**EDUC 490: SPECIAL TOPICS IN TEACHING SCIENCE**

**COURSE DESCRIPTION**

This course intends to help prospective secondary science teachers to review and reflect upon their pedagogical skills as they prepare to become successful and effective teachers in their respective localities/contexts. Focusing on and drawing from their individual teaching subjects, throughout the course, we will navigate through such selected topics as: Translating the importance of science learning in our teaching; Science as integrated knowledge and discipline; Understanding the teaching and learning context; Analyzing the teaching and learning materials; A review of preparation for teaching; Problem solving in science; A review of assessment in science teaching and learning; and On reflection on practice, all in an effort to sharpen our professional skills as science teachers. Conscious of various current learning theories, we will build our weekly discussions around topics selected from chemistry, biology and/or physics syllabi as we execute each of the weekly topics. The essence is to adopt a reflective practice as we engage in assessing our pedagogical skills necessary for a successful secondary school science teaching and learning.

**RATIONALE**

Science teaching is the act of promoting student learning of science. It requires the integration of knowledge about science with the learner, the practice of teaching, and the context in which the teaching and learning will occur. The science teacher benefits from understanding science in its substance, its structure, and its process; from developing insight into the background prior knowledge, and conceptions of the learner; from being able to transform science into science teaching through strategies, representations, and interactions; and from grasping the nature of the context in which science teaching and learning takes place.

In this online course we encourage every one of us to continue to learn and grow as a professional by taking charge of and reflecting upon our own professional development.

**COURSE OUTLINE**

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| Class 1  |
| Topic | Introduction to the Course/Why Science learning? |
| Key Ideas | Outline of course and description of assignmentsWhy learning science: A reflection on the importance of learning science as addressed by/in each of our subjects of specializationHow do we translate this importance as we teach various topics in our subject areas? (The essence here is to create an increased motivation, interest and love of science.*Activity 1*: Select a topic or subtopic or concept from chemistry, biology or physics and discuss how you will teach this while demonstrating the crucial importance of science learning in our daily life.  |
| References | 1. Handout: Why should we teach science?
2. Handout: Potential strategies for creating relevance in your class
3. Handout: Effective Learning and teaching
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| Class 2 |
| Topic | Science as an integrated knowledge and discipline |
| Key Ideas | Teaching our subject as connected to other science subjects. How far do we make connections (conceptual connections) between or subjects as we teach? For instance: How do we teach a topic in * chemistry as connected to biology
* biology as connected to physics
* physics as connected to chemistry
* And so on.

What significance does this have in science learning?*Activity2:* Navigate through the two syllabi of your subject specialization. Identify areas of conceptual connections between the three science subjects. Do you think it is important to illuminate these conceptual connections as we teach? How can this be organized? What roles do you think this has in science learning?  |
| References | 1. Handout: Curriculum connections
2. Ways to integrate curriculum
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| Class 3 |
| Topic | Understanding the Teaching/Learning context |
| Key Ideas | Consideration of our actual teaching and learning environment. Rethinking about specific teaching/learning context for particular topics* Classroom versus Out of classroom teaching/learning environment
* Small classes versus large classes
* Availability and use of teaching/learning resources (Rethinking about alternative resources as we prepare for teaching)

*Activity 3:* Choose a topic. Situate yourself in a particular teaching/learning environment of your choice. Discuss how you would plan and successfully implement the topic given the identified environment. |
| References | 1. Handout: Contextual factors in teaching and learning
2. Handout: Contextual factors of the classroom
3. Handout: Contextual Factors-Adaptation suggestions
4. Handout: Teaching Large Classes
5. Cooper, J.L. & Robinson, P. (2000). Arguments for making large classes seem small. *New Directions for Teaching and Learning*, (8).
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| Class 4  |
| Topic | Analyzing the teaching/learning materials: Textbook & Teaching media |
| Key Ideas | Evaluation of science reading materials/teaching media* A reflection on their styles, readability levels, and usability in classroom

Language use in science teaching* Discuss the appropriateness of the language used in textbooks e.g. in introducing the concepts, use of technical terms, sentence length etc.
* Language in classroom – Issues of monolingual versus bilingual, code switching, when do we say what and how do we say it, and so on

