट धेरै लाभ प्राप्त गर्न सक्दछन् । उदाहरणको लागि, विद्यार्थीहरूले साथीहरूलाई सिकाएर आफ्नै सिकाईलाई पनि सबल र टिकाऊ बनाउन सक्नेछन्; विद्यार्थीहरूले एकआपसबीच अन्तरक्रिया गर्दा खुलेर कुरा गर्न सक्नेछन्; र विद्यार्थीहरु स्वयंम्ले प्रबन्ध मिलाई समस्याको समाधान गर्न सक्ने क्षमता विकास गर्न सक्नेछन् ।

विद्यालयका STEM Club हरूले देहायबमोजिम कार्य सम्पादन गर्नुपर्नेछ:

१. प्रत्येक हप्ता कम्तिमा एक पटक भेट्ने र STEM Equipments को प्रयोग गरी विभिन्न परियोजनाको अन्वेषण गर्ने ।
२. STEM Equipments को प्रयोग गरी महिनामा एक पटक अन्य विद्यार्थीका लागि कम्तिमा एउटा कार्यशाला सञ्चालन गर्ने ।

स्टेम क्लबको अपेक्षित परिणामहरू

१. STEM Club का सदस्य वा विद्यालयका विद्यार्थीहरूले STEM का कार्यक्रम तथा प्रदेशस्तरीय STEM प्रतिस्पर्धामा सहभागिता ।

२. STEM Club का सदस्यहरूद्वारा शैक्षिक सत्रमा क्लब बाहिरका विद्यार्थीहरूका निमित्त कम्तिमा ५ वटा STEM कार्यशाला आयोजना हुने ।

३. विविध किसिमका सकारात्मक सिकाईका परिणामहरू हासिल गर्नेछ।

Evaluation and Monitoring:

It is essential to incorporate evaluation and monitoring into program design, from inception through delivery. Including evaluation in program planning in the early stages allows for adaption and improvements along the way. Formative assessment can inform program improvements, while summative assessment indicates whether programs meet their intended outcomes.

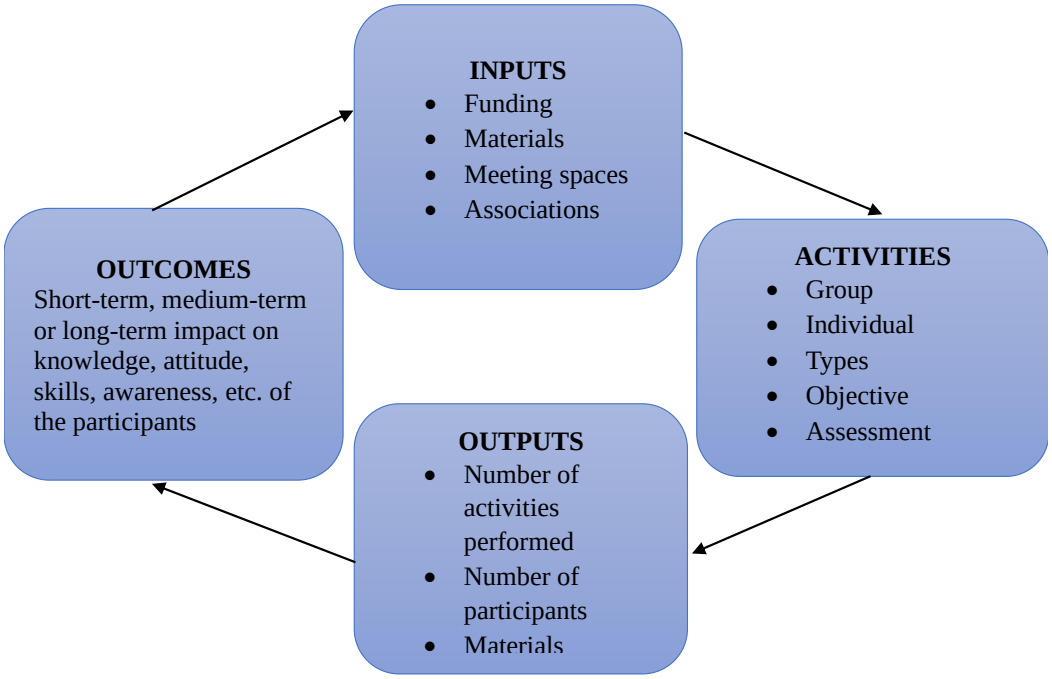


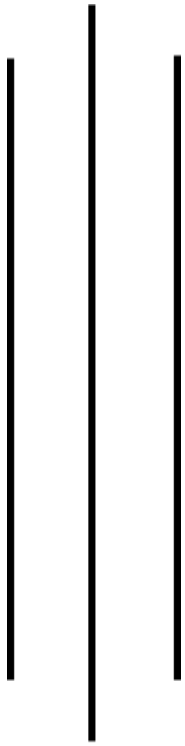
Figure: Logic-Model for Program Planning and Assessment

The evaluations of programs with short durations, such as week-long STEM programs, should focus on short-term outcomes (such as awareness, interest, attitudes, and program-specific knowledge) and intermediate outcomes (such as continued participation in STEM programs, STEM self-efficacy, and persistence in STEM through courses or future degrees). Shorter programs should be evaluated using brief and efficient data collection tools, such as short surveys and pre and post-activity questionnaires. Conversely, more extended programs can use a wider variety of data collection tools, including focus groups, longitudinal surveys, or student journal reflections.

To provide effective formative feedback and summative impact information to program stakeholders, it is necessary to design evaluation questions to understand whether the programs are meeting program-level and STEM education goals or not. The guiding questions for evaluation should be:

- What is the overall program impact on participants' confidence in STEM content knowledge, attitudes towards STEM, and intent to persist in STEM?
- To what extent are participants satisfied with their program experience?

