**Real-world applications of nuclear science: Develop your own lesson**

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| **Date:** | As advertised | | | |
| **Time:** | 4.00 – 5:30 pm online video-conference plus lesson preparation time and collaborative feedback over a 10 week period | | | |
| **Duration:** | 7 hours |
| **Target group for the course:** | | | Years 9-12 Secondary School Science Teachers | |
| **Indicative cost of course to participant:** | | | | FREE |

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

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| **2.1.2 Apply knowledge of the content and teaching strategies of the teaching area to develop engaging teaching activities**  Teachers will build on their understanding of focus topic about nuclear science and by completing pre-reading and attending an introductory webinar with ANSTO scientists and education staff. Teachers will review how this knowledge and understanding is relevant within the Australian Curriculum and learn about new resources and activities about nuclear science that might be appropriate for their own students. Teachers will select, modify and use example teaching activities and resources to develop a teacher resource pack for a 60-80 minute lesson for a given year group and subject.  **2.3.2 Design and implement learning and teaching programs using knowledge of curriculum, assessment and reporting requirements**  Teachers will be required to create a resource pack for a lesson that addresses at least Knowledge and Understanding descriptors and at least one Science Inquiry Skills or Science as a Human Endeavour descriptor or a Learning Across the Curriculum content point. Teachers will learn about, select from and adapt resources created by ANSTO that will help them address multiple components of the curriculum within a lesson. Teachers will annotate lessons with self-reflections, and collaborative feedback will support continued enhancement of future lessons on this topic across a range of syllabus outcomes.  **3.3.2 Select and use relevant teaching strategies to develop knowledge skills, problem solving and critical and creative thinking**  Teachers will be exposed to a range of different teaching strategies as possible activities and resources to use in their lesson and resource pack. Teaching strategies that ANSTO will introduce as a starting point for further discussion include project-based learning using real data sets, collecting data during first-hand investigations, leading a Q&A with a scientist to investigate real-world applications of Inquiry Skills and Science as a Human Endeavour, or using textual or video stimulus for comprehension activities. Through a collaborative process, teachers support each other in developing additional strategies that are relevant to a range of students.  **3.4.2 Select and/or create and use a range of resources, including ICT, to engage students in their learning**  Teachers will collaborate with ANSTO and with their peers via an online platform to share a range of resources for teaching nuclear science. Teachers will be able to ask questions and chat online to help each other find appropriate resources. Teachers will submit their resource packs for a 60-80 minute lesson and these will be made available in a shared online library to all course participants for future use. |

**Research basis of the course.** This should include reliable research, evidence of best practice and the expertise that exists within the teaching profession.

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| Science education institutions, like ANSTO, not only support development of teacher knowledge but also provide teachers with ideas for pedagogy (Kisiel 2012). Access to current science and its applications is crucial if students are to truly value the role of science in society, but teachers may lack the time, skills or resources to translate this research into educational materials (Brown *et al*. 2017). We aim to contribute to teachers’ pedagogical content knowledge in an integrative way, by combining the knowledge of ANSTO scientists with the experience of ANSTO education staff to provide practical examples of integration into syllabus outcomes   * Teachers learn about nuclear science and its applications from ANSTO * Teachers discuss how this content can help them communicate key knowledge and skills components of their curriculum * Teachers discuss strategies for integrating educational resources and tools into their teaching programs by creating a teaching resource pack for a lesson   Kisiel, J. (2012). Introducing future teachers to science beyond the classroom. Journal of Science Teacher Education. 24(1):67-91.  Brown, J.C., Bokor, J.R., Crippen, K.J., Koroloy, M.J. (2017). Translating current science into materials for high school via a scientist-teacher partnership. Journal of Science Teacher Education. |