 *Activity 4:* From the text/reference book of your choice, select a topic or subtopic, and critically discuss how the concept(s) has been presented focusing on but not limited to the aspects outlined above. Is the presentation of the concepts same as what the syllabus suggests. What necessary improvement would you bring in especially as you think about teaching the concept in class?  |
| References | Handout: 15 Important characteristics and qualities of a good textbook |
| Class 5 |
| Topic | Preparation of teaching: Planning for contextually responsive lessons |
| Key Ideas  | The dynamics of preparing a successful lesson in our actual teaching and learning environment and associated challenges*Activity 5:* Considering the issues you discussed in activity 3, develop a lesson plan that is responsive to a particular learning environment. Make sure you include all necessary components of a good lesson plan i.e. topic, subtopic, desired learning outcomes, student activities, materials required, assessment mechanisms etc.  |
| References | 1. Week 3 readings |
| Class 6 |
| Topic | Preparation of teaching: Designing contextually responsive practical/hands-on activities  |
| Key Ideas | The dynamics of preparing a successful practical or hands-on activity that responds to our actual teaching and learning environment and associated challengesConsidering available alternatives*Activity 6:* Same as activity 5, but this time it is a hands-on/practical lesson. |
| References |  1. Handout: What are the benefits of hands-on learning? How do I justify a hands-on approach?
2. Week 3 readings
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| Class 7 |
| Topic | Preparation for teaching: Classroom pedagogies |
| Key Ideas | Developing classroom presentation skills* Responding to such issues as class size, nature of topic, children’s’ prior experiences, and so on.
* Considering associated challenges

*Activity 7:* Discuss different strategies you will employ in presenting a particular lesson/concept of your choice given such situations as presented above |
| References | 1. Week 3 readings |
| Class 8 |
| Topic | Problem solving in science |
| Key Ideas | Recognizing various steps in problem solving for understanding* Systematic problem solving
* Strategies for planning and monitoring problem solving activities in students for understanding

*Activity 8:* Examine a selected problem(s) from subject of your choice. Discuss strategies on how to assist students solve it. Emphasize the strategies that stimulate critical thinking.   |
| References | 1. Handout: Teaching problem solving skills
2. Dogru, M. (2008). The application of problem solving method on science teacher trainees on solution of the environmental problems. *Journal of Environmental & Science Education*, *3*(1), 9-18.
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| Class 9 |
| Topic | A review of assessment in science teaching and learning |
| Key Ideas  | Considering effective assessment in science* What are the characteristics of effective assessment?

Setting questions that assess effectively* Considering a variety of question types: Essay, objective, and short answers
* Item analysis and moderation of test/exam items

Assessment of practical work/hands on activities (Assessing the skills)*Activity 9:* Select a previous public examination in subject of your choice. Critically discuss what’s being tested, the balance of the exam, coverage of the syllabus, format of the exam etc. If it were you, would you set a similar or different exam? Why yes or no? |
| References | 1. Handout: Classroom assessment in science
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| Class 10 |
| Topic | On reflection on practice |
| Key Ideas | Learning to reflect on practice* Lesson observation and analysis
* Understanding various observation, recording and feedback skills necessary in enhancing effective teaching skills

Reflecting on our course: what have we learnt? What’s your way forward?*Activity 10: Are you a reflective teacher?* |
| References | 1. Handout: Critical reflection
2. Handout: Reflective teaching: Exploring our own classroom practice
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**GENDER STATEMENT**

Please incorporate gender inclusive language in your oral and written language. This language positions women and men equally. It does not exclude one gender or the other, nor does it demean the status of one gender or another. It does not stereotype genders [assuming all childcare workers are female and all police officers are male], nor does it use false generics [using mankind instead of human kind, or using man-made instead of hand crafted]. In addition, this language requires gender balance in personal pronouns, for example, use "he and she" rather than "he" or balance gendered examples in a paper, referring to both male and female examples. Make sure you adhere to these guidelines as you learn in groups, write your assignments, and post your responses on the blog.

**ASSESSMENT**

1. **Class Participation**

Engagement in online class activities, course readings, discussions, completion of minor assignments during the course (10%)

1. **The Portfolio**

The purpose of this assignment is to help you practice a “reflection on practice” by reflecting on the course and write a brief critical summary of all classroom activities we conducted during the course. This should then help alert you to be keen and participative during the activities so you have your summary built right from the beginning. Your reflection should not exceed 10 single spaced pages. (20%)

**C. Final Exam**

Will consist of short answer and essay questions (70%)