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| **Course title:** | | ANSTO Chemistry and Physics Teacher Professional Development Days | | | | |
| **Date/s:** | Usually during the first week of December each year. The course may be run more often if demand is high. | | | | | |
| **Time:** | 8.30am to 3pm | | |  | | |
| **Duration:** | 5 hours | |
| **Target group for the course:** | | | | | Chemistry and Physics teachers | |
| **Indicative cost of course to participant:** | | | | | | $0 Parking, morning tea and lunch provided – no cost |

**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 hear from expert scientist speakers, who will provide examples of ANSTO’s role in research and applied science. Teachers will discuss how these research stories and applications can be used to help teach components of the Chemistry and Physics components of the Stage 5 science syllabus, and the Chemistry and Physics Stage 6 syllabuses. Teachers will select and use example teaching activities that help bring these research examples and applications to life.  **2.2.2 Organise content into coherent, well-sequenced learning and teaching programs**  Teachers will discuss and plan how to use ANSTO Education teaching resources within a lesson, and as part of a larger teaching program.  **2.6.2 Use effective teaching strategies to integrate ICT into learning and teaching programs to make selected content relevant and meaningful**  Teachers will participate in videoconferences and virtual tours with ANSTO experts. Teachers will develop strategies for integrating these virtual experiences into their teaching programs to highlight the real-life applications, benefits and risks of nuclear science.  **3.3.2 Select and use relevant teaching strategies to develop knowledge, skills, problem solving and critical and creative thinking**  Teachers are engaged in a range of teaching and learning strategies that highlight the current research examples to identify, scaffold and illustrate science and knowledge concepts  **3.4.2 Select and/or create and use a range of resources, including ICT, to engage students in their learning**  Teachers assess a range of educational resources for teachers and students about nuclear science and its applications, and discuss strategies for using them in the classroom. |

**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). Rather than just update teachers’ knowledge of current science content, we aim to contribute to teachers’ pedagogical content knowledge in an integrative way. By combining the expertise of ANSTO scientists and ANSTO education staff:   * Teachers learn about the latest developments in science research and its applications * Teachers discuss how this content can help them communicate key science concepts in their syllabus * Teachers discuss strategies for integrating educational resources and tools into their teaching programs   Kisiel, J. (2012). Introducing future teachers to science beyond the classroom. Journal of Science Teacher Education.24(1):67-91. |

