Course title:	Planning for and Reflecting on ANSTO virtual experiments by videoconference				
Date/s:	On request				
Time:	On request				
Duration:	Hours	3	Minutes:	00	
Target group for the course:	Stage 5 science teachers, Chemistry and Physics teachers				
Indicative cost of course to participant:	$0				

Short explanation of how the course relates to the standard descriptors at the Proficient Teacher level

Teachers work together with ANSTO Education Officers to offer their class a student-led investigation-based learning experience. Teachers plan and deliver at least three lessons with their class at school: a planning lesson with their students to design their own experiment as a class (1 lesson), and a lesson by videoconference with an ANSTO Education Officer to allow their students conduct the experiment remotely with guidance (1 lesson). Teachers then assist their students to analyse and present their results, write a discussion and form a conclusion.

2.1.2 Apply knowledge of the content and teaching strategies of the teaching area to develop engaging teaching activities

As well as developing their own activities, teachers will select and use ANSTO-developed teacher resources, including topics for class discussion, and student activities, including a report-format worksheet, online interactives, background reading and focus questions for their discussion.

2.2.2 Organise content into coherent, well-sequenced learning and teaching programs

3.2.2 Plan and implement well-structured learning and teaching programs or lesson sequences that engage students and promote learning

Teachers design and deliver a series of 3 lessons, including a preparatory lesson where students plan their experiment, a lesson by videoconference to perform their experiment, and a lesson to reflect on their experiment and write up their results.

2.5.2 Apply knowledge and understanding of effective teaching strategies to support students' literacy and numeracy achievement

Teachers will set numeracy and literacy outcomes appropriate for their students, adapted from the following:

- Develop and write a hypothesis and method (literacy)

- Communicate instructions verbally (literacy)

- Record data in a table, graph and analyse the data (numeracy)

- Interpret their results with reference to information from secondary sources (literacy and numeracy)

They will support student achievement in these areas by selecting and using ANSTO-developed student activities and a toolbox of suggested strategies for teaching literacy and numeracy in science.

2.6.2 Use effective teaching strategies to integrate ICT into learning and teaching programs to make selected content relevant and meaningful

3.4.2 Select and/or create and use a range of resources, including ICT, to engage students in their learning

Teachers integrate ICT into their teaching program by using the experimental method as a scaffold for the lessons they plan (aim, method, results, discussion, conclusion). Teachers select from ANSTO-developed multimedia resources for the preparatory lesson, and then use videoconferencing to connect their students with high-quality experimental equipment and a real-life context for their investigation.

3.3.2 Select and use relevant teaching strategies to develop knowledge, skills, problem solving and critical and creative thinking

Teachers select and use ANSTO-developed teaching resources and student activities to design lessons that:

- give students the freedom and responsibility to plan their own investigation

- provide students a familiar scaffold for designing an investigation (aim, method, results, discussion, conclusion)

- engage students in decision-making processes about their own learning

- facilitate class discussion to come to a consensus

Research basis of the course

Evidence suggests that inquiry-based learning with e-mentoring in science can enhance student learning (Li et al. 2014). The aim of this course is to help teachers to incorporate inquiry-based learning via videoconference into their teaching programs in a highly syllabus-relevant way.

Li, Q., Moorman, L., Dyjur, P. (2014). Inquiry-based learning and e-mentoring via videoconference: A study of mathematics and science learning of Canadian rural students. Education Technologies and Research Development. 58: 729-753.

Rationale for the course

There are several reasons for this course:

- Both students and teachers need to become comfortable with collaborating as digital citizens

- Videoconferencing is a crucial tool that allows teachers to facilitate collaboration between their students and the rest of the world

- There are a plethora of videoconferencing programs offered to schools, but few programs are free, inquiry-based, student-led, highly-syllabus relevant, and put students in contact with experts in the field

- Some teachers require training in how to use different videoconferencing technologies and how to make it an effective teaching tool with their students

Summary of the course

The course is a two-lesson program that teachers will use with their science class (either Year 9/10 or Preliminary Physics). Teachers will receive 3 hours recognition for the course:

1. Teacher preparation and videoconference organisation (1 hour):

- Organise and book a videoconference with ANSTO Education staff (including conducting test connections)
- Plan two lessons with their students

2. Prepare a preparatory lesson to their students (1 hour) - In the first lesson, teachers will select from a range of ANSTO teaching resources to help students:

- Read and interpret background information about ionising radiation
- Using a list of available equipment, develop an hypothesis and method for a first-hand investigation, looking at the penetration power of different types of ionising radiation

3. Help facilitate a videoconference with their students (non-accredited time) - In the second lesson, teachers will link their students via videoconference to ANSTO Education. Teachers will help students:

- Communicate the method of the experiment to ANSTO Education staff (either verbally or by text methods)
- Record the results of their experiment in their own table

4. Prepare a reflective lesson to help students analyse and interpret their results (1 hour) – In the third lesson, teachers will help students:

