

## **Title: Student- Centered Instruction in STEM classroom**

### **Introduction**

STEM education involves learning to solve authentic problems, team work and collaboration, critical thinking and solving real world problems through making students the center of instruction. In SCI students are encouraged to take responsibility to own their learning as well. For this to happen, it is significant to equip teachers through professional development so as to foster student creativity and to develop young innovators as well.

During this time of 21<sup>st</sup> century way of life, the pedagogy of education should address real world problems through developing student interest to gain knowledge and skills which would enable them to transfer their learning to a new situation. The integrated STEM education and students centered instructional approach would significantly support the intended outcome of engaging students in the instruction process rather than fostering them to be information receivers. This can happen through involving students in the instructional process by providing students with the opportunity to construct new knowledge and problem-solving skills which can be accomplished through a series of open-ended and hands –on activities.

With that said, the intention of this professional development session is to create awareness and clear understanding about STEM classroom to fellow teachers in higher ground academy, and to support them to apply student- centered instructional model through integrated STEM approach in their respective classroom.

### **Integration of NASA assets and /or content from the endeavor courses**

The 5E lesson plan, the content in math modeling and the engineering design process from E in STEM were the eye opener courses for a teacher (Me) who facilitates an entirely project based classroom and the instructional model is student centered. All the course resources from NASA and the rich discussion articles provided from the instructors changed the way I see instruction in STEM classroom. These resources would be used in my Professional development session and will be applied through prompt questions, examples, and activities. For instance, The Makey- Makey, Fishertechnik, and the solar box cooker project I did in the endeavor courses would be an asset, and I would consider to conduct Makey - Makey project activity to display during the PD session. One of my colleague from science department and a student who did Make- Makey last year would be doing the activity with me during the session.

### **The proposed audience**

The proposed audience would be 15 High School teachers from Language arts, Science, Math, Social studies, Technology, Special education and ELL departments teaching 9 to 12 grade level with an average of 26 students in a classroom. The PD session will also include a principal and two assistant principals.

## **The Learning Goals**

At the end of the Professional development session attendees will be able to understand further about integrated STEM education and student-centered instructional model and would be able to apply in their respective classroom. The following NGSS and CCSS standards will be introduced during the Makey- Makey activity in the PD session.

### **NGSS Standards**

**HS-PS3-1** Create a computational model to calculate the changes in the energy of one component in a system when a change in energy of the other component(s) and energy flows in and out of the system are known

**HS-PS3-2** Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative positions of particles (objects)

**HS-PS3-3** Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

**HS-PS3-5** Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction

### **Common Core Standards**

#### **Mathematics**

**M.P.2.** Reason abstractly and quantitatively

**M.P.4.** Model with Mathematics

**HSN.Q.A.1.** Use units as a way to understand problems and to guide the solution of multistep problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

**HSN.Q.A.2.** Define appropriate quantities for the purpose of descriptive modeling

**HSN.Q.A.3.** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities

#### **Professional Development Session**

The PD session is proposed to be held in High school STEM classroom during our high school team meeting which takes place every Thursday at 2:30PM. It is an hour long meeting which I hope one of the team meeting time will be secured for me. The day of the PD session will be confirmed after discussing with a principal. He is out of school and will hopefully back by the coming week.

#### **Pre and post-survey**

In general, my pre-survey would ask about attendee's prior experience about student-centered instruction, integrated STEM education, pedagogy in STEM education, PBL, 21<sup>st</sup>

century classroom challenges, the difference between traditional classroom and Integrated STEM education, and their own perspective towards student – centered instruction and integrated STEM Education. The post- survey would ask the same or very similar questions which will help me to evaluate the outcome of the professional development session.

### **The expected outcome of Professional development session**

My fellow teachers understand the struggles of supporting and enabling students to take the responsibility to own their learning. Therefore, the PD session would help educators to redesign the instruction towards student – centered, and support students to shoulder more of their learning and be responsible for the outcome. This approach will help students to face more challenges and foster their creativity rather than working to get one right answer. I also expect teachers to appreciate the process of students learning rather than focusing on the destiny. Secondly, I would expect the change in perspective of all teachers, the principal, and the assistant principals towards the STEM classroom and treat STEM classroom as it is supposed to be. Thirdly, The PD session would help teachers to collaborate more for the better students learning.

### **Follow up the teachers in attendance**

My school is relatively small, and we always approach and support each other. So then it will not be difficult for me to go to their classroom and observe their instructional model, pedagogy and ask them the content included in my PD session, and ask their hindrances to apply student - centered instruction in their classroom.

### **Data collection methods**

The data collection involves interviewing PD participants about the impact of PD regarding student - centered instruction and integrated STEM education. The observation is semi - structured which include asking open ended questions regarding the PD session. One teacher from each department, ELL teacher, SPED case manager and the principal will be interviewed. For data recording, descriptive notes and audiovisuals will be used to record the PD session and possibly during the interview process as well. The length of the interview will be from 10 to 15 minutes. Data from observation of the PD session, the descriptive notes will serve to triangulate data found in the interviews and will provide information and connection to the PD session regarding Student - centered instruction and integrated STEM education.

### **Conclusion**

It is expected the outcome of the PD may reveal the better project-based learning environment in STEM classroom and the significance of student – centered instructional model in 21<sup>st</sup> century classroom to foster creativity and innovation to solve real world problems.

## Reference

1. Fulton, K. & Briton, T. (2011) STEM Teachers in Professional Learning Committees: From Good Teachers to Great Teaching. Retrieved from <https://www.wested.org>
2. Diana Laboy-Ruth. *Integrated STEM Education through project Based learning*. Retrieved from <https://www.rondout.k12.ny.us/common/pages/DisplayFile.aspx?itemId=16466975>