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| **Rationale for the course** |
| ANSTO Education strives to ensure that the latest science developments and research are being communicated to teachers and students in schools. By helping teachers to incorporate the latest developments in science into their teaching programs, we hope that the content taught in classrooms is up-to-date and delivered in engaging ways. Ultimately, we hope that integrating current science research into teaching programs will inspire students to pursue study and a career in science and engineering. |
| **Summary of the course** |
| The course is a one-day face-to-face program at ANSTO. The program consists of ANSTO scientist speakers, other education expert speakers, and workshops where teachers will have the opportunity to see new educational resources they can incorporate into their teaching programs. |
| **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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| Session 1  Talks from ANSTO experts  (2 hours) | 1. Overview of ANSTO and its roles in the rapidly changing world of nuclear science.   * Medical research and medicine production * Environmental research * World-class research facilities * Nuclear safety * Waste management * Community engagement   2. Expert ANSTO speaker 1: This speaker will talk about the science, latest developments and wider significance of their research/work at ANSTO.  3. Expert ANSTO speaker 2: This speaker will talk about the science, latest developments and wider significance of their research/work at ANSTO. | **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** | Content: ANSTO’s role in nuclear research, safety and the community  In this session: Teachers will engage with information about nuclear science which has been explicitly matched to the Australian Curriculum:-  Year 9 Science: Biological Sciences (ACSSU175), Chemical Sciences (ACSSU177), Science as a Human Endeavour (ACSHE157, 158, 160, 161)  Senior Physics: Unit 1: Thermal, nuclear and electrical physics (ACSPH026-036)  And the NSW syllabuses:  Stage 5 Science: Chemical World (CW1, CW2)  Year 11 Chemistry: Module 1: Properties and structure of matter  Year 12 Physics: Module 8: From the universe to the atom  Year 12 Investigating Science: Module 6: Technologies and Module 8: Science and society  And will use a number of classroom activity resources (developed by ANSTO Education) to develop teaching and learning activities that address   * Attitudes and perceptions regarding nuclear science and technology (debate topics and questions) * Organising information to identify and then evaluate the benefits and risks of nuclear science (Benefits vs risks table * Summarising and presenting information to describe the historical development of scientific understanding about nuclear science (timelines, flow charts, picture collages)   Teachers are given the opportunity to acquire content knowledge through interactions with experts from the ANSTO facility – who are involved in nuclear medicine development, environmental research, mining processes and materials engineering.  Teachers will also receive notes from each speaker about their topics.  Teachers are given the opportunity to use, select and discuss a range of specifically customised ANSTO resources that allow students to acquire knowledge about the role of nuclear science, and to investigate the social, economic, environmental impact of nuclear science and technology.  Teachers are given continuous access to a range of printed and online resources to support the development of science curriculum and teacher pedagogy as it relates to the topics we are involved in.  <http://www.ansto.gov.au/Resources/DiscoveryCentre/ForTeachers/Workbooks/index.htm>. |
| Session 2  Customised tour of ANSTO site  (1.5 hours) | Teachers will participate in a tour of a variety of locations at ANSTO. ANSTO education officers and other ANSTO staff will explain each facility, answer questions, and highlight the significance of each research facility in the Chemistry and Physics syllabuses.  Potential tour sites include:   * OPAL reactor – Australia’s 20MW nuclear reactor, which is used to produce nuclear medicines * Neutron Guide Hall – neutron scattering techniques permit scientists to explore the structure and dynamics of materials under different conditions at atomic or molecular levels. * Centre for Accelerator Science – one or more of our linear particle accelerators will be visited and the research and analytical techniques will be discussed * Long Term Waste Storage facility: the categories of waste and the safe management, processing and storage of radioactive waste will be explained. | **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**  **3.4.2 Select and/or create and use a range of resources, including ICT, to engage students in their learning** | Teachers are acquiring knowledge about the ANSTO facilities and the research focus for the various areas shown to them, identifying the links this makes to the Chemistry and Physics syllabus in particular:  Year 9 Science: Biological Sciences (ACSSU175), Chemical Sciences (ACSSU177), Science as a Human Endeavour (ACSHE157, 158, 160, 161)  Senior Physics: Unit 1: Thermal, nuclear and electrical physics (ACSPH026-036)  And the NSW syllabuses:  Stage 5 Science: Chemical World (CW1, CW2)  Year 11 Chemistry: Module 1: Properties and structure of matter  Year 12 Physics: Module 8: From the universe to the atom  Year 12 Investigating Science: Module 6: Technologies and Module 8: Science and society  Teachers are engaged in a range of teaching and learning strategies that highlight the current research examples to identify, scaffold and illustrate science and knowledge concepts   * Use plain English and analogies to explain difficult science concepts * Identify common fears and misconceptions about nuclear science and compare these with facts * Use the experimental method outline (aim, hypothesis, method, results, discussion, conclusion) to scaffold a discussion about real research examples * Use real research examples to discuss reliability, validity and accuracy in experiments   And are using classroom activity resources to make connections between current research (real world examples of science content), curriculum and pedagogy that support student science literacy, science based writing and critical thinking   * Comprehension tasks using ANSTO research stories * Profile a scientist and describe their research * Experiments to demonstrate nuclear science concepts * Behind-the-news: Analyse how nuclear science is portrayed in the media * Critique real experiments for their reliability, validity and accuracy |
| Session 3  Workshops  (1 hour) | Participants may choose from multiple workshop options, such as:  1. Teaching Nuclear Science for Stage 5 Showcase:  - Hands-on activities during ANSTO excursion  - ANSTO Virtual tour option for large cohorts  - Online resources and activities  2. Teaching Nuclear Science for Stage 6 Chemistry Showcase:  - Online resources and activities  - Videoconferencing with experts and how to incorporate it into your teaching program  3. Teaching Nuclear Science for Stage 6 Physics Showcase:  - Online resources and activities  - Videoconferencing with experts and how to incorporate it into your teaching program  4. Tips for using videoconferencing in the classroom:  - Workshop discussions with various videoconference providers  - Example videoconference with a class  - ANSTO’s virtual tour | **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**  **2.2.2 Organise content into coherent well sequenced learning and teaching programs**  **2.6.2 Use effective teaching strategies to integrate ICT into learning and teaching programs to improve teaching practice and make content relevant and meaningful** | Teachers are involved in using a range of visual, audio and kinaesthetic approaches to communicating science with an emphasis on creating a curriculum that achieves balance between theory and practical activities  Teachers will participate in virtual tours and video conferences with content links to Stage 5 and Stage 6 syllabus and direct links with ANSTO experts (eg. Nuclear operators, nuclear physicists, material engineers, environmental scientists) with an emphasis on integrating these ICT resources to support classroom instruction, and the development of relevant pedagogy and student learning activities that support their engagement with science including   * Incorporating multimedia strategies in meaningful ways for teaching science concepts * Participating in real life / real time ANSTO research stories, experiences and resources * Interacting with other teachers during tours and discussions to enhance teacher’s learning and development in relation to curriculum and pedagogical planning * ANSTO Virtual tour (a live guided tour of ANSTO via videoconference) * Syllabus-relevant videoconferences with experts * Online resources, including fact sheets, scientist profiles, workbooks, videos, audio, games, etc. |