Two-Days Teacher Training Program for STEM Lab



Gandaki Province
Pokhara
2078

1. **Training Background:**

Science, being a field of constant evolution, has now been on the track of combining Science, Technology, Engineering, and Mathematics (STEM) to apply innovative teaching strategies and advanced techniques into the classroom. Understanding scientific and mathematical principles with a working knowledge of technology and engineering are the features required in the future workforce. STEM labs are the foundation to implement STEM education by encouraging students to become active learners by getting into the practical approach of STEM and helping them develop skills for becoming competent leaders, innovators, and problem-solvers. Furthermore, it encourages students to develop a passion for science, technology, engineering, and math and engages them with new learning tools and techniques. However, the National curriculum of Nepal has been facing criticism time and again for its teacher-centered lectures, insufficient revision, and lack of contextual and practical approaches for teaching. Likewise, teachers lacking competency and comfort for adapting STEM is one of the major obstacles to getting this global STEM education in Nepal (Belbase S, 2019). Therefore, focusing on in-service programs and specific training for subject knowledge, pedagogy, and classroom management to meet the teacher's current needs is of great importance. Cumulatively, the training will improve teachers' understanding of how to plan, implement, and evaluate STEM Lab-related teaching methodologies and bring motivation to enhance teachers' performance and hence student's achievements in the academic sector of Gandaki Province.

2. **Training Goals:**

The goals of this training course are to encourage the teachers teaching up to the secondary level to

- develop skills and knowledge and implement the framework of STEAM education
- learn how to develop and integrate STEM Lab activities into the academic curriculum
- understand different types of STEM Lab activities their purpose with examples
- understand different teaching-learning methodologies for STEM education
- cultivate innovative and integrated pedagogy of STEM education in basic education

3. **Training Model:**

Model 1: STEM education

- Concept
- Purpose
- Worldwide Scenario
- Scope in Nepal

Model 2: STEM Lab

- Concept
- Purpose
- Worldwide Scenario
- Scope in Nepal
- Categorization
- Methods to evaluate students' performance

Model 3: Resource-Based Learning

- Concept
- Purpose
- Examples

Model 4: Technology Implementation

- Concept
- Purpose
- Tools for Learning
- Examples

Model 5: Problem-Based Learning

- Concept
- Purpose
- Examples

Model 6: Career and Technical Education (CTE)

- Concept
- Purpose
- Examples

Model 7: Community Engagement

- Concept
- Purpose
- Examples

Model 8: Effective STEM Learning Environments

- Effective STEM Classroom Design
- Necessary Skills

Model 9: STEM Lab activities and Challenges in Implementation

4. Training Plan:

Topic	STEM Lab
Target Participants	Teachers up to secondary level teaching in Gandaki Province
Training Rationale	Providing knowledge about STEM Lab design and implementation for integration into the current teaching profession
General Objective	To improve understanding of teachers for how to plan, implement and evaluate STEM Lab related teaching methodologies and bring motivation to enhance teachers' performance and hence students achievement
Specific Objectives	● To develop skills and knowledge and implement the framework of STEAM education ● To learn how to develop and integrate STEM Lab activities into the academic curriculum ● To understand different types of STEM Lab activities, their purpose with examples ● To understand different teaching-learning methodologies for STEM education ● To cultivate innovative and integrated pedagogy of STEAM education in basic education

5. **Session Plan:**

Day	Morning Session	Evening Session
1	Session 1 1. Program kick-off 2. Introduction 3. Understanding the Expectation 4. Examination Management 5. Pre-testing 6. Registration Session 2 7. STEM Education 8. STEM Lab	Session 3 9. Sharing of teaching experience and challenges faced 10. Classroom Exercise Session 4 11. Discussion with Experts
2	Session 5 12. Resource-Based Learning 13. Technology Implementation	Session 7 17. Effective STEM Learning Environments 18. STEM Lab activities and

	Session 6 14. Problem-Based Learning 15. Career and Technical Education (CTE) 16. Community Engagement	Challenges in Implementation Session 8 19. Discussion with Experts 20. Feedback/Comments

6. Training Method:

Different training methods include:

- Oral Presentations
- Multimedia Presentations
- Brainstorming Exercises
- Group or Individual Practices (Lab Demo)
- Question-Answer Sessions
- Group Discussions
- Observations

7. **Materials required for Organizing the Training:**

To increase the training program's effectiveness, the following materials will be used to present, practice, and discuss the training content: Multimedia Projector, Registration notebook, Working sheet, etc.

8. **Training Evaluation Tools and Methods:**

Classroom exercises and feedback forms will be used to evaluate the effectiveness of the training. Also, after every session, participants will be asked to summarize the topic.

9. Training Participants:

Teachers involved in teaching up to secondary level in Gandaki Province.

10. **Training Time Slot:**

The training program will be conducted for five days. There will be four sessions each day. Each session will be 90 minutes. So the total time for the training is 12 hours.

11. Facilitators for the training:

For the execution of the training, experts involved in Science and Technology familiar with the STEM education curriculum will be invited to educate the participants regarding STEM Lab. Based on the requirement, additional experts can also be involved.

12. Basic Principles for Organizing Training:

While organizing and managing the training program, essential subject matters should be considered. Training must be focused on developing skills and efficiency among the participants regarding scientific writing and practical exercise should be the priority.

The facilitator must practice the following norms while organizing the training:

- In every session, practical exercise should be of priority.
- Training should be organized under the subject matter given by the organization and the training method.
- During the training, participants' knowledge and performance should be considered.
- Training materials (PowerPoint slides, course material) should be provided earlier.
- If the training materials are sourced from any organization or individual, then they should be mentioned.
- At the end of the PowerPoint presentation, reference material should be noted.
- The session should be conducted based on the session plan.

13. Miscellaneous:

- Seating arrangements should be made based on the room availability and the number of participants.
- The second day should start with reviewing the first day's activity.
- Worksheets for the practical exercise should be kept ready.
- At the end of the day, all the discussion topics should be summarized.
- At the end of the training program, the entire subject matter of the curriculum should be summarized.

