

BSCI100 Science Teaching

ECTS Value: 5 ECTS

Module Description

At a time when the well-being of society is increasingly dependent on scientific research and development, it is important for communities to realise that scientific literacy is no longer just an advantage but an absolute necessity. This is why communities are compelled to offer the best possible STEM education for all. It follows, that science teachers need to be adequately equipped to help students develop those qualities and skills necessary for the latter to participate effectively, not only in today's but also in tomorrow's world. This module will provide prospective science teachers with foundations and expertise in the teaching of sciences. It will cover lesson planning, the use of teaching aids and laboratory work and explains the methodology to be adopted to instil a scientific aptitude and approach in students. The module will follow on general pedagogy modules offered and apply them to the teaching of science. It will also seek to apply links with Integrated Science, Physics, Chemistry and Biology content modules. Throughout, this module will maintain links with both everyday phenomena as well as the local context.

Overall Objectives and Outcomes

By the end of this module, the learner will be able to:

Competences

- a. Organise the respective science curriculum into meaningful episodes of learning for one's students;
- b. Plan lessons that align objectives, methods, and assessments;
- c. Use diverse resources to support effective teaching of science;
- d. Develop students' skills in nature of science to effectively engage in scientific thinking and knowledge of science as part of their learning;
- e. Design and carry out effective laboratory work that engages students to carry out problem-solving;
- f. Assess achievement of learning objectives.
- g. Engage critically with literature on science education.

Knowledge

- a. foster a wide variety of pedagogical approaches and teaching strategies including group work, peer-led learning and pair-work;
- b. master techniques on how to develop and conduct an effective lesson in a science subject (Physics/Chemistry/Biology/Integrated Science);
- c. design an effective and inquiry-based practical work and classroom activities;

- d. establish awareness of potential risks in the science lab and the respective safety precautions that need to be taken to mitigate such risks;
- e. develop appealing resources that facilitate learning;
- f. assess and evaluate techniques serving both a formative as well as a summative purpose.

Skills

- a. make scientific skills, processes and content accessible to all students;
- b. plan and develop motivating and inquiry-based lessons;
- c. engage students in problem solving situations;
- d. use pertinent pedagogical approaches that engage science students in diverse ways depending on the skills, processes and content involved;
- e. use pertinent pedagogical approaches that engage science students in diverse ways depending on the students' backgrounds, aptitudes and abilities;
- f. assess and evaluate student progress in the learning of science subjects;
- g. use inquiry, reflection and interpretation to build understanding and skill in science teaching;
- h. integrate one's knowledge of the respective science content covered by the curriculum to the learning and teaching of their students;
- i. use a variety of laboratory equipment and technology to maximise efficacy of one's science teaching.

Mode of Delivery

This module adopts a blended approach to teaching and learning. Information related to the structure and delivery of the module may be accessed through the IfE Portal. For further details, kindly refer to the Teaching, Learning and Assessment Policy and Procedures found on the Institute for Education's website.

Assessment Methods

This module will be assessed through: Research Assignment and Online Tasks/Reflections.

Suggested Readings

Core Reading List

1. Black, P. & Harrison, C. (2004). *Science Inside the Black Box: Assessment for Learning in the Science Classroom*. UK: NFER London : Nelson.
2. Osborne, J. & Dillon, J. (2008). *Science Education in Europe: Critical Reflections: A Report to the Nuffield Foundation*. UK: King's College London.

Supplementary Reading List

1. Abrahams, I., & Reiss, M. J. (2012). Practical work: Its effectiveness in primary and secondary schools in England. *Journal of Research in Science Teaching*, 49(8), 1035–1055. <https://doi.org/10.1002/tea.21036>
2. Abrahams, I., Reiss, M. J., & Sharpe, R. (2014). The impact of the 'Getting Practical: Improving Practical Work in Science' continuing professional development programme on teachers' ideas and practice in science practical work. *Research in Science & Technological Education*, 32(3), 263–280. <https://doi.org/10.1080/02635143.2014.931841>
3. DiBiase, W., & McDonald, J. R. (2015). Science Teacher Attitudes Toward Inquiry-Based Teaching and Learning. *Clearing House*, 88(2), 29–38. <https://doi.org/10.1080/00098655.2014.987717>
4. Haslam, C. Y., & Hamilton, R. J. (2010). Investigating the Use of Integrated Instructions to Reduce the Cognitive Load Associated with Doing Practical Work in Secondary School Science. *International Journal of Science Education*, 32(13), 1715–1737. <https://doi.org/10.1080/09500690903183741>
5. Ochterski, J. W. (2014). Using Computational Chemistry Activities To Promote Learning and Retention in a Secondary School General Chemistry Setting. *Journal of Chemical Education*, 91(6), 817–822. <https://doi.org/10.1021/ed300039y>
6. Scott, G. W., Boyd, M., Scott, L., & Colquhoun, D. (2015). Barriers To Biological Fieldwork: What Really Prevents Teaching Out of Doors? *Journal of Biological Education*, 49(2), 165–178. <https://doi.org/10.1080/00219266.2014.914556>
7. Swain, J., Monk, M., & Johnson, S. (2000). Developments in science teachers' attitudes to aims for practical work: continuity and change. *Teacher Development*, 4(2), 281–292. <https://doi.org/10.1080/13664530000200114>
8. Archer, Louise & Dewitt, Jennifer & Osborne, Jonathan & Dillon, Justine & Willis, Beatrice & Wong, Billy. (2012). Science Aspirations, Capital, and Family Habitus How Families Shape Children's Engagement and Identification With Science. *American Educational Research Journal*. 49