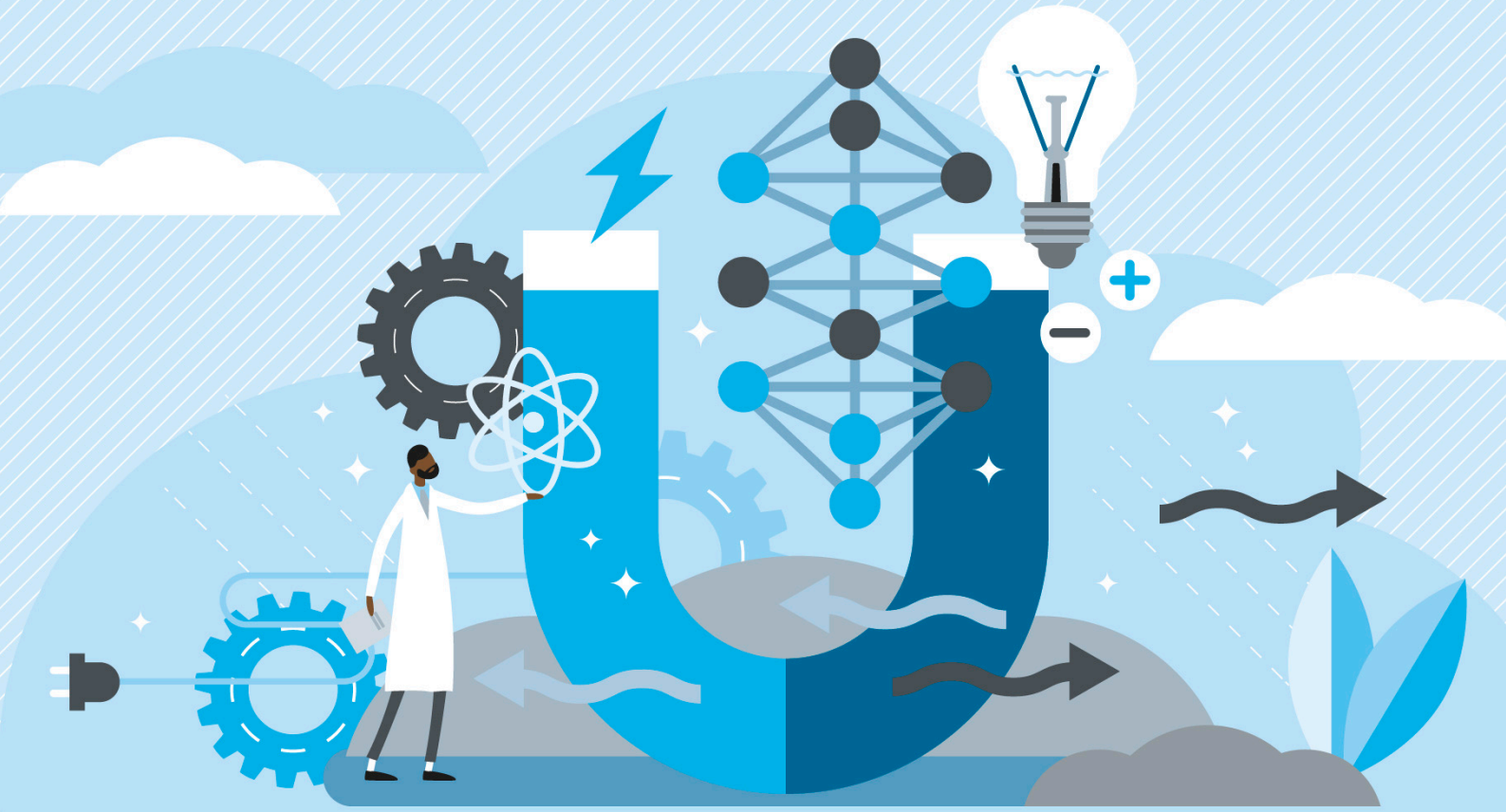
PARTICIPANT'S HANDOUT

2020 TRAINING WORKSHOP NO.1

PHYSICAL SCIENCES



GRADES 10-12

PILO
IMPROVING LEARNER PERFORMANCE

education

Department:
Education
PROVINCE OF KWAZULU-NATAL

FET
Just-in-Time Training Workshop
2020: No. 1

Participants' Handout

Physical Sciences

Jika iMfundo
what I do matters

Endorsed by:

NATU
National Teachers' Union
Educating Our Nation

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Improving Learning Outcomes in Physical Sciences

Jika iMfundo Workshop Programme		
	Description	**Page**
30 min	**Welcome & Introductions** Pre-Workshop activity	
Session 1 (90 min)	**Embracing Change**	**3**
20 min	Reflection on Change in Education	
30 min	Reflection on desired change through Jika iMfundo	
40 min	Reflection on planned changes for 2020	
Session 2 (90 min)	**Focus on resources**	**7**
60 min	Activity 1: Newton's Laws of Motion	
30 min	Activity 2: Reflections on learning	
Session 3 (60 min)	**Effective use of resources in the planner**	**12**
30 min	Activity 1: Planning and preparation	
30 min	Activity 2: Assessment plans & resources	
(30 min)	**Final Reflections**	
20 min	Post-Workshop activity	
10 min	Complete Workshop Evaluation forms & Topics for future workshops	

Workshop Purpose

This workshop has been designed to help Departmental Heads (DH) and lead teachers support teachers in the delivery of the curriculum and to help learners have a better conceptual understanding of key topics to be taught in Term 1.

Rationale for the focus of the Workshop

The work of Pilo is to be extended in 2020 and rolled out into other districts in KZN. A review of the materials and budget has led to a re-design of materials for 2020. The core principles and focus of Jika iMfundo has not changed. The focus remains on effective curriculum coverage. Apart from ensuring better curriculum coverage this workshop seeks to improve the quality of curriculum delivery too. Therefore, this workshop will focus on concepts to be taught in the first term and suggest how DH can encourage teachers to use a variety of resources to ensure improved conceptual understanding of the selected topics.

Methodology of Workshop

This workshop has been designed to engage all participants in active learning through discussion, reflection and engaging in different activities. We acknowledge that everyone has misconceptions that influence their understanding of a topic and how they teach the topic.

To correct a misconception is not an easy process but the first step is to identify misconceptions where they exist. This is a safe space to learn and explore different ideas about the content of the Physical Sciences curriculum and about using different resources to engage learners in the process of building concepts together.

Approaches that encourage active learning as well as a range of additional resources are included in the planners too.

Session 1: Embracing Change

Introduction

Change is a natural phenomenon that is in many ways the focus of Science. We observe and study change in the world around us but find it quite difficult to change our own behaviour at times. However, when we notice that a plan is not working as effectively as it could, our curiosity as scientists causes us to ask questions. This is particular important in every aspect of education. We need to cultivate a habit of asking questions that will help us identify the reason why we do not see the results of teaching and learning that we expect.

Activity 1: Reflection on Change in Education ***(20 min)***

1. This is a group activity. Your facilitator will explain how you need to form groups.

   In your groups, identify changes that you have observed in the following aspects of education in South Africa in the last 5 years. Write down each separate idea on a Post it or a card. Each Group will consider the following aspects:
   - Group 1: Science curriculum
   - Group 2: Learner performance
   - Group 3: Quality of teaching
   - Group 4: Intervention & support programmes

2. Each person needs to write down a change within the area the group is focussing on. Discuss all the relevant changes.

3. After 5 minutes, your facilitator will ask you to form new groups. In your new group identify the two most important changes you have observed. Each group will give feedback to the other participants.

Activity 2: Reflection on desired change through Jika iMfundo ***(30 min)***

1. Discuss the following questions in groups of 4 – 5.
   1.1 What is the underlying goal Jika iMfundo has attempted to address in collaboration with PILO?
   1.2 In your experience, has there been any change in the way teachers are delivering the curriculum to learners? Given examples where possible.