14. Daily Time-Slot

Day	Time	Activity	Remark
1	10:00-11:00	Program kick-off Introduction Understanding the expectation Examination Management Pre-testing Registration	
	11:00-13:00	STEM Education STEM Lab	
	13:00-14:00	Lunch Break	
	14:00-16:30	Sharing of teaching experience and challenges faced Classroom Exercise	
	16:30-17:00	Discussion	
2	10:00-10:30	Registration	
	10:30-13:00	Resource-Based Learning Technology Implementation Problem-Based Learning Career and Technical Education (CTE) Community Engagement	
	13:00-14:00	Lunch Break	
	14:00-16:00	Effective STEM Learning Environments STEM Lab activities and Challenges in Implementation	
	16:00-17:00	Discussion with Experts Feedback/Comments	

15. Training Syllabus

S.N.	Main Topic	Discussion Headings	Objective	Training Method	Remark
1	Registration, Program kick-off, Introduction, Understanding Expectations, Examination Management, Pre-testing, Registration				1 hour
Model 1: STEM Education					
2	Concept	● Four Pillars of STEM ● Framework for STEM integration in the classroom	To learn about the evolution of STEM education	Oral and Multimedia Presentation, Brainstorming Exercise, Group Discussion, Question-Answer Session, Observations	1 hour
3	Purpose	● Its need in the current teaching-learning era ● How is it different from the traditional education process? ● What are the areas of practicing STEM education?			
4	Worldwide scenario	● What are the teaching methodologies practiced worldwide under STEM ● What is the future prospects for STEM education?			
5	Scope in Nepal	● About programs conducted to date on STEM education in Nepal ● How STEM education can be made a popular practice in Nepal ● Scope areas			
Model 2: STEM Lab					
6	Concept	● Meaning ● How does the laboratory design support STEM education? ● Integrated STEM Lab ● Essential tools for laboratory setup ● General laboratory rules	To understand the need and how to integrate STEM Lab activities into the academic curriculum		1 hour
7	Purpose	● Needs of laboratory for STEM education			

8	Worldwide Scenario	● With the help of statistics ● What are the teaching methodologies practiced worldwide under the STEM lab approach			
9	Scope in Nepal	● About programs conducted to date on STEM education in Nepal ● How STEM lab can be made a popular practice in Nepal			
10	Categorization	● The basis for differentiating laboratory set up and their purpose			
11	Methods to evaluate students' performance	● Approach for evaluating STEM education effectiveness among students			
	Review of the First Day (15 min)				
Model 3: Resource-Based Learning					
12	Concept	● Its theory ● Resources required (multimedia, printed sheets, diagram, cartoon, library, weblink etc.)	To learn about resources required for STEM education		2 hour 30 min
13	Purpose	● Why is it needed? ● Examples			
Model 4: Technological Implementation					
14	Concept	● How technology can be used in making STEM Lab more effective ● Technological Tools useful in the teaching-learning process ● How to become technology-friendly and remain updated with new tools?	To understand the importance of technical skillset for teaching in 21st Century		
15	Purpose	● Why is it needed? ● Examples			

Model 5: Problem-Based Learning					
16	Concept	● How does it support STEM education? ● Steps for such learning			
17	Purpose	● Why is it needed? ● Examples			
Model 6: Career and Technical Education (CTE)					
18	Concept	● How is it related to STEM education ● Its working areas	To learn how to motivate students for making career goals		
19	Purpose	● Why is it needed? ● Examples			
Model 7: Community Engagement					
20	Concept	● Community Visioning and Design ● How does it support STEM education?	To know the importance of collaborative learning		
21	Purpose	● Why is it needed? ● Examples			
Model 8: Effective STEM Learning Environments					
22	Effective STEM Classroom Design	● Characteristics: ● Equipped ● Flexible Layout ● Organized ● Collaborative Connected	To develop knowledge regarding how the STEM learning environment can be designed		1 hour
23	Necessary Skills Required	● Modify and adjust your language: using a keyword like ‘plan,’ ‘deign,’ and ‘observe’ everyday ● Becoming Resourceful ● Interdisciplinary Instructions			

Model 9: STEM Lab activities and Challenges in Implementation					
24	Activities	• In the context of Nepal • CPR Technology (Writing, Calibration Training, and Peer Review) • Augmented Reality (AR) Technology	To learn the scope of STEM Lab design in schools of Nepal and what challenges are on the way		1 hour
25	Challenges and how to overcome	• Lack of Pedagogical Knowledge • Going Digital • Lack of Funding etc.			
	Review of all Training Models Discussion with Experts				1 hour

Feedback Form for teachers training on STEM Lab

1: Strongly disagree, 2: Disagree, 3: Neither agree nor disagree, 4: Agree, 5: Strongly agree

Statements	Rating				
	1	2	3	4	5
Training content was satisfactory					
Presenters delivered the subject material in a clear and structured way.					
Presenters maintained my interest throughout the presentation.					
Presenters responded effectively to the audience.					
Time utilization was impressive.					
Training has improved my information.					
This training will be helpful in my future career.					

Overall rating for the organization of the training.					

1. Did the workshop achieve its objectives?

Yes

No

If No, Why?

_____

_____

2. Which topic or aspect of the training did you find most interesting or useful?

_____

_____

_____

3. What are the strengths and weaknesses of the training?

Strengths	Weaknesses

4. Comments and suggestions (including activities or initiatives you think would be useful, for the future).

_____

_____

_____

_____

_____

7. Are you interested in receiving other educational materials/workshops or e-mail updates about such training?

Yes ☐ NO ☐

If yes, mention your E-mail ID

_____

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Monitoring and Evaluation of STEM Lab

Evaluation is a process that critically examines a program. It involves collecting and analyzing information about a program's activities, characteristics, and outcomes. Its purpose is to make judgments about a program, improve its effectiveness, and/or inform further programming decisions (Patton 1987). Evaluation is done to improve program design and implementation and demonstrate the program's impact. This is done in three stages; before the program starts, i.e., baseline survey, implementation, and effects. We can evaluate the program by periodically developing the questionnaire and feedback from students, teachers, and guardians. These will be the tools for change detection.

Monitoring is the regular observation and recording of a project or program activities. It is a process of routinely gathering information on all aspects of the project.

1) All the beneficiary institutes should regularly fill up the digital logbook on their computer and upload it to their web page.
2) That logbook should include how many teachers students have visited the lab, what they have performed, which discipline is more attractive to the students, how many hours the stem lab was used, what type of support they need to run the lab smoothly.
3) Summarization of all activities that happened in the lab.

See the format of the logbook below; school can add additional components for monitoring

STEM LAB Monitoring and Evaluation Inspection Report

The STEM club can maintain a logbook in the format given below for the STEM lab

To be filled before entering the laboratory					***To be filled after existing the laboratory***			
Date	Entry time	Name of Student/s	Name of Teacher/s	Activity/ Project work	Equipment Used	Challenges	Exit time	Comments /remarks

For each entry, a digital file copy should be created/maintained, and at the end of the month, these copies should be complied and should be uploaded to the webpage or cloud or submitted to the concerned office

Evaluation form

This form can be used for evaluating the stem lab. This inspection form aims to assess the condition and utilization of the STEM lab in the school at the specific inspection period

School Name: ……..
School address: ……
School Head:……..
STEM lab coordinator: ……
Date of Visit : ……..
Time of Visit: ……
Date: ……

1. Is the lab closed or open? ……..
2. Description of STEM lab.

Location: first floor or second floor or third floor

Size: …….Cleanliness: ……(check the surfaces)

Order of equipments: ……(are they kept at labbled compartments?)

