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## MULTIPURPOSE TEACHING MACHINE\*- TLM/RESOURCE

*Information and Communication Technology (ICT) in Primary education- Its  
Application in My Classroom*

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### Abstract

*I have made a 12 volt battery operated electronic device named **Multipurpose Teaching Machine or MTM** ( in brief ) on white board ( 2'x1'6'' ) by which we can teach each and every subject to the students of any class. It has two columns and 10 rows. In first column, we can write 10 questions and in second column, answers of these questions can be written. Students uses two dual pointed Audio-Visual Pins Leads to show correctness or incorrectness of their reply/matching column I with column II. Red indicator glows on wrong matching whereas green indicator glows on right matching. Buzzer rings in both the cases. It is a novel machine since it also informs the students about the incorrectness of their responses. Traditional Teaching Machines informs only about the correctness of response. Hence my machine is a two-way machine. It became possible only with the use of diodes. Children by nature are active & creative and we cannot let them learn without utilization of their surplus energies. The amount of learning is directly proportional to the involvement of the number of senses in the process of teaching-learning. The constructed model requires the use of 3 senses such as eye, ear and skin, so, it may cause strong learning. This machine can be used equally in teaching-learning, drill & exercise & evaluation work. It has unlimited applications in teaching-learning process. Circuit of my M.T.M. seems quite complex but it was the need of this project. In this connection I would like to quote Albert Einstein who once said, "Everything should be made as simple as possible but not simpler."*

**(A) Introduction:-**

Educational Technology is the application of the scientific knowledge to the practical or educational tasks of life. Educational Technology was never created rather it has simply emerged. Educational Technology is the combination of two words i.e. Education and Technology. Education means to draw out the best in child and man and Technology is the problem solving invention . Shiv K. Mitra defined Educational Technology as “ *Educational Technology can be conceived as a science of techniques and methods by which educational goals can be realized.*” Educational Technology is mainly concerned with the task of improving the processes and products of teaching-learning. In my opinion, Philosophy is the Father of Psychology and Grandfather of Educational Technology. In other words, we can also say that Psychology is the legitimate child of philosophy & Educational Technology is the legitimate child of Psychology. I. K. Davies in his book “ *Management of Learning* ” described the three forms of Educational Technology as:

**Educational Technology 1-** Hardware Technology or Technology in Education,

**Educational Technology 2-** Software Technology or Technology of Education or Programmed Technology or Instructional Technology,

**Educational Technology 3-** Systems Approach or Management Technology.

Teaching Machines fall under the category of Hardwares ( Audio-visual equipments). Teaching Machine is regarded as one of the latest development along with computer in the field of audio-visual technology used for the educational purposes. The pioneer work in the field of teaching machine was done by **Sydney. L. Pressey** of the Ohio State Of University in 1920. In 1927, he invented a Teaching Machine for the purpose of self-learning. Edward B. Fry. defined Teaching Machine as follows: “ *Teaching Machines are defined as automatic devices which present a question or other stimulus to a learner, provide a means of response and then inform him the correctness of his response immediately after he had responded.*”. There are various types of teaching machines.

### **Types of Teaching Machines:**

- 1- Constructed response devices or linear programming type
- 2- Multiple choice machines or branching programming

Computer Aided Instruction (C.A.I) is the furtherance of teaching machines.

As we know that *Senses are the Gateway of Knowledge*. We have five senses such as Eye, Ear, Nose, Tongue and Skin .There is an old saying which reads,

*” I hear, I forget; I see, I remember; I do, I understand.”*

Research in this field reveals that we learn 1% through **Taste** , 1.5% through **Touch**, 3.5% through **Smell**,11% through **Hearing** and 83% through **Sight**. And we remember 20% of what we **Hear**, 30% of what we **See**, 50% of what we **See And Hear**, 80% of what we **Say** and 90% of what we **See And Do**. As it is vivid from the above quoted figures that **Multi-Sensory Approach** with the help of **Multi-Media Approach Of Teaching** is bound to yield optimum outcomes of teaching-learning process. It has been recognized that students grasp ideas better through *Concrete Aids* in the form of hardware and software technology. In the absence of these various illustrative aids that appeal to the senses, children find the school work dull and dreary. Therefore, utilization of the multimedia approach in teaching is quite imperative for the effective and successful teaching. I have made two types of teaching machines namely -

- + *Electric MTM with one indicator only for indicating right answer &*
- + *Electronic MTM with two indicators for indicating both right answer as well as wrong answer.*

We shall discuss the various aspects of these two machines one by one.

### **1-Aims and Objectives of the Constructed/Displayed Model:-**

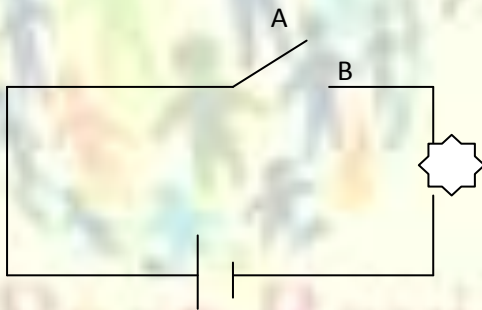
Children by nature are active & creative and we cannot let them learn without utilization of their surplus energies. The amount of learning is directly proportional to the involvement of the number of senses in the process of teaching-learning. The constructed model requires the use

of 3 senses such as eye, ear and skin, so, it may cause strong learning. My model can be used for the teaching of various subjects and also for the teaching of different classes of any level as I have pasted sun-mica on the ply-board to use and reuse the surface. We can write by coloured bold-markers and can rub it easily with duster to use the model for another subject/topic or for another class. That's why, I have named it multi-purpose teaching machine.

Computer Aided Instruction (C.A.I.) is the furtherance of teaching machines but C.A.I. requires use of electricity which is about impossible in schools situated in rural areas. So, MTM is useful specially in rural area schools.

**2-Scientific Principle:-**

If we want to light up a bulb by battery-cells then we have to connect the both ends of the cell with the respective +ve and -ve ends of the bulb. Now, we will complete this circuit through the internal wirings in the teaching machine.



