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| **Course title:** | | Planning for and Reflecting on ANSTO school excursions | | |
| **Date/s:** | On request | | | |
| **Time:** | On request | | | |
| **Duration:** | 3 hours | | | |
| **Target group for the course:** | | | Teachers of Stages 3, 4, 5 and 6 science courses | |
| **Indicative cost of course to participant:** | | | | $0 |

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| **Short explanation of how the course relates to the standard descriptors at the Proficient Teacher level**  **2.1.2 Apply knowledge of the content and teaching strategies of the teaching area to develop engaging teaching activities**  Teachers will examine 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 3, 4, 5 science syllabuses, 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**  **3.2.2 Plan and implement well-structured learning and teaching programs or lesson sequences that engage students and promote learning**  Teachers develop and deliver a well-structured sequence of lessons that “bookend” the excursion to ANSTO. Teachers select and use ANSTO-developed teacher resources to plan and deliver one lesson to prepare their students for the excursion. Teachers then plan and deliver a part or whole lesson following the excursion to consolidate concepts and contextualise experiences with theory.  **2.6.2 Use effective teaching strategies to integrate ICT into learning and teaching programs to make selected content relevant and meaningful**  Teachers will use ICT-based student activities in pre and post excursion lessons, including touch screen tasks, iPad apps, online games and SmartBoard activities. Teachers integrate these activities into a tour of scientific facilities at ANSTO, making concepts relevant and meaningful in the context of real nuclear science research.  **3.3.2 Select and use relevant teaching strategies to develop knowledge, skills, problem solving and critical and creative thinking**  Teachers work together with ANSTO Education Officers to facilitate hands-on investigations with their students, in which they apply knowledge and skills to gather and process data from primary and secondary sources.  **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.  **3.5.2 Use effective verbal and non-verbal communication strategies to support students understanding, participation, engagement and achievement**  Teachers plan and facilitate a range of visual, verbal and kinaesthetic-based teaching and learning activities for their students before and after their excursion at ANSTO. |

**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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| Excursions are an important way for teachers to contextualise content for their students and make it meaningful. Excursions are also an opportunity for teachers to collaborate with experts and educators in their community. Science education institutions, like ANSTO, not only support development of teacher knowledge but also provide teachers with ideas for pedagogy (Kisiel 2012). Teachers’ appreciation of place and context is sensitised by collaboratively planning and enacting excursions with their students (Mannion et al. 2012).  Mannion, G., Fenwick, A. and Lynch, J. (2012). Place-responsive pedagogy: learning from teachers’ experiences of excursions in nature. Environmental Education Research. 19(6):792-809.  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** |
| There are several reasons for this course:  - Teachers work to contextualise science concepts with real research examples and make them meaningful for their students  - Teachers collaborate with other educators and scientists to develop teaching strategies to engage their students  - Teachers select new technologies and teaching resources to plan well-structured lesson sequences and programs |
| **Summary of the course** |
| The course is a two-lesson plus excursion program that teachers will plan and deliver with their science class (either Year 9/10 science, Senior Physics and Senior Chemistry). Teachers will receive 3 hours recognition for the course:  1. Excursion planning and preparatory lesson (2 hours):   * Organise an excursion with ANSTO, including communicating with ANSTO Education staff about the requirements of their students and their in-class progress * Select and use ANSTO-developed teacher resources to plan syllabus-relevant preparatory activities (either a part or whole lesson) before their ANSTO visit   2. Excursion to ANSTO (non-accredited time):   * Teachers collaborate with ANSTO Education staff to facilitate an excursion to Australia’s only nuclear reactor and related facilities * Teachers critique their students’ engagement and level of understanding during the excursion and provide feedback to ANSTO Education staff   3. Post work at school (1 hour):   * Teachers select and use ANSTO-developed teacher resources to plan and facilitate a whole or part lesson back at school to contextualise their experience at ANSTO with syllabus content. |
