Name of IEEE OU	IEEE UM Student Branch
Name of IEEE Malaysia Section Chair	Dr. Mohammad Faizal Ahmad Fauzi
Name of Section Education Activities Chair	Assoc. Prof. Dr. Lee Yoot Khuan
Name of IEEE UM Student Branch Counselor	Prof. Ir. Dr. Fatimah Ibrahim
Name of IEEE UM Student Branch President	Amir Firdaus bin Eddy Rosyadie
Name of Project Leader	Dr. Raja Jamilah Raja Yusof
e-mail	fatimah@um.edu.my rjry@um.edu.my
Name of event	MyMeTs Games (Malaysian Medical Technologists)
Type of the Project	Educational Outreach
Project Title	COMPUTATIONAL THINKING AND BIOMEDICAL ENGINEERING COMPETITIVE GAMES

1. Executive summary of the program (maximum 300 words)

The global crisis of the declining phenomena of participation and interest in STEM subjects is very alarming. Teenagers are not inspired to take STEM. Rote learning of STEM subjects in classroom should be made alive with dynamic exploration of subject such as Computer Science and Engineering. This initiative is to introduce Computational Thinking and Biomedical Engineering concepts to pre universities children and teenagers age 12-17 years. The objective of the project is to create awareness, inspire and equip students with Computing and Biomedical Engineering knowledge and skills. Our approach is through playing competitive physical games that uses Computational Thinking and Biomedical Engineering problem solving context. Targeted schools are SMK Sultan Abdul Samad, Sekolah Menengah Kebangsaan Sek 9 Shah Alam, Sekolah Bimbingan Jalinan Kasih (school for homeless children) and Sekolah Kebangsaan Bukit Lanjan (aborigine school). Together with the collaboration of the Centre for Innovation in Medical Engineering (CIME), UM, school teachers, IEEE Student Branch committee and student volunteers will be trained to conduct the competitive games in the schools. There are 5-6 games to be conducted in parallel for students to play. The fastest team to complete the game challenge wins the game. The program takes up to half a day for each school and the budget proposed for each school is USD1375. Our past experiences in conducting similar initiative up to 500 – 600 children and teenagers were very well accepted. The previous workshop to teachers and university students were very positive. In summary we believe that our project is scalable and sustainable.

2. Introduction

The global crisis of the declining phenomena of participation and interest in STEM subjects is very alarming. Children and teenagers are not inspired to take STEM as their career path. Some children are not able to learn STEM from trained and experienced teachers. Some others are not exposed to these concepts because of challenges they face in schools and at home. Although small children are naturally curious and observant, which are fundamental scientific skills, these skills fates away if not properly nurtured. It is therefore, relevant that IEEE members contribute to solving this crisis through innovative and creative approaches. School children and teenagers need to be exposed to problem solving activities. Our past experience in conducting similar initiative is very well accepted by

children and teenagers. We intend to conduct these activities among pre-universities students so that they can inspire others in choosing STEM careers especially related to Computational Thinking and Biomedical Engineering.

3. Objective
1. To create awareness and inspire pre-university students to choose computing and biomedical engineering as their career path
2. To foster students' knowledge of Computer Science and Biomedical Engineering
3. To equip students with the relevant soft skills to overcome STEM-related challenges

4. Methodology

Rote learning of STEM subjects in classroom should be made alive with dynamic exploration of scientific content and these should include Computational and Engineering concepts. Our approach is to teach computational thinking and biomedical engineering to the community through competitive physical games. Computational thinking activities is also a popular activity within the computer science educators such as discussed by Curzon and et al. [3] while engineering thinking has also been very relevant to the engineering community [2]. The motivation behind this approach is firstly based on learning style theories that many students are of the kinesthetic typed compared to the visual and auditory [4] and this is also true in the context of computer science and engineering students [1,3]. Kinesthetic students process new knowledge (or understanding) with the involvement of their body movement.

The event will be held as a one-day event in the selected school. The following activities will be conducted prior to the event itself:
- A committee (from IEEE UM Student Branch) will be set up to contact the school, organise logistics (laptops, engineering game materials) and train the trainers.
- A 1-day workshop will be held to train and equip teachers with the concepts, event flow and learning outcomes related to the event.
- The event itself will comprise of 4-5 stations and the students will be divided into 7-10 groups, accordingly.
- Each group will be given 5-10 minutes at each station to complete the game before moving on to the next station.
- During the event, the trainers will guide the students through the rules and regulations of the games.
- Points will be collected at each station.
- After completing all stations, the points will be totalled up and prizes will be given to the winner with the highest score. All participants will be provided with consolation prizes and certificates.
- At the end of the event, the students will be debriefed on the computer science and engineering principles involved in each game and possible strategies to overcome each challenge.

