Development Of Electronic Digestive System Module For Effective Teaching And Learning

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Abstract: The digestive system, hence digestion of food is usually one of the topics taught at the secondary and tertiary levels of education. Often, this topic is taught using teaching aid in the form of diagrams or charts drawn on plane papers. The inanimate nature of these teaching aid employed makes learning less interesting and comprehension difficult. This paper presents the design and construction of a semi animated digestive module with remote control that visualizes the movement and process of food digestion in the body. Basically, the system consists of carved wooden digestive organs with light emitting diodes (LEDs) carefully fixed on the path of digestion. A remote control is also built to aid remote access to the module. These LEDs start to blink indicating swallowing from the mouth down to the anus illustrating the process of digestion which also involves the production of enzymes. A comparison of with the improved teaching aid will make conventional types showed that it aroused student, interest during teaching and learning process. It also reduced too much abstract explanation. Thus making teaching more efficient.

Index Terms: Digestion, Module, Visualise, Enzymes, LED, Blinking, Swallowing.

1 INTRODUCTION

Teaching aids are relevant materials used by teacher during teaching to ensure proper understanding and assimilation for effective teaching and learning. It also provides the teachers with interesting and compelling platforms for conveying schematic information while they motivate learners to quickly learn and grab the explanation easily [1]. Several electronic teaching aid modules have been developed for words spelling, simple arithmetic and map reading. Basically, modules for teaching mathematic, English language and geography are also in vogue and many others are developed for prospective subject all with the aim to ease the learning of that subject. The presence of visual elements in today's teaching and learning is widely increasing as the integration of images and visual presentations and computer interfaces broadens [2]. Digestion module will provides opportunities for private study and at the same time stimulate learners' interest and curiosity. Furthermore, these modules help the teacher to teach effectively and improve level of understanding while, enhancing quality of educational system.

2.0 METHODOLOGY

This section deals with material selection and step followed to design and construction of electronic digestive system module for effective teaching and learning. This is a practical project and the whole system was achieved using wooden frames, velvet material, and light emitting diodes and the complete circuit is powered by 9volts battery.

2.1 Materials and tools used

Following are the list of materials and tools used in the research project and table 2.1 shows the list materials and quantity used.

Table 1: *Materials used and their quantity*

S/N	NAME OF COMPONENTS/TOOLS	QUANTITY
1	Resistor	65
2	Capacitor	3
3	9 Volt battery	1
4	HT12E/HT12D	1
5	Voltage regulator	4
6	Light Emitted Diode	59
7	89c52 microcontroller	2
8	RF transmitter	1
9	RF receiver	1
10	Vero board	1
11	Button	3
12	6 Volt battery	1
13	Wire connector	1

2.1 Wooden frame

Designing and fabrication of frame using wood after it went through the following process seasoning, planning of wood by surface planning machine and cut into these dimensions of 103cm by 10cm with length of 72cm respectively.

Figure 1: *wooden frame produce:*

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2.2 Carved of human digestive system

This was achieved by using 12mm plywood which was seasoned so as to ensure that it is absolutely dry while avoiding bending of the wood. Actually, carved human digestive system made using band saw machine.

Figure 2: *wooden carved human digestive systems*

2.3 Marking and drilling of LED holes:

The wooden carved digestive tract was marked in small holes one after another from mouth down to the anus in 2.5mm diameter. While, the marked spot was drilled with drilling bit of 2.5mm diameter.

2.4 Fixing and connecting the LEDs

Light emitted diodes are fixed on carved digestive tract in the following order.

- Food movement is represented with white LEDs.
- Saliva is represented with BLUE LEDs.
- Gastric juice is represented with RED LEDs
- Pancreatic juice is represented with GREEN LEDs
- At the small intestine the food is represented with multi-color LEDs (white, blue, red and green).
- At the large intestine the food is represented with AMBER LEDs

2.5 Remote control

Radio frequency module: operate using frequency module with a frequency range varies between 30kHz & 300GHz and It comprises of RF transmitter and RF receiver. The two devices were used to send and received wireless radio signal.