- Analyse results, and write a discussion and conclusion for the investigation

Further teacher learning opportunities

Not applicable

Course/program sessions	Focus and content of the sessions	Standard descriptors at the Proficient Teachers level addressed by the session:	Explanation of how the standard descriptors will specifically be addressed within the session
Teacher preparation session	1a) Teachers contact ANSTO to organise a videoconference with us. This organisation requires: - Working with ANSTO Education staff and perhaps their own IT staff at school to organise a suitable videoconferencing solution - Organise and conduct a test connection via videoconference with ANSTO Education - Book a time and date for their class videoconference with ANSTO Education b) Teachers will also plan three lessons for their class: • A preparatory lesson • A videoconference session with ANSTO Education staff • A reflection lesson Teachers will have a range of ANSTO teacher resources and student worksheets to help them plan and deliver these lessons. ANSTO Education staff are also available to provide feedback in advance	**2.6.2 Use effective teaching strategies to integrate ICT into learning and teaching programs to make selected content relevant and meaningful** **3.4.2 Select and/or create and use a range of resources, including ICT, to engage students in their learning** **2.2.2 Organise content into coherent, well-sequenced learning and teaching programs** **3.2.2 Plan and implement well-structured learning and teaching programs or lesson sequences that engage students and promote learning**	Teachers use videoconferencing with their class to bring meaning to the science concepts and theory, linking them directly with expert knowledge about nuclear science. Teachers design and plan at three lessons (a preparatory lesson, a lesson using videoconference with ANSTO, and a reflection lesson) to integrate the use of ICT in their teaching programs. Teachers use effective teaching strategies to engage students in learning, including: - Student-led inquiry-based investigation (structured using the experimental method - aim, hypothesis, method, results, discussion, conclusion) - Continuity of concepts over two or more lessons (a preparatory lesson, and a lesson for the investigation by videoconference) with the potential to set independent tasks for homework Teachers select and use a range of resources to promote learning, including: - ANSTO-developed teacher resources, including

Course/program sessions	Focus and content of the sessions	Standard descriptors at the Proficient Teachers level addressed by the session:	Explanation of how the standard descriptors will specifically be addressed within the session
	about any lesson plans.		topics for class discussion - ANSTO-developed student activities, including a report-format worksheet, online interactives, background reading and focus questions for their discussion http://bit.ly/1tRnapS
Teacher plan and prepare first preparatory lesson to their class	Teachers use ANSTO teacher resources and student activities and worksheet to help their students design and plan a first-hand investigation: - Select appropriate equipment - Develop a method - Write a hypothesis Teachers will also work with their students to develop a strategy to communicate instructions to ANSTO Education staff via videoconference during the next lesson. This might be a few representative students reading the instructions aloud, or sending the method to ANSTO Education before the conference, or typing the instructions into a chat roll during the conference.	**2.1.2 Apply knowledge of the content and teaching strategies of the teaching area to develop engaging teaching activities** **2.5.2 Apply knowledge and understanding of effective teaching strategies to support students' literacy and numeracy achievement** **3.4.2 Select and/or create and use a range of resources, including ICT, to engage students in their learning**	Teachers will have access to ANSTO-developed teacher resources, including topics for class discussion, and student activities, including a report-format worksheet, online interactives, background reading and focus questions for their discussion Teachers will take advantage of ANSTO resources to develop engaging teaching activities that support student numeracy and literacy. Example activities and tasks for students include: - Build a glossary of terms about ionising radiation - Provide examples of written hypothesis to help students construct their own for this experiment - Writing and verbalising instructions for familiar daily activities, like making a cup of tea - Draw a labelled diagram of the equipment set up

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	This lesson will be planned during the teacher preparation session. ANSTO Education staff can provide feedback on the lesson plan if requested by the teacher.	**2.2.2 Organise content into coherent, well-sequenced learning and teaching programs** **3.2.2 Plan and implement well-structured learning and teaching programs or lesson sequences that engage students and promote learning** **3.3.2 Select and use relevant teaching strategies to develop knowledge, skills, problem solving and critical and creative thinking**	- Draw a numbered flow chart of the steps in the experiment method Teachers implement the first lesson of their 3 lesson mini-program with a view to promote student learning by: - giving students the freedom and responsibility to plan their own investigation - providing students a familiar scaffold for designing an investigation (aim, method, results, discussion, conclusion) - engaging students in decision-making processes about their own learning - facilitating class discussion to come to a consensus
Teacher plan a reflection lesson after the first-hand investigation by videoconference	Teachers connect their class with ANSTO Education via videoconference. Teachers and ANSTO Education staff help their students to: - Conduct a first-hand investigation via	**2.1.2 Apply knowledge of the content and teaching strategies of the teaching area to develop engaging teaching activities** **2.5.2 Apply knowledge and**	Teachers will develop a toolbox of strategies for supporting student literacy and numeracy in science. Example activities and tasks for students include: - Practice exercises for collating and presenting

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with their class	videoconference - Record data in a table Teachers then help their students to: - Graph and analyse the data - Write a discussion - Formulate a conclusion Students probably won't finish this in a single lesson, so there is plenty of opportunity for a teacher to continue these tasks in the next lesson or set for homework.	**understanding of effective teaching strategies to support students' literacy and numeracy achievement** **3.4.2 Select and/or create and use a range of resources, including ICT, to engage students in their learning** **2.6.2 Use effective teaching strategies to integrate ICT into learning and teaching programs to make selected content relevant and meaningful** **2.2.2 Organise content into**	data in different formats, such as tables and graphs - Practice exercises to convert numerical data into different units of measurement - Comprehension tasks for appropriate-level secondary sources about radiation - Synthesise their own results with information from secondary sources to write a discussion - Evaluate example conclusions for different experiments Teachers connect their students with ANSTO Education staff, who will discuss the significance of the investigation results in the real world of nuclear science, including: - applications of ionising radiation (nuclear medicines, environmental research) - ensuring safety around ionising radiation (shielding, distance, time, dosimetry) Teachers will also provide students virtual access

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		coherent, well-sequenced learning and teaching programs **3.2.2 Plan and implement well-structured learning and teaching programs or lesson sequences that engage students and promote learning**	to better equipment for their investigation than they might have at school Teachers assess student progress during the lesson and decide whether to continue the work next lesson or allocate tasks as independent work at home.