**(B-I)-Description of Electric MTM with Single Indication (with one indicator only for indicating right answer):**

**1-Required Material :-**

SR. NO.	NAME OF THE ITEMS REQUIRED IN MAKING ELECTRIC MTM	QUANT ITY	RATE IN RS.	TOTAL AMOUNT IN RS.
1	Plyboards ( Size 2'*3', 2'*2'-Width-12 mm or 4 Sut )	2	27/-	270
2	2 Feet , Full Length Hinge Size 1/2'' * 3/4''	1	14/-	28

3	Screws, Ripits	-	-	10
4	Chappka Kundi	1	5/-	5
5	Coloured Pieces (Purple and White) of Sunmica ( 1'*2', 2'*2 )	2	17/-	102
6	For Covering Border of MTM Board - 12' Full Length Channel Width ¾ Inchie	1	4.50/-	54
7	Handle	1	10/-	10
8	Nails	-	-	15
9	Fevicol 100 Grams	1	-	25
10	Brass Nut-Bolts, Varshals	30	3/-	90
11	Coloured Wires Used in Telephone Connections	5 mtrs.	5/-	25
12	Socket-Pins	2	5/-	10
13	Simple (or USB Port Based or Programmable ) Door-Bell With Light Indicator	1	100/-	100
14	Bold-Markers	3	10/-	30
15	Permanent Markers, Red & Black	2	20/-	40
16	White Board Markers, Camel/ Reynolds	2	25/-	50
17	Duster	1	20/-	20
18	Carpenter Wages	-	-	100
19	<b>Grand Total (Expenditure)</b>	-	-	<b>984</b>

## 2-Structure and Working of the Model:-

- ✚ There are only three columns in the displayed model in which the central column is the question column and the left side and the right sides columns are for writing answers. Teacher can use any answer column or both the columns simultaneously for evaluating the students. We can match the columns in three ways i.e. column A & column B, column B & column C, column C & column A.
- ✚ In teaching of English, we can let the students learn vocabulary with correct pronunciation. We can teach them synonyms, antonyms, one word substitutes, vitamins,

three forms of verbs, mathematical 2D or 3D figures, roman numerals etc....we can teach them the important facts of G.K. We can teach them important formulae of Maths , Physics and Chemistry. We can teach them kinds of angles, types of vitamins with their chemical names etcetra.....It can be easily presented in any classroom by placing it on blackboard's tripolar stand. One by one you can call the students to answer all the questions written on it & the selected student who is playing the role of scorer, will prepare the table of result on blackboard by showing the number of right and wrong responses given by each student individually to inform the students about their performances.

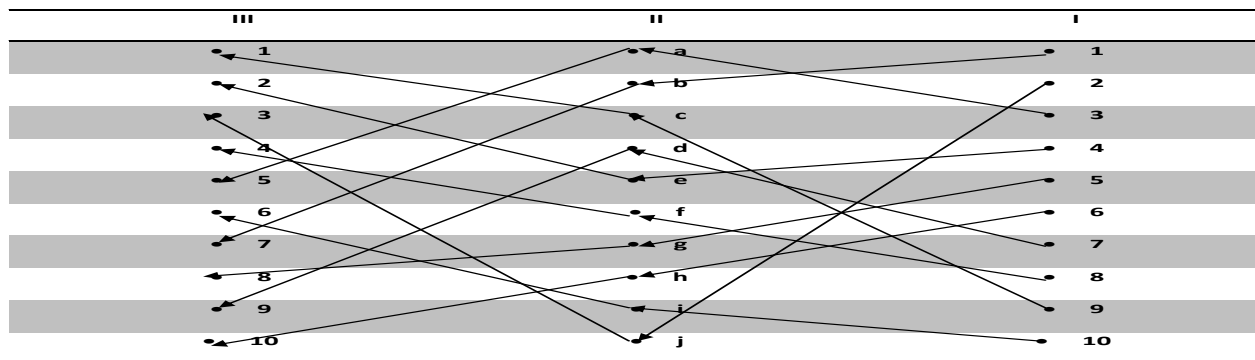
✚ We can also devise new matching circuit only by turning the MTM board upside down with the same wiring connections in both of the MTMs. It will help the teachers in discouraging those students who believes in memorising the matching scheme of the electrical circuit without noticing the questions & their answers.

✚ You can view its video by clicking on this link.[http://youtu.be/dnijbk\\_gG0k](http://youtu.be/dnijbk_gG0k)

**Answer scheme of Electric MTM (with one indicator only for indicating right answer)**

When Upside is Up		When Upside is Down	
1-b-7	6-h-10	1-c-5	6-j-8
2-j-3	7-d-9	2-g-4	7-e-3
3-a-5	8-f-4	3-d-6	8-a-9
4-e-2	9-c-1	4-i-10	9-f-7
5-g-8	10-i-6	5-b-1	10-h-2

M.T.M. ELECTRICAL CIRCUIT : ( SEE BACK SIDE OF MTM)



**MULTIPURPOSE TEACHING MACHINE STRUCTURE**

<b>SR. NO.</b>	<b>ANIMALS IN ENGLISH</b>	<b>ANIMALS IN HINDI</b>	<b>ANIMALS IN ENGLISH</b>
1	COW	a-GHODA	1- PIG
2	CAMEL	b-GAAYE	2- RABBIT
3	HORSE	c-SU-ER	3- CAMEL
4	RABBIT	d-BAAGH	4- LION
5	SQUIRREL	e-KHARGOSH	5- HORSE
6	MONGOOSE	f-SHER	6- ELEPHANT
7	TIGER	g-GILAHRI	7- COW
8	LION	h-NEVLA	8- SQUIRREL
9	PIG	i-HAATHI	9- TIGER
10	ELEPHANT	j-OONT	10- MONGOOSE
<b>SR. NO.</b>	<b>ANIMALS IN ENGLISH</b>	<b>ANIMALS IN HINDI</b>	<b>ANIMALS IN ENGLISH</b>

<b>SR. NO.</b>	<b>COUNTING IN ENGLISH</b>	<b>COUNTING</b>	<b>COUNTING IN ROMAN</b>
1	FOUR	a-3	V
2	EIGHT	b-4	VII
3	THREE	c-5	VIII
4	SEVEN	d-2	X
5	ONE	e-7	III
6	SIX	f-10	IX
7	TWO	g-1	IV
8	TEN	h-6	I
9	FIVE	i-9	II
10	NINE	j-8	VI
<b>SR. NO.</b>	<b>COUNTING IN ENGLISH</b>	<b>COUNTING</b>	<b>COUNTING IN ROMAN</b>