Proposed date of the event: July 2018

Proposed location of the events (concurrent):
Our target community are school children and teenagers from various backgrounds including children from underprivileged backgrounds.

Tentative program

7.30-8.15 am	Registration Preparation of Game Stations
8.15 – 8.30 am	Welcoming Remarks
8.30 - 9.30 am	Games in parallel
9.30 – 10.00 am	Break
10.00 – 11.00 am	Games in parallel
11.00 – 11.30 am	Games debriefs Calculate marks and determine winner
11.30 – 12.00 noon	Certificate and Prize Giving

Proposed budget (expenses):

Expense description	Expense Amount ($US)
Travel and sustenance - 4 Schools (children and teenagers)	1,000
Materials for games - Computational thinking material - Engineering material	1,000
Prizes for Games - 4 Schools	1,000
Workshop to be conducted for trainers and teachers	2,000
Miscellaneous	500
Total expenses	**5,500**

5. Scalability and sustainability of the program
Scalability of program
Similar program had been conducted in 6 schools under University Malaya grant (estimated of 300-400 children and teenagers). The project was completed successfully and won 2nd place for the poster competition in the P*ersidangan Akademia-Komuniti Universiti Malaya* held on the 28 & 29 November 2017 (refer to Appendix a). Youtube link:
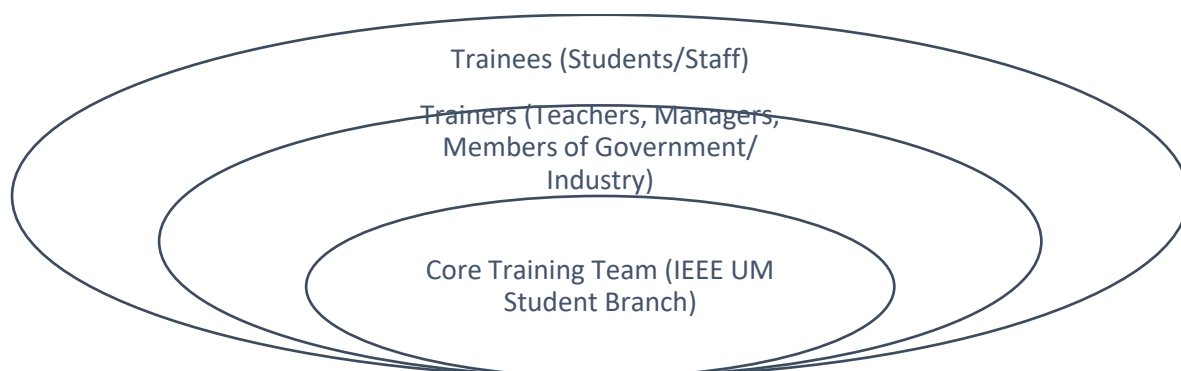https://www.youtube.com/watch?v=Vylt3XMRuCA
Our previous experience in conducting this project had lead us to conduct games in many other events such as the following:
- STEM program in Simunjan, Sarawak with Agensi Innovasi Malaysia (AIMS) (refer to appendix b)
  - Estimated of 100-150 children and teenagers
- STEM program in Minggu Sains Negara in Da Men Mall, Subang Jaya, Selangor (Refer to appendix c)
  - Estimated of 100 -150 children and teenagers
- Several local residential program funded under the local residential association (Refer to appendix d)
  - Estimated of 50-80 children and teenagers

All previous program were conducted with University students and lecturers as facilitators. The concepts of competitive computational thinking and engineering games had been proved and tested to be scalable.

Sustainability of program
This program is also considered as sustainable since it is easy to train University students, teachers and also members of the public to conduct this type of game competition. We had also previously conducted a workshop for teachers and university students (appendix e) to create their own game so that these activities can be implemented in classroom and other places. The workshop was a success, based on the teacher's feedback form and based on the eagerness of our university students in conducting similar activity in schools (appendix f). Teachers and individuals who have received the training will be equipped to organize the event independently. This program may also be adapted as a team-building and skills training tool in industry.

Trainees (Students/Staff)

Trainers (Teachers, Managers, Members of Government/ Industry)

Core Training Team (IEEE UM Student Branch)

Figure 1. Flowchart illustrating the knowledge transfer path.

6. How does the program align with some of MGA goals?
MGA goals is for the purpose in fulfilling the mission of IEEE. The core purpose of this mission is to foster technological innovation and excellence for the benefit of humanity. Our program will be able to foster technological innovation by feeding to the community the knowledge and interest needed to achieve technological innovation in Computer Science and Biomedical Engineering.

