**Lesson Idea Synopsis**

Students will make use of Geogebra and Vector Sum model on Easy Java Simulation Script to check if they have constructed the scale drawing correctly to find the resultant force.

### Instructional Objectives

Students should be able to:

(a) add two vectors to determine a resultant by a graphical method

(b) solve problems for a static point mass under the action of 3 forces for 2-dimensional cases (a graphical method would suffice)

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|  Overview |
| **How was the lesson carried out? (Please include level, ICT equipment & resources needed, pedagogy or strategies used, thinking skills taught, if any, duration of lesson, etc)**Level: Sec 3 / Sec 4Duration: 2 periods (70 minutes)Resources: Plain papers, construction set, MacBook with Geogebra 5 ([https://www.geogebra.org](https://www.geogebra.org/))and Java enabled browser installed. |

Introduction (10 mins)
• The teacher will start off the lesson by getting the students to sit in pairs and setting up their MacBook. Students are required to use Geogebra 5 to create a thumbnail diagram of how the resultant force is to be obtained from the vector scaled drawing.

• The teacher will then proceed to brief the students that they will be recapping on what they have learnt from the previous lesson on the use of the tip to tail method or parallelogram method to find the resultant force.

• Students will also be briefed that there will be a total of (2+1) questions on Vector Sum for them to try out their construction.

Lesson Proper (Activity) (30 mins)
• The teacher will give instructions to each pair on what they are required to do for each of the vector sum question. They will do the questions in order to the level of difficulty. Using Geogebra 5, they would sketch the thumbnail of how the vector diagram would look like on the plain paper. (Note: the thumbnail they created on Geogebra has no arrows to indicate the direction of the force, the angle to indicate the direction of resultant force) They would now proceed with the construction of the vector diagram using their construction set and plain paper. Using the Vector Sum EJSS model ([http://iwant2study.org/lookangejss/01\_measurement/ejss\_model\_vectorsum04/vectorsum04\_Simulation.xhtml)](http://iwant2study.org/lookangejss/01_measurement/ejss_model_vectorsum04/vectorsum04_Simulation.xhtml%29), they would be able to check if their answers are correct. The students will go through the routine of creating the thumbnail using Geogebra, construction and then using the EJSS model to check if their answers are correct for the first two questions.

15 mins
• The pair will then check on each other’s work. They will also make use of this time to reflect on the importance of indicating the arrows on the lines drawn to represent forces and resultant force, and the use of an angle to represent the direction of the resultant force.

Lesson Closure/Exit pass (10 mins)
• The teacher will proceed with the assessment of the students learning by getting them to do the last question. Students will need to get this correct. If not, the teacher will need to revisit this chapter and proceed with intervention strategies.

Summary (5 minutes)
The teacher will recap on the use of tip to tail method, and /or parallelogram method to find the resultant force. The teacher would also emphasize on the importance to choose an appropriate scale to draw a vector sum scaled drawing.

**How did ICT value-add to the learning process? How did the use of ICT change the learning and teaching process?**

Students were able to work together to visualize how the vector diagram can be drawn together.
Teacher has more time to interact and monitor the students.

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| **What were the outcomes? (Benefits to pupils or teachers, re-designing of pedagogy, development of staff, etc)** |
| Students were able to use “Think-Pair-Share” to learn how to obtain the resultant force using the vector sum scale drawing. Teacher is able to monitor students' work easily by walking around, and paying close attention to those students with difficulties in using the software and/or the construction of the vector diagram. Teacher is performing the role as a facilitator. |
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| **How did you assess student's learning using ICT? (Examples of work produced, etc)** |
| Students were required to do the last question. Grading was done at the end of the lesson. The sample answers are deposited in the teacher’s dropbox account (<https://www.dropbox.com/sh/88ymnfuf82or4yo/AACDbMrTQkwsuNFvVUIsfP20a?dl=0)> if the students need to revisit the topic for revision. |
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| **What went well during the ICT lesson? What would you do differently next time?** |
| Strengths:•Most students were able to use the Geogebra 5 and Vector Sum EJSS model with ease. •The activity provides the students the opportunity to do “think-pair-share” with their peers. •They were required to prepare some work and pre-reading before this lesson i.e the resolution of vectors into their horizontal and vertical components so that they can construct the lines on Geogebra, which allows them to be more self-directed. •Most of the students were on task.Improvement:•More guiding questions or scaffolding should be given to the students to work on the activity. •Teacher will need to come up with some intervention strategies to close up the gap during next lesson. |

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| **Which aspect(s) of Self-Directed Learning (SDL) does this lesson highlight? How would the students display the SDL competencies?** |
| Students were made to take charge of their own learning by taking the responsibility of doing some pre-reading before the start of this lesson. In addition, by sharing the Dropbox link with the students, it also serves as an extension of summing up what they have learnt for this topic. |
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| **Which aspect(s) of Collaborative Learning (CoL) does this lesson highlight? How would the students display the CoL competencies?** |
| The activity provides the students the opportunity to do a “think-pair-share” with their peers. Students were made to build on each other existing knowledge and overcome the question on Vector Sum using scaled drawing together. |