Orientation of Classroom: …….

Record keeping

Is the logbook maintained regulary? …….. (Check the date of digital file)

Are all the items listed have been updated? ……..(tentative percentage of equipment from the list)

Stem club members roster is upto date? ……..(when was the last member included in the clup)

Any project or innovation in action? ……..(if yes, list the project title)

Safety

Are equipment's safely placed? ……..(if any missing, please mention)

Are fire extinguisher, safety aid available? ……..

Is someone reponsibile for regular lab safety training?

Are there any damaged wiring? ……..

Is workspace sufficient? ……

Comments, Corrective action and findings

Annex I

Materials and Equipment's List

Physics Materials List			
S.N.	**Item description**	**S.N.**	**Item description**
1	Astronomical telescope	39	Disc
2	Axe	40	Disposable syringes of 10ml
3	Ball-bearing	41	Drawing board
4	Ball pen's cylinder	42	Dropper
5	Balloon	43	Drum
6	Bar magnets	44	Dry cell
7	Barometer	45	Dynamo
8	Bathroom scale	46	Eclipse model or chart
9	Battery	47	Electric bulb
10	Bell	48	Eraser
11	Biscuit	49	Eureka can
12	Black enamel coated tin can	50	Fiber tape
13	Black strips of paper	51	Flask
14	Blade	52	Forceps
15	Bottle opener	53	Galvanometer
16	Brick	54	Glass
17	Bulb	55	Glass cutter
18	Bulb with holder	56	Glass piece
19	Calorimeter set	57	Glass rod
20	Candle	58	Glass rod
21	Candle wax	59	Glass slab
22	Cans	60	Glass tube
23	Cardboard	61	Graph paper
24	Cell	62	Graphite rod (pencil lead)
25	Clinical thermometer	63	Graphite rods
26	Coin (coated)	64	Ground glass
27	Colored glass	65	Gum,
28	Colored papers	66	Hair pins protractor
29	Compass needle	67	Hand lens
30	Compound microscope	68	Hardboard
31	Concave mirror	69	Hygrometer
32	Conductor wires	70	Ice cubes
33	Connecting wires	71	Inclined plane
34	Convex lens	72	Ink
35	Convex mirror,	73	Iron dust
36	Cork	74	Iron filings

37	Cover lid	75	Iron nails
38	Coverslip	76	Iron rod
S.N.	**Item description**	**S.N.**	**Item description**
77	Knife	119	Razorblade
78	Lab balance	120	Red ink
79	Laboratory thermometer	121	Retort stand
80	Ladder	122	Rods
81	LED bulbs	123	Rope
82	Lever bar	124	Rubber band
83	Lever set	125	Rubber cork (big and small)
84	Lever stand	126	Rubber pad, drum
85	Loads	127	Ruler
87	Magnet	128	Sample of dhiki
88	Magnets of various type	129	Sample of doko
89	Magnifying glass	130	Sample of janto
90	Masking tape	131	Sand
91	Masses	132	Scale
92	Maximum and minimum thermometer	133	Science book
93	Measuring cylinder	134	Scissors
94	Measuring tape	135	The screen made from a white sheet of paper
95	Metal ball	136	Screwdriver
96	Model / chart of eclipse	137	Screw nail
97	Model/chart of solar system	138	Sickle
98	Moly mod balls	139	Simple pendulum
99	Nail cutter	140	Spade
100	Needle	141	Spool
101	Nylon rope	142	Spring balance
102	Paper sheets	143	Stand and clamp
103	Pins	144	Stands
104	Plane mirror	145	Stapler
105	Plane sheet	146	Sterilized needle
106	Plane surface board	147	Sticks
107	Plastic bottle	148	Stop watch
108	Plastic cups	149	String (approx. 1m) length
109	Plastic thread	150	Strings
110	Plastic water bottle	151	Switch box
111	Pliers	152	Syringe
112	Ply wood	153	Table
113	Power pack	154	Table fan
114	Protractor	155	Thermometer

115	Pulleys	156	Thin pins
116	Radio	157	Thumb pins
117	Rain gauze	158	Ticking clock
118	Ray box	159	Tongs
S.N.	**Item description**	**S.N.**	**Item description**
160	Torchlight bulb	171	White sheet of paper
161	Tracing paper	172	Wiping cloth
162	Triple beam balance	173	Wire
163	TT ball	174	Wooden thermometer
164	Tuning forks	175	Wooden board (soft),
165	Watch glass or plate	176	Wooden piece
166	Weather cock	177	Wooden plank
167	Weighing balance	178	Wooden splinter
168	Weighing machine	179	Wooden stand
169	Weighing masses	180	Wooden stick
170	White enamel coated tin can,	181	Wool

Chemistry Materials List			
S.N.	**Item description**	**S.N.**	**Item description**
1	Alcohol (methanol)	26	Dil. HCL
2	Aluminum foil	27	Dilute sulphuric acid
3	Aluminum piece	28	Ethanol
4	Aluminum wire	29	Filter paper
5	Ammonia solution	30	Funnel
6	Ammonium chloride	31	Gas jar
7	Ash water	32	Hard glass test tube
8	Beaker	33	Hollow cylindrical pipes
9	Beaker of 250 ml	34	Hydrochloric acid,
10	Beehive shelf	35	Hydrogen peroxide
11	Bunsen burner	36	Incense stick
12	Burner	37	Iodine solution
13	Calcium bicarbonate	38	Kerosene
14	Calcium hydroxide	39	Lemon solution
15	Camphor	40	Lie big condenser
16	Caustic potash	41	Limestone (calcium carbonate)
17	Chalk powder	42	Lime water(calcium hydroxide)
18	China dish	43	Litmus
19	Clay	44	Magnesium bi-carbonate
20	Coke	45	Magnesium ribbon

