Sri Lanka Institute of Information Technology

TMP-22-056

Project Topic Assessment – 2022 (Regular)

Topic

TangiGuru: Tangible Learning Solution for Early Childhood Development.

Abstract (200 Words Max):

Since early 2020, most of the world's education has been online due to the Covid-19 outbreak. It did not affect the elderly students, but students of younger ages, especially from 4 to 7, could not grab the teachings via the online platform. Also, they got addicted to electronic devices such as mobile phones and tablet PCs. Therefore, to improve the learning ability and creativity of the kids while solving the addiction to electronic devices, an interactive tangible learning kit with different activities is proposed to be developed for the children to learn things more interactively and improve their thinking ability and creativity. Children can learn with minimal supervision using the proposed learning kit while having interactive guidance similar to on-premise teachers. Therefore, this proposed Tangible Learning Kit solves most remote teaching activities related to early childhood development.

Keywords: Early Childhood Development, Tangible Learning, Embedded Systems

Research Group/Area: Select the area by referring to the document uploaded to the Course Web

Computing for Inclusive and Equitable Society (CIEC)

E-learning and Education (ELE)

Supervisor should fill this part

Supervisor and Co-Supervisor endorse the proposed project, and hence, guide the students to acquire required knowledge skills pertaining to above sub domains of their specializations.

Supervisor: **Ms. Shashika Lokuliyana**

Signature

Continuation of Previous Year Project? ☐

If yes, state the Project ID

and year

Co-Supervisor: **Ms. Narmadha Gamage**

Signature

External Supervisor: Mr. Rajitha De Silva

Name

Team Members:

Student Name	Student ID	Specialization
Leader: Hettiarachchi T.C.D.S.	IT19206806	CSN
Member 2: Semasinghe L.S.	IT19051130	CSN
Member 3: Ratnasuriya M.M.D.	IT19215716	CSN

Member 4: N/A	N/A	Select your Specialization

Research Problem:

Children who are in early childhood need to teach with supervised learning. Due to the Covid outbreak in early 2020, most of the world's education has been online. These remote online teachings are always virtual and primarily unsupervised or minimally supervised. For children at such a young age, it is impossible to make them focus on a digital screen for more extended periods without addiction. Therefore, such methods are vastly ineffective for children in their early childhood. [1]

Further, this virtual online education causes physical and mental health issues, especially addiction. Due to the rise in screentime, students may acquire terrible posture and vision-related issues. With the electronic devices they use for online education, such as smartphones, children get quickly sidetracked to other unwanted applications in those devices. [2]

Traditional educational toys overcome some of the above problems, but they mostly rely on adult supervision and guidance. Also, such toys only have a limited scope of learning, so it needs a wide variety of toys to cover all the required learning outcomes related to early childhood education. As these young children are already living in a technology conquered world, it is crucial to adapt them to the technology correctly. So neither traditional educational toys nor smart mobile devices do fulfill them.[3]

[1] J. A. Fails, A. Druin, M. L. Guha, G. Chipman, S. Simms, and W. Churaman, "Child's play: A comparison of desktop and physical interactive environments," *Proc. Interact. Des. Child. 2005, IDC 2005*, pp. 48–55, 2005, doi: 10.1145/1109540.1109547.

[2] M. Sahu, S. Gandhi, and M. K. Sharma, "Mobile Phone Addiction among Children and Adolescents: A Systematic Review," *J. Addict. Nurs.*, vol. 30, no. 4, pp. 261–268, 2019, doi: 10.1097/JAN.0000000000000309.

[3] C. S. González-González, M. D. Guzmán-Franco, and A. Infante-Moro, "Tangible technologies for childhood education: A systematic review," *Sustain.*, vol. 11, no. 10, pp. 1–15, 2019, doi: 10.3390/su11102910.

Solution proposed:

We propose an interactive tangible learning solution to address these problems by integrating the tangibles with an embedded system. Using this solution, children can independently learn with minimal supervision and guidance.