<b>SR. NO.</b>	<b>VITAMINS</b>	<b>CHEMICAL NAMES</b>	<b>VITAMINS</b>
1	D	a-Retinol, Retinal	1 E
2	C	b-Cholecalciferol, Ergocalciferol	2 B <sub>1</sub>
3	A	c-Tocopherols, Tocotrienols	3 C
4	B <sub>1</sub>	d-Phylloquinone, Menaquinones	4 B <sub>2</sub>
5	B <sub>5</sub>	e-Thiamine	5 A
6	B <sub>3</sub> , B <sub>6</sub>	f-Riboflavin	6 B <sub>9</sub> , B <sub>12</sub>
7	K	g-Pantothenic Acid	7 D
8	B <sub>2</sub>	h-Niacin, Niacinamide Pyridoxine, Pyridoxamine, Pyridoxal	8 B <sub>5</sub>
9	E	i-Folic Acid, Folinic Acid  Cyanocobalamin, Hydroxycobalamin, Methylcobalamin	9 K
10	B <sub>9</sub> , B <sub>12</sub>	j-Ascorbic Acid	10 B <sub>3</sub> , B <sub>6</sub>
<b>SR. NO.</b>	<b>VITAMINS</b>	<b>CHEMICAL NAMES</b>	<b>VITAMINS</b>
<b>SR. NO.</b>	<b>ASIAN COUNTRIES</b>	<b>CAPITALS</b>	<b>ASIAN COUNTRIES</b>
1	AFGANISTAN	a-THIMPU	1 SHRI LANKA
2	BANGLADESH	b-KABUL	2 CHINA
3	BHUTAN	c-COLUMBO	3 BANGLADESH
4	CHINA	d-KAATHMANDU	4 PAKISTAN
5	INDIA	e-BEIJING	5 BHUTAN
6	JAPAN	f-ISLAMABAD	6 TAJIKISTAN
7	NEPAL	g-NEW DELHI	7 AFGANISTAN
8	PAKISTAN	h-TOKIYO	8 INDIA
9	SHRI LANKA	i-DUSHANABE	9 NEPAL
10	TAJIKISTAN	j-DHAKA	10 JAPAN
<b>SR. NO.</b>	<b>ASIAN COUNTRIES</b>	<b>CAPITALS</b>	<b>ASIAN COUNTRIES</b>

**(B-II)-Description of Electronic MTM with Double Indications (with two indicators for indicating both right answer as well as wrong answer ):**

**1-Required Material :**

SR. NO.	NAME OF THE ITEMS REQUIRED IN MAKING ELECTRONIC MTM	QUANT ITY	RATE IN RS.	TOTAL AMOUNT IN RS.
1	MDF Board ½ Inch or 4 Sute in Width, Size 18” by 24” Inches	1	35/-	105
2	Beading for Border	24’ Feet	2.50/-	60
3	Beading for Cell Box and Stand	1.5’’*3’ 1.5’’*4’	10/- 3	30 12
4	Hinges ½” By ¾” with Screws	2	8/-	16
5	Hinges 1.5’’ for stand of MTM with Screws	2	8/-	16
6	Handle	1	10/-	10
7	Chhapka	1	5/-	5
8	Nails	250 gm	80/-	20
9	White Mica Sheet Used in Electrical Fittings, Size 18” by 24” Inches Note – 4’*4’ ,43.25/-, Sheet Cost Rs. 692/-	1	72/-	216
10	Brass Nut Bolts With Varshals	8	2.50	20
11	Continuity Tester for Checking Continuity Of Diodes. It Must Conduct in One Way Only.	1	10	10
12	Striped 10 Coloured Circuit Wire	7 Mtr.	6/-	42
13	Diodes IN 4007	90	0.50/-	45
14	Av Pins Sockets	20	5/-	100
15	Leads	2	15/-	30
16	PCB for Holding Diodes	1	100	100

17	Bike Indicators	2	35/-	70
18	Bike Buzzers	2	20/-	40
19	Bike Flasher	1	30/-	30
20	Permanent Markers, Red & Black	2	15/-	30
21	White Board Markers, Camel/ Reynolds	2	25/-	50
22	12 Volt Battery (Original )/UPS Battery	1	560/-	560*
23A	Battery Cells, Eveready , Steel Body	8	15.50	124**
23B	Springs for Cell Holder	4	7.50	30**
24A	Hi-Watt 6F22 9V General Purpose Battery for Transistor Radios	1	15/-	15***
24B	9V General Purpose Battery Holder	1	5/-	5***
25	12 Volt D.C.1.5 Amp Adaptor	1	210/-	210****
26	Carpenter Wages	-	-	200
27	Electrician Wages	-	-	100
28	Painter Wages	-	-	20
29A	<b>Grand Total (Expenditure)*</b>	-	-	<b>1937/-</b>
29B	<b>Grand Total (Expenditure)**</b>	-	-	<b>1531/-</b>
29C	<b>Grand Total (Expenditure)***</b>	-	-	<b>1397/-</b>
29D	<b>Grand Total (Expenditure)****</b>	-	-	<b>1587/-</b>

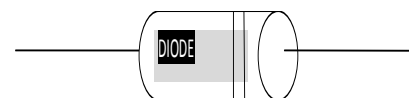
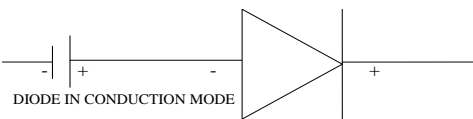
**2-Structure and Working of the Model:-**

See attached photographs for structure and working of the Electronic M.T.M.

