



2015 TRAINING WORKSHOP NO.4  
**MATHEMATICS**



**FOUNDATION PHASE**

**Activity 1: Group error analysis activity – using learners’ responses as data**

1. Study and complete the item. ANA 2013 Grade 3 Mathematics Item 10.1 and 10.2

10. Complete the table:

10.1	Count forwards in 100s	584	<b>684</b>	<b>784</b>	<b>884</b>	<b>994</b>
10.2	Count backwards in 20s	320	<b>300</b>	<b>280</b>	<b>260</b>	240

Give time for participants to work out the correct solution to the question. (In bold above)

2. Study the data (achievement data and some learners’ responses given below) related to the item.

What do the item statistics tell us?

**Item 10.1:** 37 % of learners answered the question correctly.

**Item 10.2:** 30% of learners answered the question correctly.

The set of scanned learner responses includes correct, partially correct and incorrect answers given by learners in the 2013 ANA. Allow the participants time to decide which responses fit into which category. The questions that follow structure their review of the learner responses.

Scan 1: Correct response

10. Complete the table:

10.1	Count forwards in 100s	584	684	784	884	984 ✓
10.2	Count backwards in 20s	320	300	280	260	240 ✓

Scan 2: Partially correct response (forwards in 100s correct but backwards in 20s not correct.)

10. Complete the table:

10.1	Count forwards in 100s	584	684	784	884	984 ✓
10.2	Count backwards in 20s	320	420	520	620	240 ✗

Scans 3, 4 and 5: Incorrect responses – read in the DBE UNICEF extract about these different responses.

10. Complete the table:

10.1	Count forwards in 100s	584	585	586	587	588	X
10.2	Count backwards in 20s	320	310	320	330	240	X

10. Complete the table:

10.1	Count forwards in 100s	584	585	586	587	588	X
10.2	Count backwards in 20s	320	321	322	323	240	X

10. Complete the table:

10.1	Count forwards in 100s	584	4	5	8	100	X
10.2	Count backwards in 20s	320	3	2	0	240	X

1. Think about the knowledge required to answer the item. Read further about this when you prepare in the DBE UNICEF extract.
  - a. Situate this knowledge in the curriculum.  
*Participants should refer to their CAPS document to locate the item in the current curriculum. They should look at whether/not the item was at the expected level for the grade being tested.*
  - b. What skills and knowledge would learners need to be able to answer this question correctly?  
*This discussion goes beyond CAPS to think about prior knowledge or related curriculum knowledge that would enable a learner to answer the question correctly.*
  - c. How did the learners achieve on this item?  
*The given stats indicate learner achievement in the 2013 on this item. This information is useful since it shows how easy/difficult the learners found this item.*

2. Think about what learners might have been thinking when they got the wrong answers. Are there any common misconceptions evident? How can you explain the errors they made?  
*Read about this in the DBE UNICEF guide to inform your discussion. There are other explanations possible. Encourage your groups to come up with as many explanations as they are able to.*
3. What does this activity (your error analysis) teach you about the way you would teach the content in the item?  
*Encourage personal discussion here. This is where the application of the error analysis will develop and participants can learn more about the mathematical content of the item themselves through engaging meaningfully in such a discussion.*

**Reflection:** Refer to pages i, ii and iii of *Using learners' responses to inform the teaching of Mathematics*. These reflection points are based on the hands-on error analysis activity you have just completed as the first part of Activity 1. As the presenter you can prepare yourself for this discussion by reading the first three pages of the introductory notes to *Using learners' responses to inform the teaching of Mathematics*.