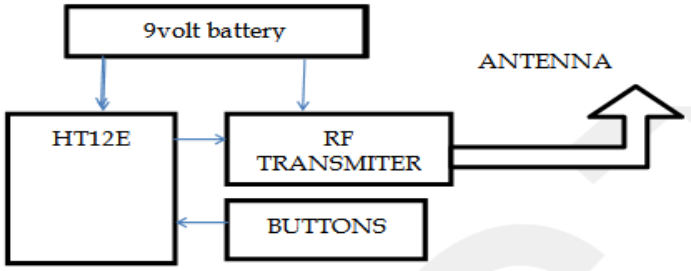

Figure 3: *Block Diagram Radio Frequency Transmitters*

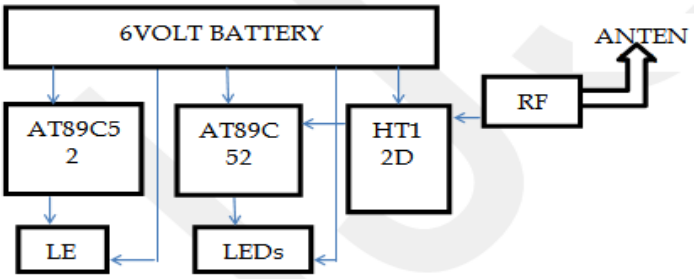

Figure 4: *Block Diagram of Radio Frequency Receivers*

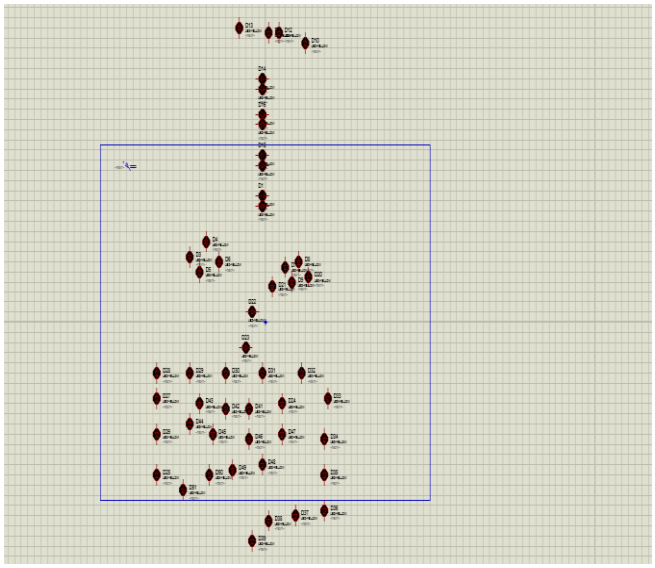

Figure 5: *Arrangement of LEDs in Digestive Tract*

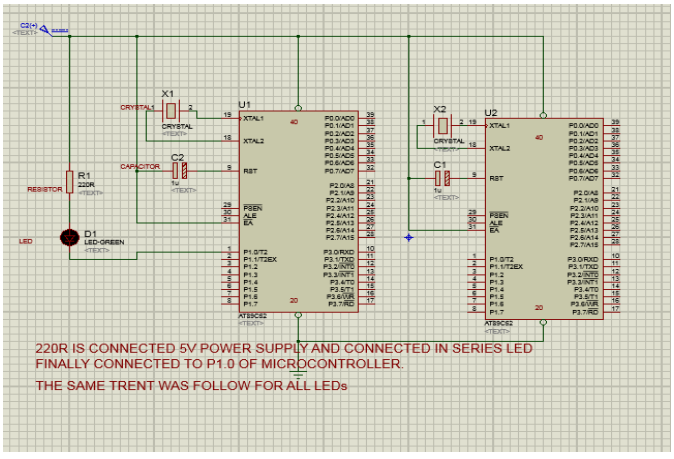

Figure 6: *Main Circuit Diagram Connected to RF Receiver*

3.0 RESULTS

- The LED used worked as expected giving a clear picture of the process involved in digestion in human system.
- Furthermore, the remote control built from a radio module worked having effect within 22m radius.
- Atheistic was achieved since the wood was painted.
- It fascinated student thereby increasing their interest to learn the process of digestion.

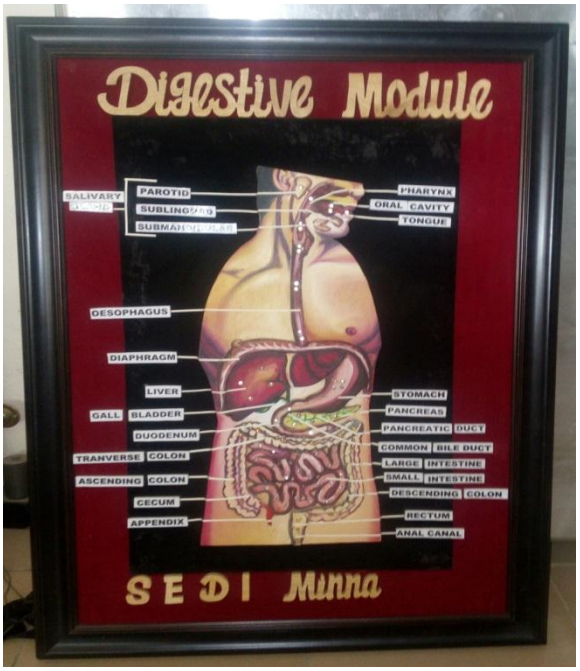

Figure 7: *Complete Assembled Remote Controlled Digestive Module*

4.0 DISCUSSION:

So as to ensure clear communication different color of LEDs was used. White LED was used to depict the food, Blue to depict salivary gland, green LED was used as secretion in the lever, red is the secretion in the pancreas, multicolor for the mixture of food in the small intestine and amber color represents the waste in the large intestine. All these LEDs glow with good lumen since the current passing through it was regulated using limiting resistor. The remote control was able to cover 22m of radius. This unique design intrigued students such that they want to go over the processes again and again. With this, there is an impact on them as they describe the project and unconsciously describing the process of digestion.

5.0 CONCLUSION:

Via a semi-animated teaching aid students in both secondary and tertiary institutions can explain the process of digestion. Furthermore, the module lightning leaves lasting imprint on the mind of the student. Since it look more practical than theory. The system makes natural science more practical thereby empower teacher to be able to convey the knowledge easily.

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