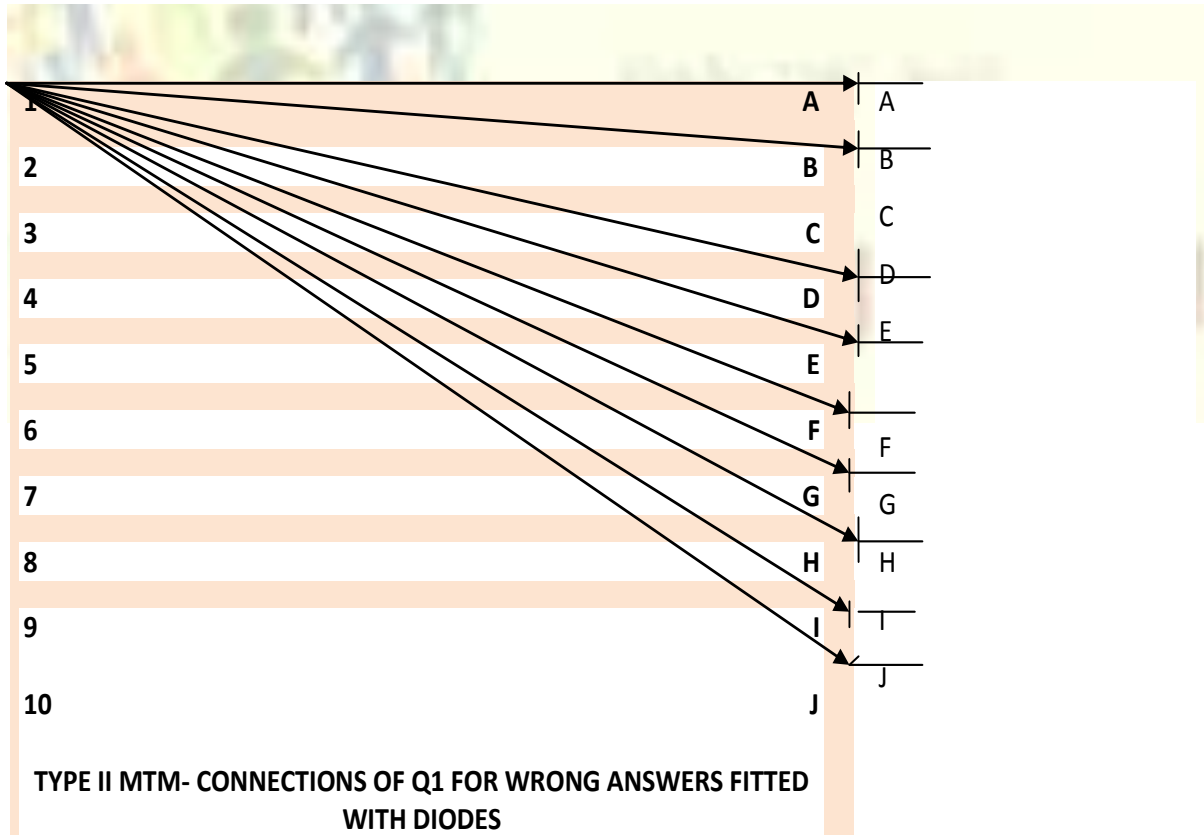
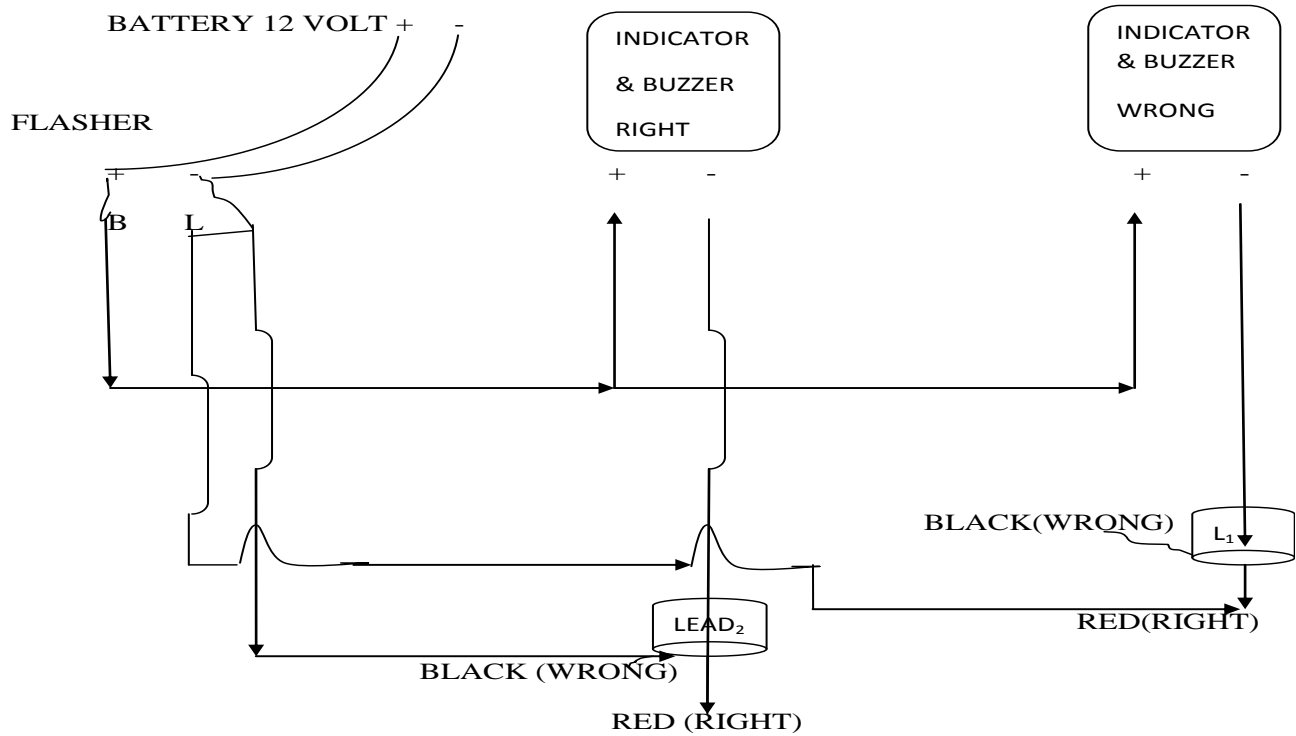
**How to Prepare & Use Electronic M.T.M. ?**

- ✚ While buying A.V. sockets, check tightness/ fitness of all 20 A.V. sockets with selected A.V. lead pins by inserting selected A.V. lead pins in them.
- ✚ Fit the 20 A.V. sockets on white sheet as shown in picture, 10 in each column at equal distances by drilling the sheet & then join the white sheet with wooden box by 2 hinges and 6 brass nut bolts.