| **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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| Excursion planning and development of preparatory lesson (2 hours) | Teachers organise an excursion with ANSTO, including communicating with ANSTO Education staff about the requirements of their students and their in-class progress  Teachers select and use ANSTO-developed teacher resources to plan and facilitate syllabus-relevant preparatory activities (either a part or whole lesson) before their ANSTO visit | **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**  **3.2.2 Plan and implement well-structured learning and teaching programs or lesson sequences that engage students and promote learning** | In this session: Teachers will engage with information about nuclear science which has been explicitly matched to the NSW science syllabus:  Stage 3 Science syllabus: Physical World (ST3-6PW, ST3-7PW)  Stage 5 Science syllabus: Chemical World (CW1, CW2)  Stage 6 Chemistry syllabus: Production of Materials (9.2.5)  Stage 6 Physics syllabus: From Ideas to Implementation (9.4.3), Medical Physics (9.6.3), From Quanta to Quarks (9.8.3, 9.8.4)  Teachers will select for 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) * Interpreting, summarising and presenting information to describe the historical development of scientific understanding about nuclear science (timelines, flow charts, picture collages)   Teachers organise content into three learning sessions for their class to ensure continuity in student learning. Teachers plan for pre excursion lessons in sequence:  1. Pre-excursion preparatory activities in class  2. Excursion at ANSTO (not included in endorsement activity)  3. Post-excursion activities in class  Teachers will communicate with ANSTO Education staff about whether they are yet to cover, or have already covered, the nuclear science topic in class. Teachers will work collaboratively with ANSTO Education staff prior to the excursion to customise teaching activities for their students during their excursion. |
| ANSTO excursion with students (non-accredited time) | Teachers collaborate with ANSTO Education staff to facilitate an excursion to Australia’s only nuclear reactor and related facilities  Teachers critique their students’ engagement and level of understanding during the excursion and provide feedback to ANSTO Education staff | **3.5.2 Use effective verbal and non-verbal communication strategies to support students understanding, participation, engagement and achievement**  **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**  **2.6.2 Use effective teaching strategies to integrate ICT into learning and teaching programs to make selected content relevant and meaningful**  **3.3.2 Select and use relevant teaching strategies to develop knowledge, skills, problem solving and critical and creative thinking** | Teachers collaborate with ANSTO Education staff to plan and facilitate a range of visual, verbal and kinaesthetic-based teaching and learning activities for their students during their excursion at ANSTO, such as:  - Seeing nuclear research facilities first-hand and close-up  - Using scintillation counters to measure radioactivity  - Simulating a fission reaction with ping pong balls  - Drawing and labelling diagrams of nuclear medicine canisters and scans  - Writing nuclear chemical equations  - Listening to nuclear research stories  - Asking questions to clarify concepts and contextualise information  Teachers will participate in ICT-based student activities with ANSTO education officers, including:  - touch screen tasks  - iPad apps  - online games  - SmartBoard activities  Teachers integrate these activities into their planning for a specific tour of scientific facilities at ANSTO, making concepts relevant and meaningful in the context of real nuclear science research.  Teachers and ANSTO Education staff facilitate first-hand investigations of radiation, using scintillation counters, cloud chambers and half-life simulations. Teachers organise students to work independently in small groups to plan and conduct each investigation, record and interpret results.  Teachers collaborate with ANSTO Education staff to customise content and teaching strategies used during the excursion to suit their students’ needs. |
| Post-excursion activities at school (1 hour) | Teachers select and use ANSTO-developed teacher resources to plan and facilitate a whole or part lesson back at school to contextualise their experience at ANSTO with syllabus content. | **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**  **2.2.2 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 select and use ANSTO-developed teacher resources to facilitate activities in which students to “evaluate”, “assess” and “make judgements” using their new knowledge. Activities could include:  - discuss/debate as a class the benefits versus risks of nuclear science  - illustrate, using diagrams, how their perceptions of nuclear science have developed during this program  - predict how nuclear science may result in new technologies in the future  - evaluate the impact of the public’s perception of nuclear science on the development of new technologies  Teachers plan and deliver a concluding session of activities for their students to:  - summarise content covered  - contextualise theory with real-life applications  - appreciate nuclear science from a scientific, historical and social perspective |