7. Educational outcomes of the program;
- Participants will benefit the knowledge transferred on Computer Science and Biomedical Engineering
- The program should spark interest in Computer Science and Biomedical Engineering
- Participants should developed awareness and trigger structured thinking and promote better problem solving ability/skills
- Teachers will be equipped to conduct the games on their own and incorporate it into their lessons

8. Impact of the program to the participants:
- Promote interest in STEM education and therefore may spark interest to choose STEM as a career in the future
- Instill Computer Science and Biomedical Engineering knowledge to participants in a fun and enjoyable manner
- Giving opportunity to participants, teachers, students and lecturers to form a relation for future collaboration and assistance.

References:

[1] Ates, A., & Altun, E. (2008). Learning styles and preferences for students of computer education and instructional technologies. *EGITIM ARASTIRMALARI-EURASIAN JOURNAL OF EDUCATIONAL RESEARCH, 8*(30), 1-16.

[2] Centre of Real-World Learning. (2014). *Thinking like an engineer Implications of the eduation system.* Royal Academy of Engineering.

[3] Curzon, Paul, Joan Peckham, Harriet Taylor, Amber Settle, and Eric Roberts. 2009. Computational thinking (CT): on weaving it in. In *Proceedings of the 14th annual ACM SIGCSE conference on Innovation and technology in computer science education* (ITiCSE '09). ACM, New York, NY, USA, 201-202. DOI=http://dx.doi.org/10.1145/1562877.1562941

[4] Klement, M. (2014). How do my students study? An analysis of students` of educational disciplines favorite learning styles according to VARK classification. *Procedia - Social and Behavioral Sciences. 132*, pp. 384-390. Elsevier.

Appendix a:Grant Information and Winning Certificate

Appendix b: Simunjan, Karnival HOTSTEM

Appendix c: Da Men Mall, Minggu Sains Negara

Appendix d: Conducted games in residential area

Appendix e: Conducted workshop for teachers and university students

Appendix f: Student initiative to conducting Computational Thinking programs

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TENTATIF PROGRAM

"C.R.E.A.T.E - COMPUTATIONAL REASONING & THINKING EMPOWERMENT"
PERINGKAT KEBANGSAAN 2018

TARIKH

28-29 APRIL 2018
(SABTU-AHAD)

TEMPAT

FAKULTI SAINS KOMPUTER & TEKNOLOGI MAKLUMAT
UNIVERSITI MALAYA,

ANJURAN

SEKRETARIAT SUKARELAWAN UNIVERSITI MALAYA SESI 2017/2018

KOLABORASI BERSAMA
FAKULTI SAINS KOMPUTER & TEKNOLOGI MAKLUMAT
PERSATUAN KOMPUTER UNIVERSITI MALAYA

1. BUTIRAN PROGRAM

    1.1 TARIKH

    28-29 April 2018 (Sabtu-Ahad)

    1.2 TEMPAT

    Melalui kolaborasi bersama Fakulti Sains Komputer & Teknologi Maklumat, program ini dirancang untuk mengadakan bengkel tersebut di Fakulti Sains Komputer dan Teknologi Maklumat.

    1.3 JADUAL

Tarikh	Masa	Aktiviti	Tempat
28 April 2018 Sabtu	8.00 pagi	Pendaftaran	Kolej Kediaman Ungku Aziz
	11.00 pagi	Majlis Pelancaran & "Ice-breaking"	The Cube, FSKTM
	1.00 petang	Rehat, solat & makan	
	2.00 petang	"Introduction to C.R.E.A.T.E"	
	6.00 petang	Sesi Jelajah Kampus	Sekitar DTC, Tasik Varsiti
	7.30 malam	Rehat, solat & makan	Kolej Kediaman Ungku Aziz
	8.30 malam	"Critical or Creative?"	
	11.00 malam	Minum malam & rehat	

Tarikh	Masa	Aktiviti	Tempat	
29 April 2018 Ahad	7.00 pagi	Senaman pagi	Kolej Kediaman Ungku Aziz	
	8.00 pagi	Sarapan & persiapan		
	9.00 pagi	"Programming"	MM2	
	10.30 pagi	"Multimedia"	MM4	
	12.00 tengah hari	"Computer System & Network"	MM6	FSKTM
	1.00 petang	Rehat		
	2.00 petang	Sesi Perkongsian	The Cube	
	4.00 petang	Majlis Penutup & Penyampaian Hadiah		
	5.00 petang	Bersurai		

Endorsed by,

Education Activities Chair
IEEE Malaysia Section