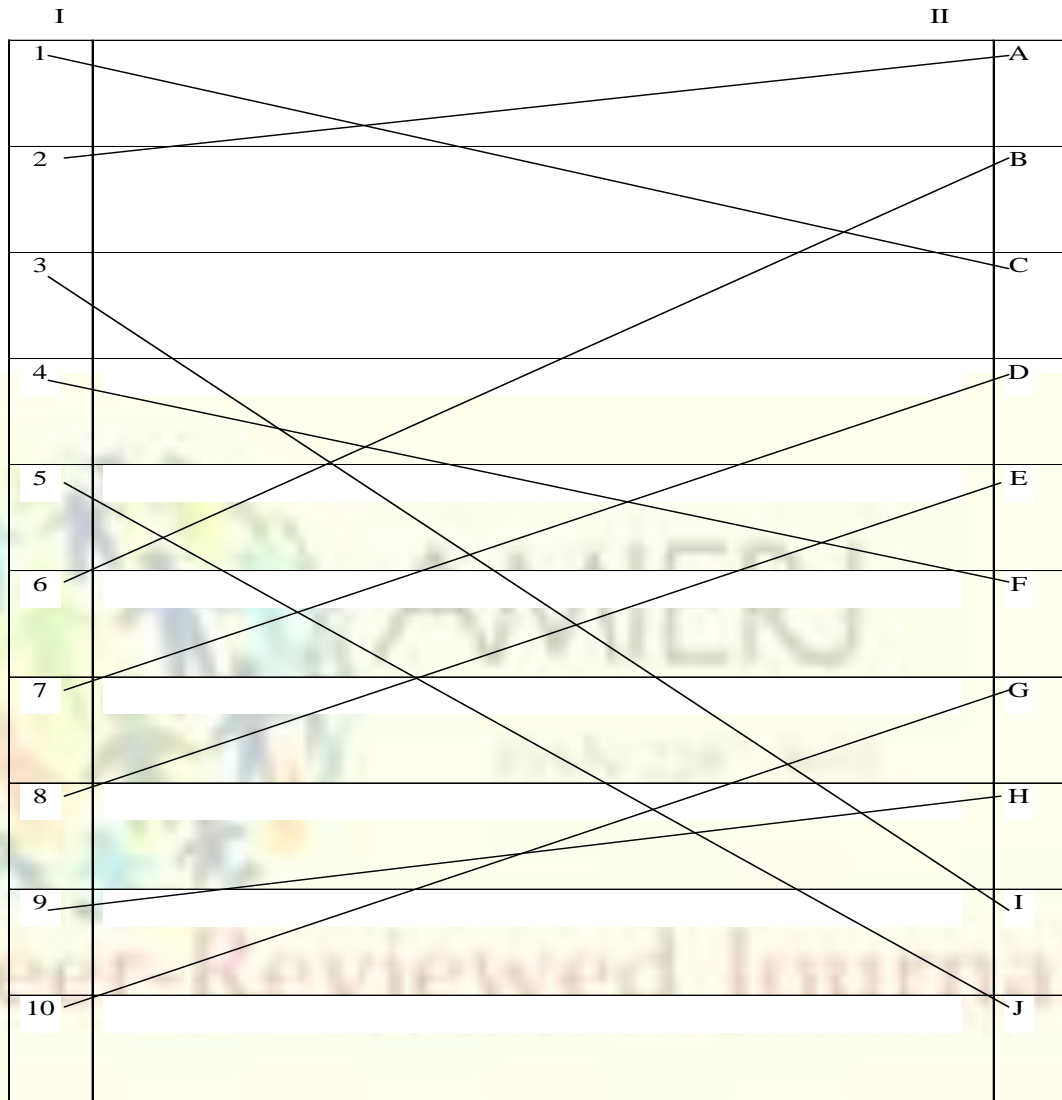
- ✚ Make connections on the reverse side of A.V. sockets as shown in wiring scheme & answer scheme.
- ✚ Solder 90 diodes (on P.C.B.) as shown in picture with 90 circuit wires ( 9 wires of each colour ) & 10 rings of A.V. sockets.
- ✚ Make 12v battery, flasher, indicators, buzzers, leads circuit in the wooden box as shown in figure.
- ✚ Write questions & answers from the Question Bank on the white surface of the mica sheet by white board markers.
- ✚ Now M.T.M. is ready for use. Both M.T.M.s can be easily presented in any classroom by placing it on blackboard's tripolar stand. One by one you can call the students to answer all the questions written on it & the selected student who is playing the role of scorer, will prepare the table of result on blackboard by showing the number of right and wrong responses given by each student individually to inform the students about their performances.
- ✚ We can teach each and every subject to the students of any class. It has two columns and 10 rows. In the first column, we can write 10 questions and in the second column, answers of these questions can be written. Students uses two dual pointed *Audio-Visual Pins Leads* to show correctness or incorrectness of their reply/matching column I with column II. Red indicator glows on wrong matching whereas green indicator glows on right matching. Buzzer rings in both the cases. It is a novel machine since it also informs the students about the incorrectness of their responses. Traditional Electric Teaching Machines informs only about the correctness of response. Hence my machine is a two-way machine. It became possible only with the use of diodes
- ✚ We can also devise new matching circuit only by turning the MTM board upside down with the same wiring connections in both of the MTMs. It will help the teachers in discouraging those students who believes in memorising the matching scheme of the electrical circuit without noticing the questions & their answers.



## ELECTRICAL CIRCUIT OF MTM WITH TWO INDICATORS AND BUZZERS



**TYPE II MTM CONNECTIONS FOR RIGHT OPTIONS**



**WIRING SCHEME OF M.T.M. WITH TWO INDICATORS**

CI \ C II	1 BBRO YGBP SW	2 BBRO YGBP SW	3 BBRO YGBP SW	4 BBRO YGBP SW	5 BBRO YGBP SW	6 BBRO YGBP SW	7 BBRO YGBP SW	8 BBRO YGBP SW	9 BBRO YGBP SW	10 BBRO YGBP SW
<b>A-BLACK</b>		<b>TOP OF PIN A</b>								
<b>B-BROWN</b>						<b>TOP OF PIN B</b>				
<b>C-RED</b>	<b>TOP OF PIN C</b>									
<b>D-ORANGE</b>							<b>TOP OF PIN D</b>			
<b>E-YELLOW</b>								<b>TOP OF PIN E</b>		
<b>F-GREEN</b>				<b>TOP OF PIN F</b>						
<b>G-BLUE</b>										<b>TOP OF PIN G</b>
<b>H-PURPLE</b>									<b>TOP OF PIN H</b>	
<b>I-SILVER</b>			<b>TOP OF PIN I</b>							
<b>J-WHITE</b>					<b>TOP OF PIN J</b>					