1. What is the difference between an error and a slip?  
*When we talk about work that learners got wrong we use words such as mistake, error or slip. Errors tend to be systematic, persistent and pervasive mistakes performed by learners across a range of contexts. They are based on conceptual misunderstanding. Slips are mistakes that are easily corrected when pointed out. Slips or mistakes are more like careless errors. Since errors are systematic and persistent, they are not necessarily responsive to easy correction or re-explanation of concepts. When doing error analysis, teachers need to examine all learner work – both errors and slips, so that they get an overview of what their learners know/don't know and how to address content issues that are evident in their learners' work. They also will realise how deeply embedded the problem is (error) or not (slip).*
2. In what way is it useful to think about how learners think when they answer a mathematics question **correctly**?  
*Thinking about how learners answer a question correctly helps focus your own thinking on the content of the question. It enables a teacher to check his/her own personal knowledge of the topic.*
3. In what way is it useful to think about how learners think when they answer a mathematics question **incorrectly**?  
*Thinking about how errors could be made when answering the question enables the teacher to start to think diagnostically about the way learners think when they go "wrong". This is important because if a teacher can conceptualise how a learner was thinking they will be more able to address the learner's error specifically instead of just re-teaching the content in the same way. It is useful to study learners' working to discover ways in which they have gone wrong.*
4. How can mathematics teachers be more responsive to their learners' errors?  
*There are many ways. Encourage broad discussion on this topic and try to suggest that participants take on board the idea of doing error analysis themselves and apply it in their districts/classes. Examples of ways in which teachers could be responsive are:*
  - *Use learners' errors when you plan for the next lesson on the topic.*
  - *Think about learners errors when you set a test – especially a multiple choice test – be on the lookout for misconceptions which are a sign of a problematic conceptual understanding that you need to address when you teach.*
  - *Use learners' errors on a topic to plan an intervention on the topic in your district/workshop in your school.*
  - *Etc.*

## Activity 2: ANA learner marks analysis – using learners’ marks as data

This activity is designed to take the participants through the notes on doing a test marks analysis which is found on pages iii-viii of *Using learners’ responses to inform the teaching of Mathematics*. Read these pages of the guide carefully as part of your preparation to lead this activity discussion.

Analysing the learners’ test marks can give teachers insight into:

- How well/poorly the learners did on the test as a whole (using the class average).
- Which items were most/least difficult on the test?
- Which content areas presented the biggest (and progressively less significant) problems to learners when they wrote the test? Etc.

1. Study page iv. of the DBE UNICEF error analysis materials.
  - a. What information should be recorded on an assessment grid in order to do an item marks analysis?  
*See page iii and iv of the guide.*
  - b. Use the handout and information given at the end of this manual to draw up the assessment grid for the activity exemplar as it was done in the DBE UNICEF materials.

Content addressed in question	Place value and number	Number names	Comparing numbers	3-D objects – slide and roll	3-D objects – break down shape into 2-D shapes	Number patterns – add/subtract in a sequence	Multiplication by 10	Word problems – multiply by 10	Addition – 2-digit and 3-digit numbers	Ordering numbers on a number line	Total correct	Percentage
Question number	1	2	3	4	5	6	7	8	9	10		
Mark	2	1	3	2	3	4	5	2	1	2	25	

2. Study page v. of the DBE UNICEF error analysis materials.
  - a. In what way should learners’ marks be recorded in the marks sheets?  
*See page v of the guide.*
  - b. Record the exemplar marks and calculate the totals and percentages for these marks in your exemplar mark sheet.

Question number	1	2	3	4	5	6	7	8	9	10		
Mark	2	1	3	2	3	4	5	2	1	2	25	
Learner's name												
Thembi	2	1	3	2	3	3	4	2	1	1	22	88
Gugu	1	1	1	0	2	2	3	0	1	0	11	44
James	0	0	2	1	1	2	2	0	0	0	8	32
Manono	1	0	1	1	2	2	2	1	0	1	11	44
Mary	0	1	2	2	1	3	1	0	0	0	10	40

- c. What does marks’ analysis assist teachers to observe?  
*See page v of the guide.*

3. Study page vi. of the DBE UNICEF error analysis materials.

a. Why is it useful to work out class averages for learners' tests?

*Class averages give us insight into the overall achievement of the learners in the class on a test. They can therefore show us if a test was generally too easy/difficult for a class, if the class knows the work covered in test/not, and so on. With the class average we can also compare each learner to the whole class to see if they are achieving well/not.*

b. Work out the class average for the marks in your exemplar mark sheet.

Thembi	2	1	3	2	3	3	4	2	1	1	22	88
Gugu	1	1	1	0	2	2	3	0	1	0	11	44
James	0	0	2	1	1	2	2	0	0	0	8	32
Manono	1	0	1	1	2	2	2	1	0	1	11	44
Mary	0	1	2	2	1	3	1	0	0	0	10	40
												50

4. Study page vii. of the DBE UNICEF error analysis materials.

a. What is the final step in an item marks analysis for a learners' test?

*This is the step where we work out learner achievement on each question in the test and not just on the test as a whole (learner average/class average).*

b. Work out the average per question for each item using the marks in your exemplar mark sheet.

