



UNIVERSITY
OF
JOHANNESBURG

<u>FACULTY</u>	: Education
<u>DEPARTMENT</u>	: Childhood Education
<u>CAMPUS</u>	: SWC
<u>MODULE</u>	: HLMSOOY – Learning in the primary school: Math and Science
<u>SEMESTER</u>	: Second
<u>EXAM</u>	: November 2019

DATE : November 2019 **SESSION** :

ASSESSOR(S) : Dr F. Naude,
Dr M. Kazeni,
Dr K. Fonseca

MODERATOR : Dr L. Kok
(UNIZULU)

DURATION : 3 HOURS **MARKS** : 100

NUMBER OF PAGES: 5 PAGES

INSTRUCTIONS:

1. Answer ALL THE QUESTIONS.
2. Number your answers clearly
3. Answer section A and section B in separate book.

SECTION A: SCIENCE

QUESTION 1: Critical issues of the national curriculum

Choose any topic from the intermediate phase natural science and technology curriculum that could be deemed as controversial and write an essay wherein you argue that teaching learners to be scientifically literate would be beneficial to understanding this controversial topic. Support your argument by referring to relevant literature.

Include the following in your essay:

- A description of the controversial topic and an explanation on why the topic is regarded as controversial. **(6)**
- How the topic relates to the national curriculum. **(2)**
- Discuss what scientific literacy is and how an individual can develop their scientific literacy. **(8)**
- The importance of introducing science in the early grades. **(4)**
- How this controversial topic aids in conceptual development and how conceptual development occurs. **(3)**
- Support your claims with relevant literature **(2)**

[25]

Question 2: Item analysis, and trends and research in science curricula.

2.1 Eight learners wrote an objective test containing 10 questions. Their scores were used to calculate the difficulty and discrimination indices of the test questions (see Table 1). Study the table and answer the questions that follow.

Table 1: Difficulty and Discrimination indices

Item	Number Correct (Upper group)	Number Correct (Lower group)	Difficulty (p)	Discrimination (D)
Question 1	3	2	0.625	0.25
Question 2	3	3	0.75	0.0
Question 3	4	3	0.875	0.25
Question 4	4	0	0.50	1.0
Question 5	4	2	0.75	0.5
Question 6	4	4	1.0	0
Question 7	3	4	0.875	-0.25
Question 8	4	2	0.75	0.5
Question 9	2	1	0.125	0.25
Question 10	4	1	0.625	0.75

2.1.1 Which test question was the most difficult? Explain your answer. **(3)**

2.1.2 Which of the test questions had the poorest discrimination power? Explain your answer. **(3)**

2.1.3 Question 7 has a negative discrimination index. Explain what this means, and how the question should be dealt with. **(3)**

2.2 There is a great deal of fear that robots and machines will not only take over existing jobs, but will also perform better at most tasks currently done by humans. To this effect, a report from the World Economic Forum (2016) about the future of work estimated that, “... 65% of children entering primary school today will ultimately end up working in completely new job types that don’t yet exist.”

This situation requires educators to develop learners’ skills that could be useful for jobs that cannot be done by machines and robots.

2.2.1 Name four skills that could prepare learners for *new job types that do not yet exist*. **(4)**

- 2.2.2 Explain how each of the four stated skills could be relevant for effective participation in the economies of the fourth industrial revolution. (12)
[25]

SECTION B: MATHEMATICS

Question 3: Teaching mathematics for Understanding

Read the following case study and answer the following question/s.

There are two classrooms where addition of two-digit numbers are taught. In the first classroom, the children look at the numbers in the problem, think about the relationships between the numbers, and then *choose* a computational strategy that fits these ideas. They have developed several different strategies to solve addition problems by exploring numbers and various representations, such as the open number line and the hundreds chart. Consequently, they are relating addition to various representations and employing number relationships in their addition strategies (taking numbers apart and putting them together differently). In the second classroom, the teacher provides one strategy for how to add—the standard algorithm. Although the standard algorithm is a valid strategy, the entire focus of the lesson is on the steps and procedures that the teacher has outlined. The teacher solicits no ideas from individual children about how to combine the numbers and instead is only able to find out who has and who has not been able to follow directions.

3.1 Discuss in essay format by stating in which class mathematics is taught for understanding. Justify your answer by looking at the differences in relation to the following:

- First state in which class mathematics is taught for understanding, class 1 or class 2. Then, (2)
- Differentiating between conceptual understanding and procedural knowledge. Refer to the text to extract examples to strengthen your differentiations. (6)
- Discuss the similarities and differences between the learning goals in each class by focusing on how learners' prior knowledge is taken into consideration and learner engagement. (6)

3.2 Discuss your understanding of internal and external representations in mathematics. Give examples. (4)

3.3 Explain what the following statement, “Conceptual understanding exists along a continuum from instrumental understanding to relational understanding”, means. Include a diagram and a practical mathematical concept to illustrate your understanding of the statement. (6)

3.4 Discuss what the implications for mathematics education are when learners mainly gain procedural knowledge in mathematics classrooms. (6)

[30]

Question 4: The role of mathematical thinking in classrooms

4.1 Explain what mathematical thinking is. Then discuss the importance of developing mathematical thinking in mathematics classrooms to prepare learners to thrive in the Fourth Industrial Revolution. (12)

4.2 Discuss how you can engage learners in Mason, Burton and Stacey’s (1982, 2000) mathematical processes using the following mathematical tasks: “The sum of two odd numbers is always an even number”. (8)

[20]

100 marks

