**O3.2\_Framework of the lesson plan**

**Age group/class: 15 years old and above**

**Lesson title: Fluid Mechanics.** Small Fall Water Turbine.

**School Discipline: Physics/Mechanics**

**Key concepts:** Hydraulics. Water Turbine. Computer simulation.

**Aims:**

* How to understand concepts such as water flow, turbulence, hydraulic pressure etc.
* How computer simulation reduces costs, materials and time compared to reduced and full scale experiments.

**Skills developed**: observation, description, analysis

**Materials/Equipment needed**:

* VR headset
* VR video/link <https://eloquent-ramanujan-887aa5.netlify.app/small-fall-turbine.html>

**Lesson plan:**

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| **Stages** | **Description of activity** | **Time** |
| **Preparation before the lesson** | This lesson focuses on hydraulics.  If this is a first VR experience for students – go through the safety rules: -  Learners are to sit down whilst using the VR glasses and not hold anything in their hands, unless the experience is of such a nature that it requires you standing, in which case, ensure enough space is allowed around all students.  -  Learners will be told to expect a feeling of vertigo. If it gets worse, students must remove VR glasses.  -  Learners need to know how to adjust the viewing focus before using the headsets.  -  Learners must not use the headset when they are: tired, need sleep, under emotional stress or anxiety, when suffering from cold, flu, headaches, migraines as this can worsen their susceptibility to adverse reactions.  -  Learners should be given the choice to opt out of using VR. |  |
| **Introduction** | Share Learning Intentions with students.  Ask learners to think and write any questions they have regarding the learning objectives, as for example: *What is hydraulic pressure? What causes turbulence in water? What is a small fall water turbine? How does a water turbine help to produce electricity?How does water flow change with various parameters?* | 5 min. |
| **Initial Immersive Experience** | Learners put on the VR headsets and explore the video at their own pace.  Turn the headsets off and bring students back into the classroom. | 3 min. |
| **Guided Immersive Experience** | Learners begin to explore the VR material on small fall water turbines.  Students put on the VR headsets and start the immersive experience focusing on finding more information on how small fall water turbines are tested in a computer simulation and on a small scale experiment.    Allow time for this guided exploration or on and off for as long as it is needed for learners to familiarise with the tools. | 5 min. |
| **Follow up** | When the VR moment is over, learners gather in groups of 2 or 3and share their ideas.  Learners compare notes and discuss to complete their knowledge and understanding. The teacher facilitates the discussion and ensures there are no misunderstandings.  Learners use their research stations (laptops/tablets/phones) to add to the knowledge gained through the VR experience by completing their notes.  The task is:   * analyze how a small fall water turbine works * analyze how various parameters would influence the turbine efficiency * analyze how computer simulation affects factors such as cost, time, materials when it comes to experiments and design. | 5 min.  10 min. |
| **Formative Assessment** | Teacher shows materials that explain how the small fall water turbine can be adapted to a larger scale in a hydroelectric dam and how it works. | 5 min. |