2. The diagram below reflects the process that we have attempted to implement in schools in some districts over the last six years:

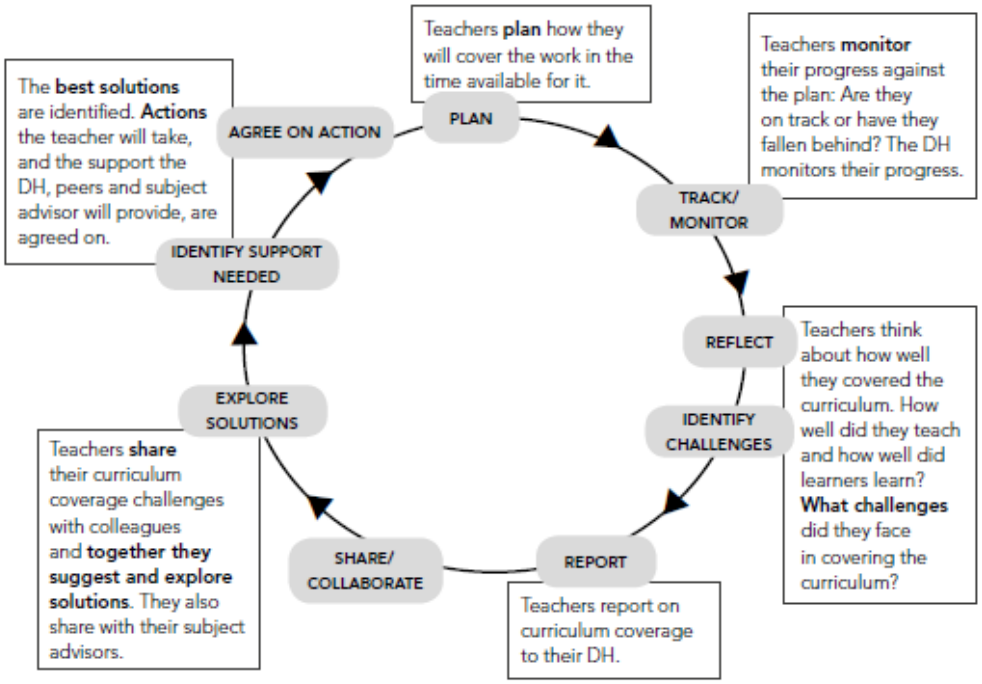


Figure 1: The cycle of practices for supporting improved curriculum coverage

2.1 What has worked well?

2.2. What aspects should still be developed?

Activity 3: Reflection on planned changes for 2020 (40 min)

What has not changed:

- All the detailed planning for each of the approved LTSMs. The layout has changed and the small tracking columns have been deleted
- Most of the planning tables, assessment exemplars and additional resources have been included. The contents list makes the order of the new planner clear.
- The focus on tracking and reflection. The format of this has changed to save costs of printing and distribution. The new document is also more flexible and can be used with any planning tool teachers use – the ATP or their own work schedules. It can be used for any subject and grade. (See more below).

What has changed:

- The name of the document will now be called a Planner, not a Planner and Tracker.

- Two terms' planners are now in one document; two books of planners will thus be distributed in the year. Teachers must keep these documents – they will not get a new version each year.
- The format of the tracking document. Tracking will be done on a separate sheet – a copy is included for photo copying. An example is shown on the next page.
- The tracking template now encourages:
    - daily as well as weekly reflection
    - teachers to think about curriculum coverage in terms of what learners have learnt, as well as what they have covered - this is done by asking them to think about the number of leaners they feel are working at a level 4 level of achievement by end of each week/set of lessons

Questions for discussion

1. How do the following teacher activities support improved curriculum coverage:
    a. Planning what to teach each day of the term?
    b. Reflecting on the day's teaching?
    c. Tracking curriculum actually covered against what was planned?
    d. Reporting on curriculum coverage to the departmental head?
    e. Sharing curriculum coverage challenges with peers; the DH and advisers?
2. What is the role of the DH in supporting improved curriculum coverage- what must he/she do?
3. What sort of attitudes and ways of interacting must exist among members of a department if curriculum coverage is to be improved?

This is the no. of the week in the planner that is being followed.

This is the no. of the week in the term when the work actually starts. If curriculum coverage is behind, this might be a later week than the week in the planner.

Week no. in planner _____

Week no. in term when work planned for week started _____

Refer to the planner for details of the week's work (or the ATP for subjects without planners)

Class (or subject for FP)				
On track by end of week? (Yes/no)				
How many learners are working confidently? (Rough estimate)				
How many learners in this class?				

At the end of the week, the teacher uses evidence from informal and formal assessment, to estimate for each class how many learners out of the total are working confidently at Level 4 or above. They use this information, together with the amount of work planned that they have taught, to state whether or not their curriculum coverage is on track.