**Excercises for Using M.T.M. for Drill or Practice Work or Evaluation Work**

**WORMS AND INSECTS**

SR.NO.	COLUMN "A" QUESTIONS	COLUMN "B" ANSWERS	SR.NO.
1	TURTLE	CHHIPKALI	A
2	LIZARD	TITLI	B
3	GLOW WORM	KA-CHHUA	C
4	LEECH	BICHHU	D
5	CRICKET	MAKDI	E
6	BUTTERFLY	JOAK	F
7	SCORPION	LEEKH	G
8	SPIDER	MADHU-MAKHI	H
9	HONEY BEE	JUGNU	I
10	NIT	JHINGUR	J

**Excercises for Using M.T.M. for Drill or Practice Work or Evaluation Work**

SR. NO.	COLUMN "A" QUESTIONS GENDER MALE ANIMALS	COLUMN "B" ANSWERS FEMALE ANIMALS	SR. NO.
1	HORSE	HIND	A
2	STAG	CAT	B
3	FOX	MARE	C
4	LION	TIGRESS	D
5	PEACOCK	COW	E
6	TOMCAT	LIONESS	F
7	TIGER	ROE	G
8	BULL	HEN	H
9	COCK	VIXEN	I
10	HART	PEAHEN	J



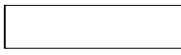
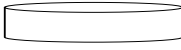

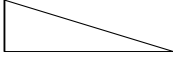
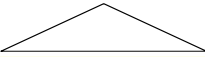

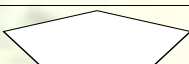


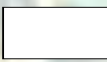
**Exercices for Using M.T.M. for Drill or Practice Work or Evaluation Work**

SR.NO.	COLUMN "A" QUESTIONS	COLUMN "B" ANSWERS	SR.NO.
1			A
2			B
3			C
4			D
5			E
6			F
7			G
8			H
9			I
10			J

**Exercices for Using M.T.M. for Drill or Practice Work or Evaluation Work**

SR. NO.	COLUMN "A" QUESTIONS BIRDS IN ENGLISH	COLUMN "B" ANSWERS BIRDS IN HINDI	SR. NO.
1	SWAN	ULLU	A
2	OWL	CHEEL	B
3	WOODPECKER	HANS	C
4	PIGEON	TOTA	D
5	BAT	BULBUL	E
6	KITE	KABUTAR	F
7	PARROT	MOAR	G
8	NIGHTINGALE	BAAJ	H
9	HAWK	KATHFODWA	I
10	PEACOCK	CHAMGAADAR	J

### EXCERCISE FOR MATHEMATICAL SHAPES

SR.NO.	COLUMN "A" QUESTIONS	COLUMN "B" ANSWERS	SR.NO.
1		CYLINDER	A
2		HEXAGON	B
3		RECTANGLE	C
4		PENTAGON	D
5		CIRCLE	E
6		RIGHT TRIANGLE	F
7		SQUARE	G
8		CUBOID	H
9		CUBE	I
10		EQUILATERAL TRIANGLE	J

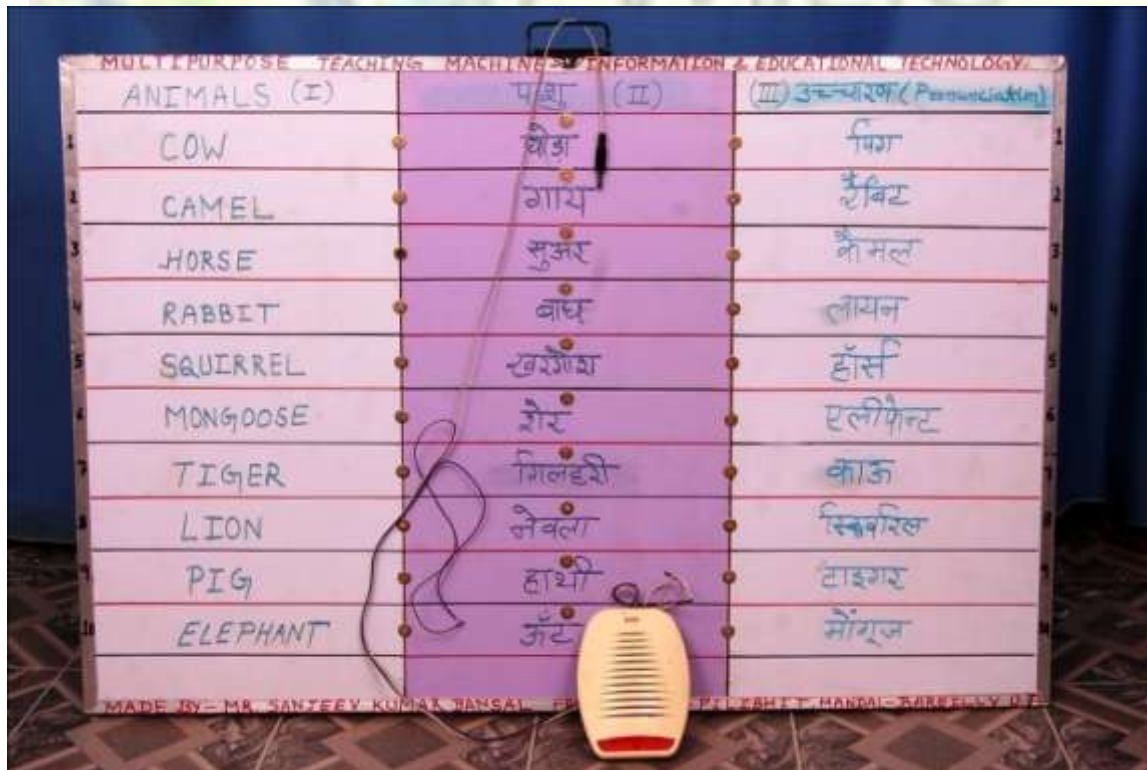
### Exercises for Using M.T.M. for Drill or Practice Work or Evaluation Work

SR. NO.	COLUMN "A" QUESTIONS PARTS OF BODY	COLUMN "B" ANSWERS PARTS OF BODY	SR. NO.
1	WRIST	KAMAR	A
2	WAIST	HONTH	B
3	KIDNEY	KALAI	C
4	KNEE	JABDA	D
5	LIVER	KANDHA	E
6	LIP	GHUTNA	F
7	JAW	NASEN	G
8	SHOULDER	AEADI	H
9	HEEL	GURDA	I
10	VEINS	JIGAR/ YAKRAT	J