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| **Rationale for the course** |
| ANSTO Education strives to support teachers who seek opportunities to collaborate and produce engaging materials for teaching nuclear science. ANSTO’s “Real-world Applications of Nuclear Science: Develop your own Lesson” course supports teachers in incorporating new resources, the latest research, and a range of strategies for teaching nuclear science into their lessons. |
| **Summary of the course** |
| The “Real-world Applications of Nuclear Science: Develop your own Lesson” course is designed to support teachers in creating a resource pack for a lesson about a focus topic related to nuclear science with their own class (e.g. radiometric dating, nuclear medicines, monitoring air pollution). The course is online and has four parts:   1. Pre- reading for teachers to read relevant information about the focus topic, including news articles, videos and profiles of the scientists participating in the introductory webinar. Teachers are required to prepare some questions for the scientists based on this pre-reading and will be given 30 minutes of NESA accreditation for their pre-reading work. 2. An introductory webinar (90 minutes)    1. Short presentations from 3-4 scientists about how their research contributes to our understanding of the topic, followed by a Q&A session with the teachers    2. Where does this focus topic fit in the Australian Curriculum?    3. Resources for teaching this focus topic in the classroom 3. Teachers will develop resources for a 60-80 minute lesson about an aspect of nuclear science for a year group and subject of their choice 4. Teachers need to provide two sets of feedback:    1. Provide feedback on the activity/resource developed by another participating teacher    2. Write a self-reflection on the process of incorporating current scientific knowledge into teaching resources and strategies.   Teachers are encouraged to post ideas, ask questions and work together via the online forum. ANSTO will also post resources and answer questions via the forum.  Each teacher must upload their own individual activity/resource onto the online platform. Teachers may work together but must submit their own work that is substantially different from that of their peers. Teacher activities/resources will remain shared online in a folder system for ongoing access for participating teachers. |
| **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** |
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| **Part 1**  Pre-reading (0.5 hrs) | Introduce teachers to the focus topic with relevant background information. | **2.1.2 Apply knowledge of the content and teaching strategies of the teaching area to develop engaging teaching activities** | In this session teachers will improve their knowledge of the focus topic by reading relevant news articles, videos and scientist profiles. Teachers will prepare questions that they can ask scientists during the introductory webinar.  We will explore topics on radiometric dating, nuclear medicine and air pollution that will be covered by different sessions. We will provide teachers with an enriched knowledge of how these concepts can be taught and explored using ANSTO resources. |
| **Part 2**  Webinar (1.5 hours) | Introduce teachers to the latest research about the focus topic, where the focus topic is addressed in the Australian Curriculum, and present a range of resources for teaching the focus topic. | **2.1.2 Apply knowledge of the content and teaching strategies of the teaching area to develop engaging teaching activities**  **2.3.2 Design and implement learning and teaching programs using knowledge of curriculum, assessment and reporting requirements**  **3.3.2 Select and use relevant teaching strategies to develop knowledge skills, problem solving and critical and creative thinking.** | Teachers will talk with leading experts in the field for the topic of the course. Each expert will give a short presentation about their research and teachers will be able to ask questions via the chat function during the webinar.  ANSTO Education staff will showcase selected resources we’ve created to help teach the focus topic. Teachers will learn how these resources address Knowledge and Understanding, Inquiry Skills, Science as a Human Endeavour and Learning Across the Curriculum content descriptors.  In particular, ANSTO Education staff will focus on the use of technology to enhance understanding and aid free exploration of curriculum concepts, both for students and teachers. We will provide teachers with the tools to incorporate big data sets into their classroom lessons, in-depth knowledge of how to do analysis and visualisation. |
| **Part 3**  Lesson preparation and resource development (4 hours)  (To be completed within 10 weeks) | Teachers develop an activity/resource for a 60-80 minute lesson about the focus topic for a year group and a subject of their choice | **2.1.2 Apply knowledge of the content and teaching strategies of the teaching area to develop engaging teaching activities**  **3.4.2 Select and/or create and use a range of resources, including ICT, to engage students in their learning**    **3.3.2 Select and use relevant teaching strategies to develop knowledge skills, problem solving and critical and creative thinking**    **2.3.2 Design and implement learning and teaching programs using knowledge of curriculum, assessment and reporting requirements** | Teachers will use the knowledge and resources from the introductory webinar, plus work collaboratively with their peers and ANSTO online, to develop a resource pack for a 60-80 minute lesson about the focus topic for a year level and a subject of their choice.  Teachers will develop a resource pack that includes everything they would need to deliver this lesson in class, for example:   * Teacher notes with answers * Student worksheets * Resource list (annotated with weblinks where appropriate) * Ideas for differentiation of the lesson * Homework or follow-up activities   Teachers will design activities that will combine learning knowledge content with science inquiry skills, literacy and numeracy.  Examples of activities for a teacher resource pack might include:   * Comprehension and/or literacy activity about a video or other text * Hands-on activity to help students understand/represent/model a concept * An experiment to collect data   Teachers will design their resource pack to address the following from the Australian Curriculum:   * one Knowledge and Understanding descriptor related to nuclear science or its applications, and; * either one Science Inquiry Skills descriptor or one Science as a Human Endeavour descriptor or one Learning Across the Curriculum Content point (from Cross-curriculum priorities, General Capabilities or other Learning Across the Curriculum Areas)   Teachers will post their resource pack for the lesson in an online forum to allow other teachers to view their work. The lessons will be collated and remain available as an online resource library for participating teachers. |
| **Part 4**  Lesson reflection and feedback  (1 hour) | Teachers gather feedback from students and/or colleagues about their lesson and write a critique of their own work. | **2.1.2 Apply knowledge of the content and teaching strategies of the teaching area to develop engaging teaching activities**  **3.3.2 Select and use relevant teaching strategies to develop knowledge, skills, problem solving and critical and creative thinking** | Teachers will receive feedback about their lesson from their peers in the course as annotations on their lesson plan or as comments in the online forum.  Teachers must write their own self-reflection on the process of incorporating current scientific knowledge into teaching resources and strategies.  Teachers will contribute to the professional development of peers by providing at least one comment on a fellow-participant’s lesson plan. |