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MSCI102 Integrating Technology in Science Education

ECTS Value: 5 ECTS
Contact Hours: 25
Self-Study Hours: 60
Assessment Hours: 40

Overall Objectives and Outcomes

The way science is taught inevitably provides implicit messages to learners concerning the nature of science - and even explicit messages about questioning, experimentation or evidence are undermined if these processes are not central to the learning process. In our modern world science and its applications are so pervasive and powerful that they impinge on virtually every aspect of life including: ethical, legal, economic, environmental, cultural, social, medical, spiritual and religious. The module aims to follow up on the first science methodology module by providing prospective science teachers with expertise in the teaching of sciences. It will cover lesson planning, the use of digital resources and laboratory work and explains the methodology to be adopted to instil a scientific aptitude and approach in students.

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

Competences:

a) Actively discuss case studies in literature dealing with different teaching strategies including technology integration;

b) Design and carry out effective laboratory work that engages students to carry out problem solving;

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) Develop their own digital resources to support learning.

Knowledge:

a) Reflect on constraints experienced by teachers;

b) Critically discuss general themes in technology integration in teaching and learning;

c) Realise challenges of classroom management and student engagement in technology enhanced/integrated learning and how to overcome them;

d) Critique several case studies of technology adoption in the classroom;

e) Appreciate technological pedagogical content knowledge;

f) Propose ways of presenting content in an effective manner;

g) Assess the use of several digital tools in the classroom;

h) Develop lab-based teaching strategies;

i) Design effective, inquiry-based practical work and classroom activities;

j) Produce appealing resources that facilitate learning.

Skills:

a) Present content in an effective manner;

b) Effectively make use of the internet to prepare motivating and engaging lessons;

c) Effectively make use of several digital tools to prepare engaging lessons;

d) Effectively design activities and resources;

e) Engage students in problem solving situations;

f) Use a variety of laboratory equipment and technology to maximise efficacy of one's science teaching.

Assessment Methods

This module will be assessed through: Assignment.

Suggested Readings

Core Reading List:

1. Riopel, M., & Smyrnaiou, Z., (Eds) (2016). *New Developments in Science and Technology Education,* Springer International Publishing, Switzerland

Supplementary Reading List:

1. Hennessy, S., Wishart, J., Whitelock, D., Deaney, R., Brawn, R., Velle, L. la, … Winterbottom, M. (2007). Pedagogical approaches for technology-integrated science teaching. *Computers & Education*, *48*(1), 137–152. https://doi.org/10.1016/j.compedu.2006.02.004

2. Jimoyiannis, A. (2010). Designing and implementing an integrated technological pedagogical science knowledge framework for science teachers' professional development. *Computers & Education*, *55*(3), 1259–1269. https://doi.org/10.1016/j.compedu.2010.05.022

3. Kim, M. C., Hannafin, M. J., & Bryan, L. A. (2007). Technology-enhanced inquiry tools in science education: An emerging pedagogical framework for classroom practice. *Science Education*, *91*(6), 1010–1030. https://doi.org/10.1002/sce.20219

4. Maeng, J. L. (2017). Using Technology to Facilitate Differentiated High School Science Instruction. *Research in Science Education*, *47*(5), 1075–1099. https://doi.org/10.1007/s11165-016-9546-6

5. Robinson, M. (2005). Robotics-Driven Activities: Can They Improve Middle School Science Learning? *Bulletin of Science, Technology & Society*, *25*(1), 73–84. https://doi.org/10.1177/0270467604271244

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6. Rutten, N., van Joolingen, W. R., & van der Veen, J. T. (2012). The learning effects of computer simulations in science education. *Computers & Education*, *58*(1), 136–153. https://doi.org/10.1016/j.compedu.2011.07.017

7. Sorensen, P., Twidle, J., & Childs, A. (2014). Collaborative approaches in initial teacher education: lessons from approaches to developing student teachers' use of the Internet in science teaching. *Teacher Development*, *18*(1), 107–123. https://doi.org/10.1080/13664530.2013.878378

8. Welch Anita, & Huffman Douglas. (2011). The Effect of Robotics Competitions on High School Students' Attitudes Toward Science. *School Science and Mathematics*, *111*(8), 416–424. https://doi.org/10.1111/j.1949-8594.2011.00107.x

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