ANSWER SCHEME OF ELECTRONIC MTM CIRCUIT BOARD

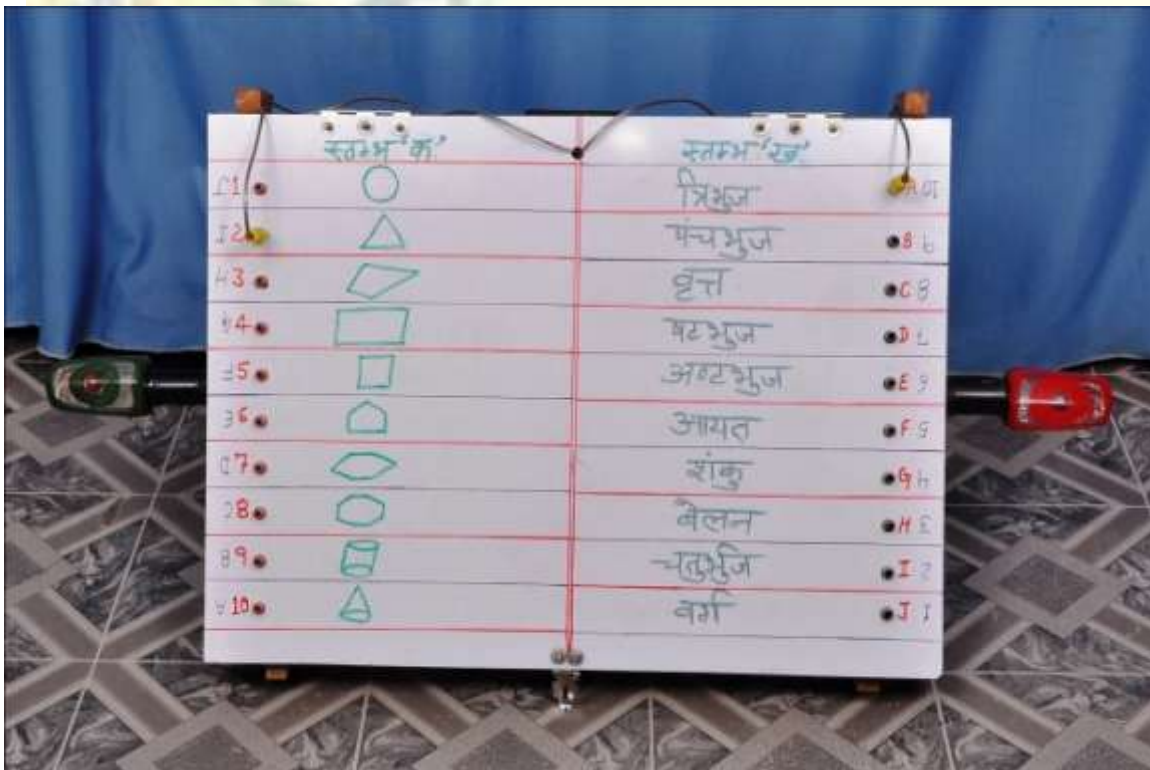
WHEN UPSIDE UP				WHEN UPSIDE TURNED DOWN			
1	C	6	B	1	F	6	C
2	A	7	D	2	H	7	D
3	I	8	E	3	B	8	J
4	F	9	H	4	A	9	E
5	J	10	G	5	G	10	I

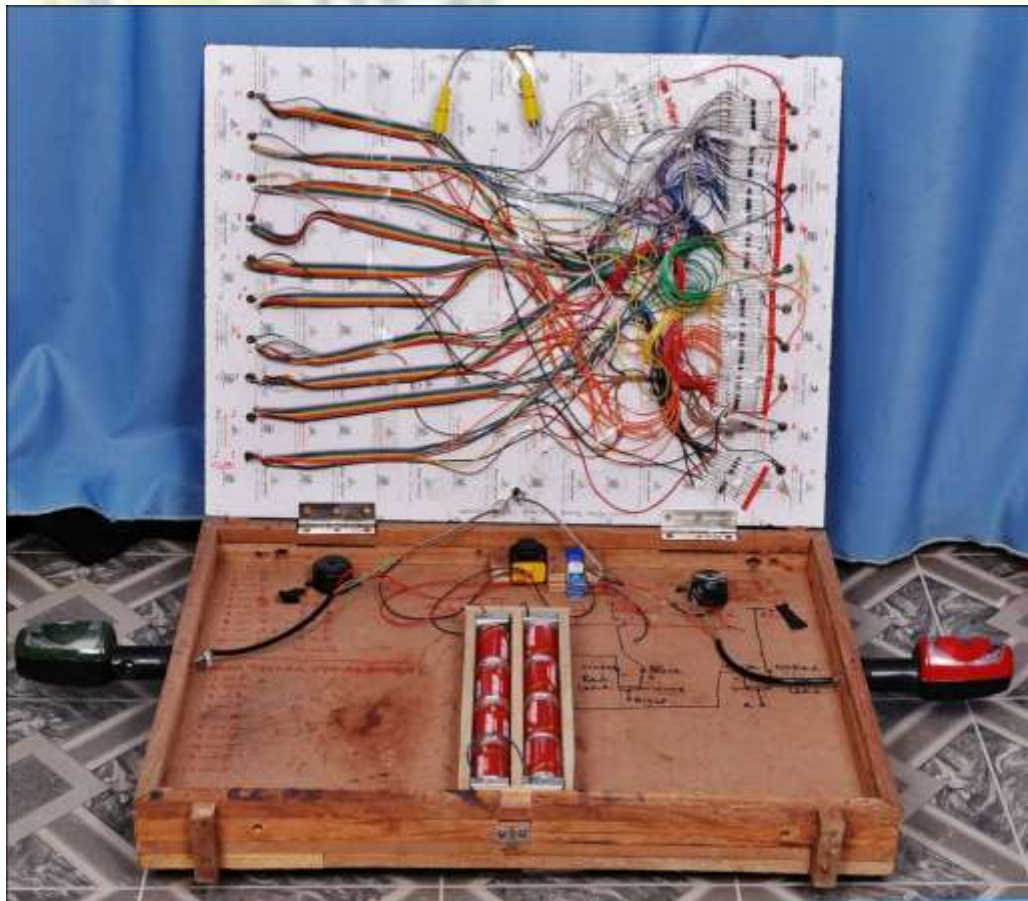
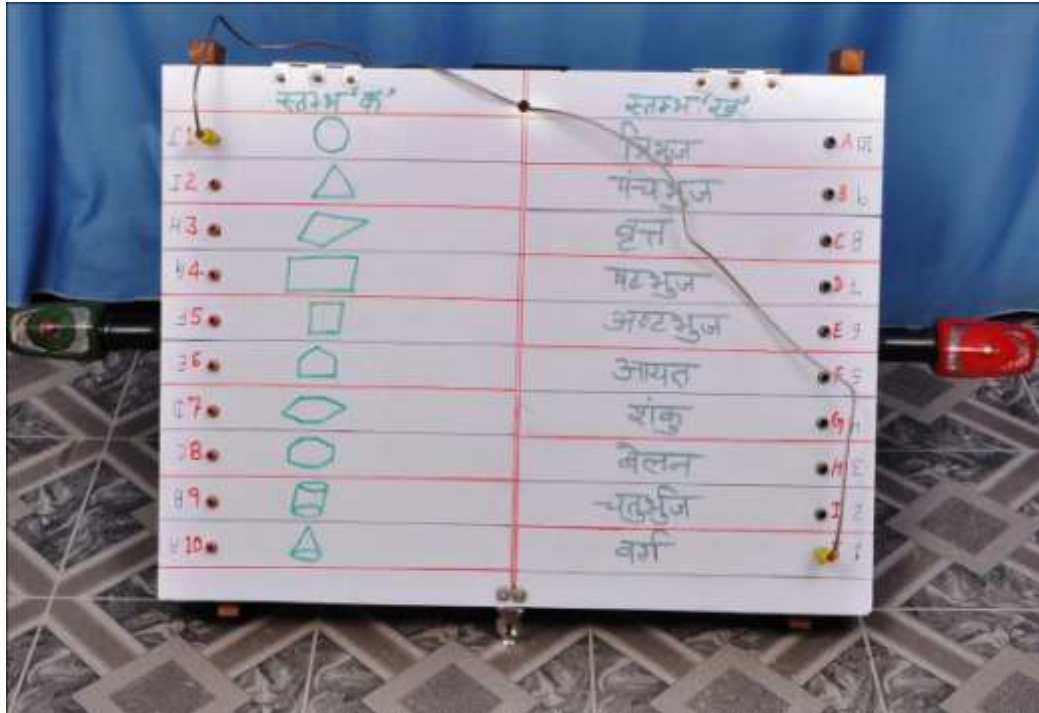
Photographs of Electric MTM with Single Indication (with one indicator only for indicating right answer):