21	Conical flask	46	Manganese dioxide
22	Copper plate	47	Methyl orange
23	Copper sulfate	48	Periodic table chart
24	Copper wire(red and black)	49	Petri dish
25	Delivery tube	50	Phenolphthalein
S.N.	**Item description**	**S.N.**	**Item description**
51	Porcelain basin	65	Sulfuric acid
52	Porcelain dish	66	Test tube
53	Potassium permanganate	67	Test tube holder
54	Potassium permanganate crystal	68	Thistle funnel
55	Quick lime	69	Thread
56	Round bottom flask	70	Tripod stand
57	Smokebox	71	Washing soda
58	Soap	72	Water trough
59	Soap solution	73	Wax
60	Sodium chloride	74	Wire gauze
61	Sodium hydroxide	75	Woulfe's bottle
62	Sodium nitrite	76	Zinc
63	Spatula	77	Zinc dust
64	Splinter	78	Zinc plate

Biology Materials List			
S.N.	**Item description**	**S.N.**	**Item description**
1	Bat (mammal)	25	Leishman's stain
2	Bean plant	26	Liver fluke
3	Blotting paper	27	Maize
4	Blue ink	28	Maize plant
5	Brophyllum	29	Match stick
6	Brush	30	Microscope
7	Butterfly	31	Millipede
8	Cactus	32	Model of eye
9	Carrot	33	Model of the human digestive system
10	Chicken muscle	34	Model of the human skeletal system
11	Cockroach	35	Mosquito larva and pupa
12	Cotton	36	Mouse
13	Cotton thread	37	Mucor
14	Crab	38	Mushroom
15	Dahila	39	Mustard plant
16	Earthworm	40	Octopus

18	Epithelial tissues permanent slides	41	Oiled paper
19	Ginger	42	Onion
20	Glycerin	43	Permanent slide of stages of plasmodium
21	Gram	44	Permanent slide of stages of spirogyra
22	Hookworm	45	Permanent slide of stages of amoeba
23	Hydrilla	46	Permanent slide of yeast
24	Leech	47	Pila
S.N.	**Item description**	**S.N.**	**Item description**
48	Pistia	78	Specimen of frog
49	Potato	79	Specimen of insects
50	Prawn	80	Specimen of lizard
51	Radish	81	Specimen of pigeon
52	Rajma	82	Specimen of rat
53	Rose stem	83	Specimen of snake
54	Roundworm	84	Specimen of stages of the life cycle of the butterfly
55	Safranin	85	Specimen of toad
56	Sample of stages of the life cycle of silkworm	86	Specimen of turtle
57	Sample of flowering plants	87	Specimens of maize
58	Sample specimens of earthworm	88	Specimens of Ascaris
59	Sample specimens of spider	89	Specimens of pea
60	Samples of monocot and dicot seeds	90	Specimens of cycas
61	Samples of flowering plants	91	Specimens of fern
62	Samples of monocot and dicot plants	92	Specimens of hydra
63	Samples of non-flowering plants	93	Specimens of liverwort/ moss
64	Samples of stages of the life cycle of the mosquito	94	Specimens of tapeworm
65	Samples specimens of mosquito	95	Specimens of some vertebrates
66	Samples specimens of snail	96	Specimens of sponge
67	Samples specimens of amoeba	97	Spirit
68	Samples specimens of euglena	98	Spirit lamp
69	Samples specimens of the housefly	99	Sugar

70	Samples specimens of mucor	100	Sugarcane stem
71	Samples specimens of mushroom	101	Sweet potato
72	Samples specimens of octopus	102	Tapeworm
73	Samples specimens of paramecium	103	Turnip/beetroot,
74	Samples specimens of starfish	104	Unio
75	Sea horse	105	Vegetable oil
76	Specimen of fish	106	Water hyacinth
77	Specimen of flying lizard	107	Water lily

DIY Materials			
S.N.	**Item description**	**S.N.**	**Item description**
Power fabrication tools		**Stationeries**	
1	3d printer	1	Adhesive tapes
2	3d printer filament	2	Color paper (250)
3	Blower	3	Electrical tapes
4	Circular saw	4	Glue tube
5	Cordless drill	5	Masking tapes
6	Desktop computer	6	Metal ruler long
7	Drill bit set	7	Metal ruler small
8	Grinder cutter	8	Paper cutter
9	Grinder machine	9	Scissor
10	Grinder wheel	10	Superglue
11	Hand drill	**Robotics station**	
12	Jigsaw	1	Arduino
13	Planer	2	Battery 1.5 v
14	Planer cutter	3	Battery 12 v
15	Welding machine	4	Battery 6 v
16	Welding rod	5	Battery 9 v
Electric station		6	Battery box 1.5
1	2amp power supply	7	Battery cap 9v
2	5amp power supply	8	Battery charger
3	Caster wheel	9	Battery lithium 5400 mah
4	Component rack	10	Bluetooth module
5	Extension cord	11	Bread board
6	Forceps	12	Buzzer module
7	Glue gun	13	Capacitor
8	Glue gun sticks	14	Charger
9	Iron stand	15	Charger
10	Multimeter	16	Development & assembly

11	Solder flux	17	Infra-red sensor
12	Solder paste	18	Jumper wire (strips)(mm-mf-ff)
13	Solder sucker/pump	19	L293d motor driver
14	Solder wire	20	Ldr / piece
15	Soldering iron	21	Led/piece
16	Soldering station	22	Matrix board
Safety gears		23	
1	Apron	24	Robot chassis
2	Gloves	25	Robot motor
3	Helmets	26	Servo motor
4	Protective glass	27	Ultrasonic sensor
S.N.	**Item description**	**S.N.**	**Item description**
Hand tools		**Clamp joint measurements**	
1	Adjustable wrenches	1	Bench vise 6"
2	Align key set	2	Blind rivet
3	Ball peen hammer	3	Carpenter’s square
4	Centre punch	4	G clamps 2"
5	Claw hammer	5	Metric tape 5m
6	Combination pliers	6	Rivet gun
7	Files set	7	Spirit level
8	Hacksaw set	8	Spring clamp
9	Handsaw	9	Vernier caliper digital
10	Metal cutter scissor		
11	Mini hacksaw set		
12	Nails different size		
13	Nose plier		
14	Nut and bolts, different size		
15	Rubber mallets		
16	Screwdriver set		
17	Screwdriver set (small)		
18	Sheet metal hammer		
19	Sheet metal shears		
20	Spanner set		
21	Thread cutting die		
22	Thread cutting tape		
23	Wire snips		
24	Wire strippers		

