UNIVERSITY OF JOHANNESBURG

FACULTY	: Education
DEPARTMENT	: Childhood Education
CAMPUS	: SWC
MODULE	: HLMSOOY – Learning in the primary school: Math and Science
SEMESTER	: Second
EXAM	: December 2019

DATE : December 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

Children learn concepts of natural phenomena from an early age. Using your knowledge of conceptual change theory, explain how children acquire intuitive theories and how these theories change. **(10)**

Question 2: Critical issues of the national curriculum

Choose any topic from the foundation phase life skills curriculum or 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. **(15)**

[25]

Question 3: Item analysis, and trends and research in science curricula.

3.1 An item analysis of an objective test consisting of 10 questions yielded the results displayed on Table 1 below.

Table 1: Result of item analysis of an objective test.

N (number of students) = 932; Mean = 69.4; α (reliability) = 0.84.

Item	Difficulty index (p)	Discrimination index (D)	OPTIONS				
			A	B	C	D	E
Question 1	0.72	0.34	37	187	**667**	30	10
Question 2	0.90	0.21	**840**	1	76	9	5
Question 3	0.60	0.39	88	233	46	**561**	4
Question 4	0.99	-0.06	**923**	3	3	3	0
Question 5	0.94	0.14	20	0	12	24	**876**
Question 6	0.77	-0.01	35	16	25	**716**	140
Question 7	0.47	0.31	68	107	**432**	165	157
Question 8	0.12	0.08	**114**	218	264	153	175
Question 9	0.08	0.04	**75**	64	120	67	606
Question 10	0.35	0.42	183	98	74	**330**	247

Note: *The bolded numbers represent the number of students who selected the correct answer.*

Analyze the item analysis results on Table 1 and answer the following questions.

3.1.1 Which question(s) should be eliminated from the test or revised? Explain your answer. **(6)**

3.1.2 Which question(s) should be retained? Explain your answer**.** **(4)**

3.2 Successful participation in the 21st Century requires learners to have both content knowledge and cognitive skills, such as critical thinking and problem solving, as well as the ability to communicate and collaborate with others. These skills could be developed through inquiry-based learning.

3.2.1 Describe Inquiry-based learning. **(5)**

3.2.2 Explain how the Inquiry based teaching approach could develop learners' critical thinking, problem solving, communication, and collaboration ability. **(10)**

[25]

SECTION B: MATHEMATICS

Question 4: Teaching mathematical thinking

4.1 Explain what mathematical thinking is. (4)

4.2 Discuss the four aspects in Schoenfeld' (1985) problem-solving model needed to be successful in mathematical problem-solving. (8)

Read the following statement and complete the following question

> It is generally difficult to assess mathematical thinking in formal assessment tasks. Hence, teachers do not teach mathematics to develop processes of mathematical thinking.

4.3 Write a ½ page essay in which you argue why you agree or disagree with this statement. (10)

[22]

Question 5: 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.

5.1 Discuss in essay format by stating in which class mathematics is taught for understanding. Justify you 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. **(4)**
- 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. **(4)**
- Discuss your understanding of internal and external representations in mathematics. Give examples. **(4)**

5.2 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)**

5.3 Discuss three possible causes why teachers mainly teach procedurally in the absence of promoting conceptual understanding and what the implications for mathematics education are when learners mainly gain procedural knowledge in the absence of conceptual understanding in South African mathematics classrooms. **(8)**

[28]

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100 marks