**Electronic MTM with Double Indications (with two indicators for indicating both right answer as well as wrong answer):**







#### Suggestions for Improving MTMs :-

- + We can also *re-structure* the model by *changing its wiring pattern of answer scheme* even after some time, when we need so. You need not to devise your MTM as per my answer schemes, you must use your creativity in this regard. I have given my answer schemes just for your guidance purpose.
- + In place of 8 battery cells, one luminax *rechargeable 12 V battery* worth rs 560/- or UPS Battery worth rs. 900/- can be used with one and half year warranty.
- + In place of door-bell/ bike indicators & buzzers , two *MP3 Players* with chips & recorded sounds ("*Your Answer is Right* ", *clapping sound may be added*, "*Your Answer is Wrong, Please Try Again*") & with amplifiers can be used with proper voltage. When the student will touch the metal pins with the right options on the board, then the musical sound player will play "*Your Answer is Right* " with light. When the student will touch the metal pins with the wrong options on the board, then the musical sound player will play "*Your Answer is Wrong, Please Try Again*" with light.
- + Teachers of different subjects may prepare *Question Banks* (as per the answer scheme of MTMs ) of their subjects to be written on the white surface of MTM in case of need.

- ✚ MDF Board & White Mica Sheet which is used in electrical fittings, must be used in *size of 24" by 24" Inches* to avoid wastages.
- ✚ Ideal or Germanium *diodes* like IN 34A etc. or I.C.s may be used in place of simple Silicon diodes. Diodes number must be in accordance with the selected voltage supply. 90 diodes must be set on a strong *PCB* before connecting it with wires. You can save circuit wires by placing PCB in between the both columns.
- ✚ Metal *AV pins* of good quality worth rs. 10/- can be used in place of simple AV pins.
- ✚ Two *Counters* (one for counting right responses & other for counting wrong responses ) & one *Adder* circuit can be used to show the total number of attempts made by the students on MTM. It will eliminate the need of human scorer.
- ✚ *Timer* circuit can be used to keep record of the time taken by individual students in their practice & evaluation work.
- ✚ We can *Change Circuit* of Electronic MTM by connecting negatives of battery, flasher, indicators & buzzers directly & by connecting their positives indirectly by leads. Then lead no. 1 will become lead no.2 and vice-versa..
- ✚ Don't forget to disconnect the battery connections after using MTM as the FLASHER may consume voltage and it will discharge your battery.
- ✚ You can change flasher connections .
- ✚ You can use engraved glass engraved as "RIGHT", and "WRONG" on indicator/ light cover.
- ✚ I have uploaded *Video Clip* of MTM on YOUTUBE after shooting its using methodology in my classroom with my students. I found that student remained excited in the whole teaching-learning process. Their interest level increased considerably. You can watch out this video. In near future, I will try to upload some more related videos.
- ✚ You can operate MTM with *A.C. supply* by using 12 volt step-down transformer and rectifier. But be cautious about the input wires. You should use 12 volt DC Adaptor in place of transformer and rectifier.
- ✚ You must keep *Repairing Kit* ( DC/AC soldering iron, ranga, paste, pieces of coloured wires, tape, continuity tester, etc. ) always ready with yourself to repair minor faults which may occur during demonstration of MTM.
- ✚ You can use mini *Solar Panel* to generate 12 volts supply for MTM.

- You can use different buzzers for producing different sounds for right and wrong options. It will help the learners in distinguishing the right and wrong answers by sound only.

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NOTE:- \*Paper/Machine Presented in International Conference of Pre-primary & Primary Principals, 9<sup>th</sup> to 11<sup>th</sup> FEB, 2012, at CMS, Lucknow, U.P. & 41<sup>st</sup> State Level Science, Mathematics and Environment Exhibition for Children 2013-2014 [ SLSMEE 2013-2014 ].