Materials for low budget

Chemistry Materials List			
S.N.	**Item description**	**S.N.**	**Item description**
1	Alcohol(methanol)	37	Magnesium ribbon
2	Aluminum foil	38	Manganese dioxide
3	Aluminum piece	39	Methyl orange
4	Aluminum wire	40	Periodic table chart
5	Ammonia solution	41	Petri dish
6	Ammonium chloride	42	Phenolphthalein
7	Beehive shelf	43	Porcelain basin
8	Blotting paper	44	Potassium permanganate crystal
9	Calcium bicarbonate	45	Quick lime
10	Calcium hydroxide	46	Round bottom flask
11	Camphor	47	Smokebox
12	Caustic potash	48	Sodium hydroxide
13	Chalk powder	49	Sodium nitrite
14	China dish	50	Spatula
15	Clay	51	Spirit
16	Conical flask	52	Spirit lamp
17	Copper plate	53	Splinter
18	Copper sulfate	54	Sulphuric acid
19	Copper wire(red and black)	55	Test tube
20	Cover lid	56	Test tube holder
21	Coverslip	57	Washing soda
22	Delivery tube	58	Water trough
23	Dil. Hydrochloric acid	59	Wax
24	Dilute sulphuric acid	60	Wire gauze
25	Ethanol	61	Wooden splinter
26	Gas jar	62	Wool
27	Glass tube	63	Woulfe’s bottle
28	Hard glass test tube	64	Zinc dust
29	Hydrochloric acid	65	Zinc plate
30	Hydrogen peroxide		
31	Iodine solution		
32	Leishman’s stain		
33	Lie big condenser		
34	Litmus paper and solution		
35	Magnesium bi-carbonate		
36	Magnesium ribbon		

Physics Materials List			
S.N.	**Item description**	**S.N.**	**Item description**
1	Astronomical telescope	41	Glass tube
2	Ball-bearing	42	Graphite rod
3	Bar magnets	43	Hairpins protractor
4	Barometer	44	Hand lens
5	Bathroom scale	45	Hollow cylindrical pipes
6	Battery	46	Hygrometer
7	Beaker of various sizes	47	Iron dust
8	Bottle opener	48	Iron filings
9	Bunsen burner	49	Iron nails
10	Calorimeter set	50	Iron rod
11	Cardboard	51	Laboratory thermometer
12	Cell(electric)	52	LED bulbs
13	Clinical thermometer	53	Lever bar
14	Compass needle	54	Lever stand
15	Concave lens	55	Magnets of different types
16	Concave mirror	56	Masking tape
17	Conductor wires	57	Masses
18	Connecting wires	58	Maximum and minimum thermometer
19	Convex lens	59	Measuring cylinder
20	Convex mirror	60	Measuring tape
21	Copper wire	61	Metal ball
22	Cork	62	Moly mod balls
23	Cover lid	63	Nylon rope
24	Digital balance	64	Plane mirror
25	Digital pan balance	65	Plane surface board
26	Disposable syringes of 10ml	66	Plastic bottle
27	Drawing board	67	Plastic cups
28	Dropper	68	Pliers
29	Dry cell	69	Power pack
30	Dynamo	70	Protractor
31	Eureka can	71	Pulleys
32	Fiber tape	72	Rain gauze
33	Flask	73	Retort stand
34	Forceps	74	Rubber cork (big and small)
35	Funnel	75	Rubber pad
36	Funnel	76	Ruler
37	Galvanometer	77	Safranin
38	Glass cutter	78	Screw driver

39	Glass rod	79	Screw nail
40	Glass slab	80	Simple pendulum

Mathematics Materials List			
S.N.	**Item description**	**S.N**	**Item description**
1	Solid objects	5	Base 10 blocks
2	Abacus	6	Measuring tapes
3	Dice	7	Geoboard
4	Geometric box		

Biology Materials List			
S.N.	**Item description**	**S.N.**	**Item description**
1	Compound microscope	9	Museum specimens of invertebrate animals
2	Epithelial tissues permanent slides	10	Museum specimens of vertebrates
3	Glycerin	11	Permanent slide of stages of plasmodium
4	Model of eye	12	Permanent slide of stages of spirogyra
5	Model of the human digestive system	13	Permanent slide of stages of amoeba
6	Model of the human skeletal system	14	Permanent slide of yeast
7	Model/chart of the solar system	15	Specimen of stages of the life cycle of the butterfly
8	Models of different biological specimens	16	Various charts

Materials List for DIY			
S.N.	**Item description**	**S.N.**	**Item description**
Power Fabrication Tools		9	Power supply
1	Band saw	**Hand Tools**	
2	Circular saw	1	Screwdriver set
3	Design and fabrication software	2	Combination pliers
4	Cordless drill	3	Nose plier
5	Drill bit set	4	Sheet metal shears
6	Drill press	5	Wire snips
7	Gas welding set	6	Wire strippers
8	Heat gun	7	Adjustable wrenches
9	Jigsaw	8	Spanner set
10	Planer	9	Ball peen hammer

Electronic Station		10	Claw hammer
1	Multimeter	11	Rubber mallets
2	Soldering iron	12	Sheet metal hammer
3	Solder wire	13	Thread cutting tap
4	Solder paste	14	Thread cutting die
5	Solder flux	15	Mini hacksaw
6	Desoldering Braid	16	Hacksaw
7	Solder sucker/pump	18	Files set
8	Helping Hand	19	Centre punch
S.N.	**Item description**	**S.N.**	**Item description**
Clamp Joint Measurement		6	Servo motor
1	C clamps(2 inch)	7	Battery (LiPo) 300 mAH
2	Bench vise (6 inch)	8	Battery charger
3	Adhesive Tapes	9	Jumper Wire(M-M)
4	Electrical Tapes	10	Bread board
5	Masking Tape	11	Buzzer module
6	Superglue	12	LED.
7	Blind rivets(1 set)	13	LDR
8	Rivet gun	14	Resistor
9	Metric Tape(5m)	15	Capacitor
10	Long metal ruler	**Inventory Raw Materials**	
11	Vernier caliper	1	Acrylic sheet 3mm
12	Carpenter’s square	2	Acrylic sheet 5mm
13	Spirit level	3	MDF board 3mm
14	Metal ruler Small	4	Nuts & Bolts
15	Spring clamp	5	Hot glue sticks + glue sticks
16	Align Keyset	6	Wood glue
Robotics Kits		7	Foam board (A2)
1	Robot chassis	8	Wood (listy)
2	L293D motor driver	9	Metallic contraptions(Meccano)
3	Arduino	10	Plastic Box for components
4	Ultrasonic Sensor	11	Card Stock Paper(A2 600 GSM)
5	Infrared sensor	12	Styrofoam boards