Prompts for daily reflection.

DAY	**BRIEF NOTES ON THE DAY'S WORK: Consider such things as:** *What concepts/skills did the learners struggle with or manage well in this lesson? What could be the reasons for this? Did the class complete the work you had planned? Do you need to change your plans for the next lesson? What changes will you make?*
1	
2	
3	
4	
5	

Each day, the teacher reflects on how their lesson went, and how they could improve it using the prompts provided. They also think about whether or not they can proceed as planned in the next lesson. This is a professional judgement they make based on informal and formal assessment. They note the main points here.

Reflection on the week:	
What concepts and skills for the week did learners struggle with? What could you do differently next time to support or extend learning better? What good practice could you share?	**Did you cover the curriculum for the week? If not, what were some of the challenges? What can you do to catch up? What help do you need? How will your progress this week affect your plan for next week?**
DH:	**Date:**

At the end of the week, the teacher reflects on the week's teaching and learning. They think about what learners found difficult, and how they can change their practice so learning improves.

At the end of the week, the teacher considers whether or not the work planned for the week has been taught and learnt, and if not, what can be done to solve curriculum coverage problems and get back on track.

The teacher writes their reflections here for their own professional development, but also to share them with their DH to get support in solving problems.

At the end of the week, the DH reads the teacher's reflections and record of curriculum coverage and signs the template. S/he uses the information shared in a supportive conversation with the teacher. Together they consider the curriculum coverage problems the teacher faces and work towards finding solutions.

Session 2: Focus on Resources

A resource could be any object or person used in an activity that promotes active learning. The most important resource in a classroom is a skilled and prepared teacher. Other common resources include the Planner, the LTSMs and the learners!

In this session you will have the opportunity to engage with two digital resources (Phet simulations) that focus on different topics in the curriculum. These simulations are supported by activities that are designed to engage learners and promote the development of conceptual understanding.

On their own and without careful guidance, learners may not develop the required concepts for the topics selected.

Activity 1: Newton's Laws of Motion **(60 min)**

Phet simulation: **Forces and Motion Basics**

https://phet.colorado.edu/sims/html/forces-and-motion-basics/latest/forces-and-motion-basics_en.html

This simulation will open on any device that can connect to the Internet using a browser. It is written in Html 5. It is also an example of an Open Education Resource so can be shared freely and does not require a permanent Internet connection i.e. it can be used off line.

A. Instructions for investigating forces and motion

1. Select the Net Force activity
2. Make sure all the boxes on the control panel are ticked

3. Select one of the body shapes (red or blue) and apply a force to the cart. Record what happens to the cart.
4. Select two of the body shapes of the same colour and pull the cart in the same direction. Record what happens to the cart.
5. Based on your observations of what happens when you apply a force to the cart, comment on the sum of the forces and the speed of the cart.

6. Select three of the body shapes of the same colour. What do you predict will happen when they and pull the cart? Check to see if your prediction is correct.

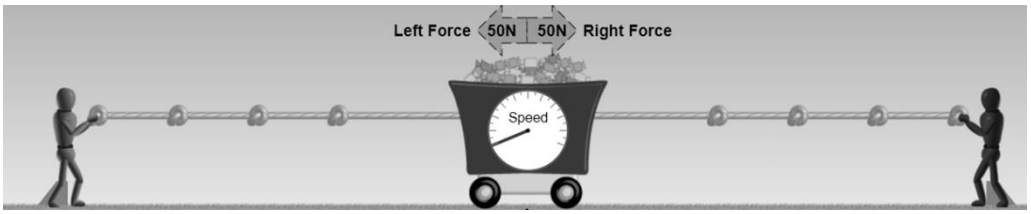
7. Draw a sketch using arrows to show how you calculate the net force applied to the cart.

8. What relationship about the net force applied to an object does this activity demonstrate?

Reflection: Evaluate how effective this resource has been used to demonstrate Newton's 2nd law in an intuitive way. Were the instructions clear? Could additional questions be asked? Is the simulation limited in any way that prevents learners from developing the required conceptual understanding of the relationship between forces and motion?