Thembi	2	1	3	2	3	3	4	2	1	1	22	88
Gugu	1	1	1	0	2	2	3	0	1	0	11	44
James	0	0	2	1	1	2	2	0	0	0	8	32
Manono	1	0	1	1	2	2	2	1	0	1	11	44
Mary	0	1	2	2	1	3	1	0	0	0	10	40
												50
Total possible marks	10	5	15	10	15	20	25	10	5	10		
Class Total	4	3	9	6	9	12	12	3	2	2		
Average per question	40	60	60	50	60	60	48	30	40	20		

c. Why is marks' analysis a useful thing to do?

*Item analysis gives information that is more closely linked to the maths content of the test since it is specific to each item and not the test as a whole. It can help teachers to decide what content to focus on for remediation. It can help teachers realise which content topics are not a problem.*

5. Study page viii. of the DBE UNICEF error analysis materials. What do steps 5, 6 and 7 recommend? How do these steps relate to the error analysis activity you did when you analysed Item 10 in Activity 1?

*See page viii of the guide.*

*Step 5: Determine what learners should know to answer a specific question correctly.*

*Step 6: Identify the typical errors learners make.*

*Step 7: Determine appropriate teaching strategies to address learner errors and misconceptions.*

*They essentially cover the same steps – in Activity 1 participants had to think about the correct and incorrect answer (and methods for achieving these answers) and they then had to think about how to incorporate these ideas into their teaching.*

6. Review the front pages of the DBE UNICEF materials.

- a. Are error analysis and item marks analysis related activities?

*Yes they are related but they are not the same. Error analysis is more about working with learner responses (written answers in tests/classwork) while marks analysis is about the marks learners achieved in a test/activity.*

- b. What follow up activities would assist teachers to use item and error analysis optimally in their classes?

*Teachers can use the ideas they come up with while they do error analysis to plan more effectively for the teaching of mathematical content.*

*Teachers need to be prepared to engage with learners' errors in their classrooms in discussion. In this way they address the learners' thinking directly and have a better chance of enabling learners to achieve deep conceptual understanding of the mathematical content.*

## Session 2: Activities 3, 4 and 5

This session involves three activities in which you will work through items from the DBE UNICEF Error Analysis guide, *Using learners' responses to inform the teaching of Mathematics*. Each activity should take about 45 minutes. Your facilitator will guide you as you break into groups and report back on your discussions.

In each activity you will be guided by the same set of questions, as you critically review the content presented in the DBE UNICEF error analysis materials. Each item presented in the DBE UNICEF guide is based on the ANA 2013 questions. The guide contains material to assist you in the error analysis process.

As you discuss each item, think about how the content could be used to inform the teaching of mathematics. Make notes in the spaces on the copies of the UNICEF materials. Think about how and what you are reading applies to your district/school context and how you could put it to use.

In each item discussion, participants should work through the DBE UNICEF guide material as they discuss given questions. They should think about how and what they are reading applies to their school context and how they could put it to use. The discussion questions are the same for each item:

1. Determine the **knowledge and skills** learners should have to be able to answer a specific question in the ANA question paper.
2. Identify where in the **CAPS** the **topic** is situated with respect to the Term and grade
3. Identify the **mistakes/errors** learners made in answering the question. Are there any other errors you can think of that they could have made?
4. Determine **teaching strategies** to address learners understanding and misconceptions regarding the question.
5. How could you use this item content to inform your teaching of mathematics?

### Discussion pointers

As the facilitator you need to circulate while groups are discussing the items to make sure they keep the discussion focused on the content of the DBE UNICEF materials.

Make sure that participants have realized the full spread of the materials:

1. Introductory pages that give background to working with learner data diagnostically – this involves using learners' responses as well as their marks as data. Not just the marks!
2. Item-by-item discussion on ANA 2013 items (with linked ANA 2014 items) giving:
  - a. The item
  - b. The curriculum context of the item
  - c. The skills and knowledge required to answer the item correctly
  - d. Some examples of learner responses to show a range from fully correct to incorrect

You should encourage the following:

- Open, free discussion
- Being receptive to the ideas presented
- Being critical as to how the ideas presented can be applied in your district/school.
- Note making while discussion is in progress so that ideas that crop up during the discussion will not be forgotten.
- Being supportive of all members in the group discussion. Etc.

### Activity 3: Data Handling

### Activity 4: Time

### Activity 4: Capacity

### Optional – further item discussion:

Discuss the items relating to mass, length and position, in the same way as you have discussed the items above.