Locally available materials

Physics Materials List			
S.N.	**Item description**	**S.N.**	**Item description**
1	Axe	36	Plane sheet
2	Balloon	37	Plastic bottle
3	Battery	38	Plastic cups
4	Bell	39	Plastic water bottle
5	Biscuit	40	Plywood
6	Black enamel coated tin can	41	Protractor
7	Black strips of paper	42	Radio
8	Blade	43	Razor blade
9	Bottle opener	44	Red ink
10	Brick	45	Rods
11	Candle	46	Rope
12	Candle wax	47	Ruler
13	Cans	48	Sample of dhiki
14	Cell	49	Sample of doko
15	Color papers	50	Sample of janto
16	Disposable syringes of 10ml	51	Sand
17	Drawing board	52	Scale
18	Drum	53	Science book
19	Dry cell	54	Scissors
20	Electric bulb	55	The screen made from white sheet of paper
21	Eraser	56	Sickle
22	Galvanometer	57	Spade
23	Graph paper	58	Stapler
24	Gum,	59	Sticks
25	Ice cubes	60	Table
26	Inclined plane	61	Table fan
27	Ink	62	Ticking clock
28	Knife	63	TT ball
29	Ladder	64	White enamel coated tin can,
30	Led bulbs	65	White sheet of paper
31	Nail cutter	66	Wiping cloth
32	Needle	67	Wooden piece
33	Nylon rope	68	Wooden plank
34	Paper sheets	69	Wooden stick
35	Pins	70	Wool

Biology Materials List			
S.N.	**Item description**	**S.N.**	**Item description**
1	Bean plant	25	Sample of flowering plants
2	Blue ink	26	Sample specimens of earthworm
3	Brush	27	Samples of monocot and dicot seeds
4	Butterfly	28	Samples of flowering plants
5	Cactus	29	Samples of monocot and dicot plants
6	Carrot	30	Samples of non-flowering plants
7	Chicken muscle	31	Samples specimens of mosquito
8	Cockroach	32	Samples specimens of the housefly
9	Cotton	33	Samples specimens of mushroom
10	Cotton thread	34	Specimen of fish
11	Earthworm	36	Specimen of insects
12	Ginger	37	Specimen of lizard
13	Gram	38	Specimen of pigeon
14	Maize	39	Specimen of rat
15	Maize plant	40	Specimen of toad
16	Match stick	41	Specimens of maize's
17	Mouse	42	Specimens of pea
18	Mustard plant	43	Specimens of fern
19	Oiled paper	44	Sugar
20	Onion	45	Sugarcane stem
21	Potato	46	Sweet potato
22	Radish	47	Turnip/beetroot,
23	Rajma	48	Water hyacinth
24	Rose stem	49	Water lily

Chemistry Materials List	
S.N.	**Item description**
1	Clay
2	Incense stick
3	Soap

Consumable materials

Biology Materials List			
S.N.	**Item description**	**S.N.**	**Item description**
1	Bean plant	19	Onion
2	Blotting paper	20	Potato
3	Blue ink	21	Radish
4	Brophyllum	22	Rajma
5	Chicken muscle	23	Rose stem
6	Cotton	24	Safranin
7	Cotton thread	25	Sample of flowering plants
8	Ginger	26	Samples of monocot and dicot seeds
9	Glycerine	27	Samples of monocot and dicot plants
10	Gram	28	Samples of non-flowering plants
11	Hookworm	29	Specimens of pea
12	Maize	30	Specimens of fern
13	Maize plant	31	Spirit
14	Match stick	32	Sugar
15	Mucor	33	Sugarcane stem
16	Mushroom	34	Sweet potato
17	Mustard plant	35	Turnip/beetroot,
18	Oiled paper	36	Vegetable oil

Physics Materials List			
S.N.	**Item description**	**S.N.**	**Item description**
1	Battery	12	Iron dust
2	Biscuit	13	Iron filings
3	Black strips of paper	14	Paper sheets
4	Candle	15	Plane sheet
5	Candle wax	16	Razorblade
6	Colour papers	17	Sand
7	Eraser	18	Sticks
8	Graph paper	19	Tracing paper
9	Gum	20	Wool
10	Ice cubes	21	Wooden stick
11	Ink		

Chemistry Materials List			
S.N.	**Item description**	**S.N.**	**Item description**
1	Alcohol (methanol)	23	Lemon solution
2	Aluminum foil	24	Limestone (calcium carbonate)
3	Aluminum piece	25	Lime water (calcium hydroxide)
4	Ammonia solution	26	Litmus
5	Ammonium chloride	27	Magnesium bi-carbonate
6	Ash water	28	Magnesium ribbon
7	Calcium bicarbonate	29	Manganese dioxide
8	Calcium hydroxide	30	Methyl orange
9	Camphor	31	Phenolphthalein
10	Caustic potash	32	Potassium permanganate
11	Chalk powder	33	Potassium permanganate crystal
12	Clay	34	Quick lime
13	Coke	35	Soap
14	Dil. Hydrochloric acid	36	Soap solution
15	Dilute sulphuric acid	37	Sodium hydroxide
16	Ethanol	38	Sodium nitrite
17	Filter paper	39	Sulphuric acid
18	Hydrochloric acid	40	Washing soda
19	Hydrogen peroxide	41	Wax
20	Incense stick	42	Zinc
21	Iodine solution	43	Zinc dust
22	Kerosene	44	Zinc plate