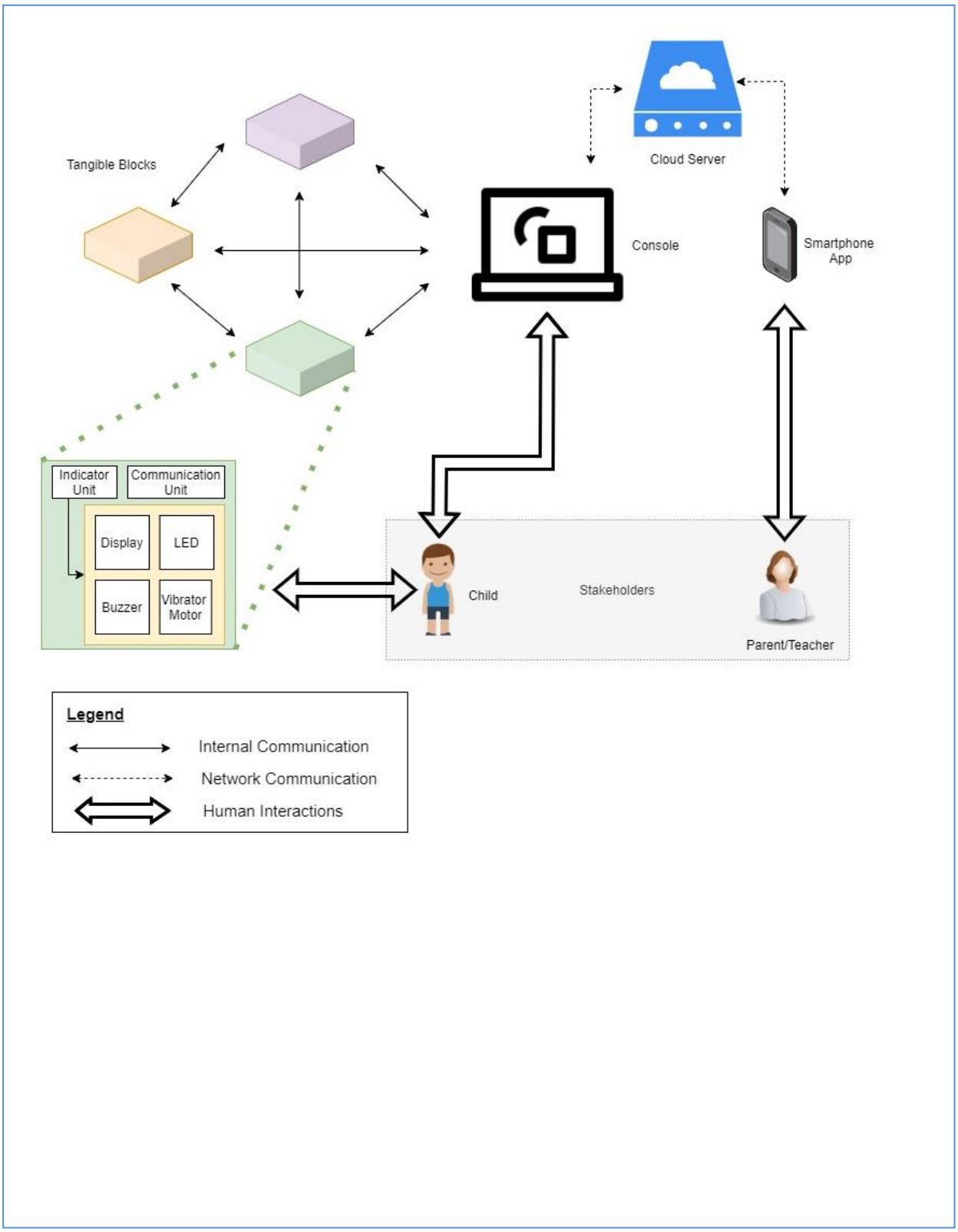
Tangibles will be developed in an interactive and exciting design to make their learning experience pleasant and exciting. It is more likely to play a game for children rather than learning by staring at a laptop or smartphone and the traditional educational toys. As a result, it is preferable to teach this strategy to little children remotely.

Through this tangible learning solution, children can participate in different learning activities related to elementary mathematics ideas, color identification, similarity recognition, word building, and many more using the tangible blocks in this kit by physically joining them with each other. This outcome hopes to develop the child's social, emotional, and physical development through these activities.

As this requires only minimal guidance and supervision, parents or teachers can still track the children's progress using the mobile application proposed to develop alongside the tangible learning kit.

System Overview Diagram for the solution proposed. Recommended to draw using draw.io. Note: This is not an activity/flow (UML) diagram

1. **Main components including the data sources, stakeholders, interaction among the stakeholders, etc.**
2. **Interconnection among the components**
3. **Major SW and HW components**



Objectives (1 main objective and 4 sub objectives):

Main Objective: To developing a tangible learning solution for children in early childhood to overcome the problems in existing remote learning solutions and traditional educational toys.

Sub Objective 1: To develop tangible blocks with interactive features and components.

Sub Objective 2: To develop a technology to identify the adjacent blocks, and method of communication between blocks and applications.

Sub Objective 3: To develop the interactive, child-friendly UI/UX which is easily understandable for children.

Sub Objective 4: To develop the learning activities suitable for required learning outcomes in the early childhood development.

Task divided among the members

Member 1:

- Developing the interacting parts of the cubes and communication between blocks and the center console.
- Developing the console casing with the required hardware.
- Developing power management of the blocks and the console.
- Creating the outgoing API between blocks and application software.

Member 2:

- Implement a mechanism to identify the adjacent blocks.
- Creating the incoming API between blocks and application software.
- Implment the system software for the console.
- Implment the cloud servers to store the user data and software updates.

Member 3:

- Develop the frontend software application.
- Develop the learning activities for the children.
- Develop the UI/UX design for the web application to be child friendly.
- Implement the mobile application to view the statistics of the child and control.

Member 4: N/A

Technologies to be used:

ESP8266, Raspberry Pi

ESP NOW / Bluetooth Low-Energy, WiFi

MongoDB, Express Js, React Js, Node Js

RethinkDB, Python

If supervisor States that this year is a continuation of previous work, state the further work the students should do compared to the previous years.
(NOTE: This part has to be filled by the supervisor)

<u>This part will be filled by the Topic Screening Panel members</u>

Acceptable: Mark/select as necessary

Acceptance/ Rejection	Correction State	
	Minor Correction	Major Corrections
Accepted	☐	☐
Resubmit	☐	☐
Rejected	☐	

Corrections (if necessary)

Any other Comments:

_____

_____

_____

Approved by the review panel:

Member's Name	**Signature**

Important:

1. According to the comments given by the panel, do the necessary modifications and get the approval by the **same panel**.
2. If the project topic is rejected, find out a new topic and inform the CDAP Group for a new topic pre-assessment.
3. A form approved by the panel must be attached to the **Project Charter Form**.