Non-consumable materials

Physics Materials List			
S.N.	**Item description**	**S.N.**	**Item description**
1	Axe	38	Dynamo
2	Ball bearing	39	Eclipse model or chart
3	Ball pen's cylinder	40	Electric bulb
4	Balloon	41	Eureka can
5	Bar magnets	42	Fiber tape
6	Barometer	43	Flask
7	Bathroom scale	44	Forceps
8	Bell	45	Galvanometer
9	Black enamel coated tin can	46	Glass
10	Blade	47	Glass cutter
11	Bottle opener	48	Glass piece
12	Brick	49	Glass rod
13	Bulb	50	Glass rod
14	Bulb with holder	51	Glass slab
15	Calorimeter set	52	Glass tube
16	Cans	53	Graphite rod (pencil lead)
17	Cardboard	54	Graphite rods
18	Cell	55	Ground glass
19	Clinical thermometer	56	Hairpins protractor
20	Coin (coated)	57	Hand lens
21	Color glass	58	Hardboard
22	Compass needle	59	Hygrometer
23	Compound microscope	60	Inclined plane
24	Concave mirror,	61	Iron nails
25	Conductor wires	62	Iron rod
26	Connecting wires	63	Knife
27	Convex lens	64	Lab balance
28	Convex mirror	65	Laboratory thermometer
29	Cork	66	Ladder
30	Cover lid	67	LED bulbs
31	Coverslip	68	Lever bar
32	Disc	69	Lever set
33	Disposable syringes of 10 ml	70	Lever stand
34	Drawing board	71	Loads
35	Dropper	72	Magnet
36	Drum	73	Magnets of various type
37	Dry cell	74	Magnifying glass

S.N.	**Item description**	**S.N.**	**Item description**
71	Loads	112	Sample of janto
72	Magnet	113	Scale
73	Magnets of various type	114	Science book
74	Magnifying glass	115	Scissors
75	Masking tape	116	The screen made from white sheet of paper
76	Masses	117	Screwdriver
77	Maximum and minimum thermometer	118	Screw nail
78	Measuring cylinder	119	Sickle
79	Measuring tape	120	Simple pendulum
80	Metal ball	121	Spade
81	Model /chart of eclipse	122	Spool
82	Model/chart of solar system	123	Spring balance
83	Moly mod balls	124	Stand and clamp
84	Nail cutter	125	Stands
85	Needle	126	Stapler
86	Nylon rope	127	Sterilized needle
87	Pins	128	Stopwatch
88	Plane mirror	129	String (approx. 1m) length
89	Plane surface board	130	Strings
90	Plastic bottle	131	Switch box
91	Plastic cups	132	Syringe
92	Plastic thread	133	Table
93	Plastic water bottle	134	Table fan
94	Pliers	135	Thermometer
95	Ply wood	136	Thin pins
96	Powerpack	137	Thumb pins
97	Protractor	138	Ticking clock
98	Pulleys	139	Tongs
99	Radio	140	Torch light bulb
100	Rain gauze	141	Triple beam balance
101	Ray box	142	TT ball
102	Red ink	143	Tuning forks
103	Retort stand	144	Watch glass or plate
104	Rods	145	Weather cock
105	Rope	146	Weighing balance
106	Rubber band	147	Weighing machine
107	Rubber cork (big and small)	148	Weighing masses
108	Rubber pad	149	White enamel coated tin can,

109	Ruler	150	White sheet of paper
110	Sample of dhiki	151	Wiping cloth
111	Sample of doko	152	Wire
S.N.	**Item description**	**S.N.**	**Item description**
153	Wooden thermometer	156	Wooden plank
154	Wooden board (soft)	157	Wooden splinter
155	Wooden piece	158	Wooden stand

Biology Materials List			
S.N.	**Item description**	**S.N.**	**Item description**
1	Bat(mammal)	34	Samples of flowering plants
2	Brush	35	Samples of stages of the life cycle of the mosquito
3	Butterfly	36	Samples specimens of mosquito
4	Cactus	37	Samples specimens of snail
5	Carrot	38	Samples specimens of amoeba
6	Cockroach	39	Samples specimens of euglena
7	Crab	40	Samples specimens of the housefly
8	Dahlia	41	Samples specimens of mucor
9	Earthworm	42	Samples specimens of mushroom
10	Epithelial tissues permanent slides	43	Samples specimens of octopus
11	Hydrilla	44	Samples specimens of paramecium
12	Leech	45	Samples specimens of starfish
13	Leishman's stain	46	Sea horse
14	Liver fluke	47	Specimen of fish
15	Microscope	48	Specimen of flying lizard
16	Millipede	49	Specimen of frog
17	Model of eye	50	Specimen of insects
18	Model of the human digestive system	51	Specimen of lizard
19	Model of the human skeletal system	52	Specimen of pigeon
20	Mosquito larva and pupa	53	Specimen of rat
21	Mouse	54	Specimen of snake
22	Octopus	55	Specimen of stages of the life cycle of the butterfly
23	Permanent slide of stages of	56	Specimen of toad

	plasmodium		
24	Permanent slide of stages of spirogyra	57	Specimen of turtle
25	Permanent slide of stages of amoeba	58	Specimens of maize
26	Permanent slide of yeast	59	Specimens of Ascaris
27	Pila	60	Specimens of cycas
28	Pistia	61	Specimens of hydra
29	Prawn	62	Specimens of liverwort/ moss
30	Roundworm	63	Specimens of tapeworm
31	Sample of stages of life cycle of silkworm	64	Specimens of some vertebrates
32	Sample specimens of earthworm	65	Specimens of sponge
33	Sample specimens of spider	66	Spirit lamp
S.N	**Item description**	**S.N.**	**Item description**
67	Tapeworm	69	Unio
68	Toad		

Chemistry Materials List			
S.N.	**Item description**	**S.N.**	**Item description**
1	Aluminum wire	18	Lie big condenser
2	Beaker	19	Periodic table chart
3	Beaker of 250 ml	20	Petri dish
4	Beehive shelf	21	Porcelain basin
5	Bunsen burner	22	Porcelain dish
6	Burner	23	Round bottom flask
7	China dish	24	Smokebox
8	Common salt	25	Spatula
9	Conical flask	26	Splinter
10	Copper plate	27	Test tube
11	Copper sulfate	28	Test tube holder
12	Copper wire(red and black)	29	Thistle funnel
13	Delivery tube	30	Thread
14	Funnel	31	Tripod stand
15	Gas jar	32	Water trough
16	Hard glass test tube	33	Wire gauze
17	Hollow cylindrical pipes	34	Woulfe’s bottle

Mathematics Materials List			
S.N.	**Item description**	**S.N.**	**Item description**
1	Abacus	5	Geometric box
2	Base 10 blocks	6	Measuring tapes
3	Dice	7	Solid objects
4	Geoboard		