B. Instructions for investigating the effect of a zero net force

1. Select one red body shape and one blue body shape as shown below:



Blue Red

1.1 Predict what will happen when you press Go

1.2 What is the net force (sum of forces)?

2. Add a 2nd red body and press Go and then immediately press pause. Next add a 2nd blue body of the same mass as the red body.

2.1 Calculate the net force (sum of forces)

2.2 Predict what will happen when you press Go.

2.3 Record your observations and comment on the following:

- The net force
- The speed of the cart

3. What relationship about the effect of a net force of zero does this activity demonstrate?

4. Draw a diagram using arrows to show the forces acting on:

4.1 The cart

4.2 The red body and the blue body.

5. Which of Newton's Laws is demonstrated in this activity?

Reflection: Evaluate how effective this resource has been used to demonstrate Newton's 1st,2nd and 3rd laws in an intuitive way. Were the instructions clear? Could additional questions be asked? Is the simulation limited in any way that prevents learners from developing the required conceptual understanding of the relationship between forces and motion?

C. Instructions for investigating friction

1. Select the Friction activity

2. Make sure all the boxes on the control panel are ticked. Don't change the friction.

3. Change the applied force on the box from 0 N to +10 N. The positive value indicates that the force is a push to the right. What do you observe?

4. Draw up a table to record your observations of what happens when you apply different forces to the 50kg box. Increase the force by 10 N till you reach a force of 120 N.

Applied force (N)	Force of Friction (N)	Net Force (N)	Speed (m/s)
0			
10			
20			

When an object remains at rest (stationary) the frictional force is called the force of static friction.

What do you notice about the force of static friction?

5. Draw a diagram showing the applied force, the force of static friction. Write down what the net force is too.

6. Increase the applied force by 1N and find the maximum force of static friction. This occurs when the largest applied force does not cause the box to move.

7. Re-set the simulation and set the applied force so that the force of static friction is a maximum. Increase the applied force by 1N. What do you observe?

8. Draw up a table to record your observations of what happens when you apply forces that cause the 50kg box to move. Increase the applied force by 10 N till you reach a force of 155 N. Is the speed constant or increasing?

Applied force (N)	Force of Friction (N)	Net Force (N)	Speed
120			
125			
135			
145			
155			

9. Draw a diagram showing the applied force, the force of kinetic friction. Write down what the net force is too.

10. Press the orange re-set button. Apply a force of -150 N to the 50 kg box. Watch what happens. Next press pause. Change the applied force to 0N.

    10.1 What is the net force (sum of forces)?

    10.2 Predict what will happen when you press play.

    10.3 Record your observations and comment on the following:

    - The net force
    - The motion of the cart

D. Motion on a frictionless surface

1. Re-set the simulation

2. Adjust the friction in the control panel to be NONE.

3. Predict what will happen if you apply a force of:

    3.1 -20 N to the box

    3.2 50 N to the box

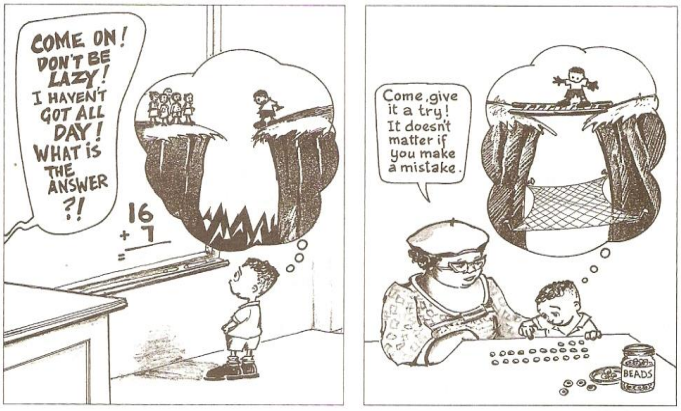
4. Check to see if your predictions are correct. Make sure you comment on the speed and direction the box is moving in.

5. Apply a force of 100 N to the box and watch what happens to the speed. Press pause when the speed reaches 20 m/s. Next change the applied force to 0N. Predict what will happen. Check to see if your prediction is correct.

Activity 2: Reflections on learning **(30 min)**

Teachers can use a range of strategies and a variety of resources. However, even when learners are engaged in activities in class they may still not develop the required conceptual understanding.

Examine the cartoons below:



1. Identify any resources being used in each cartoon.

2. In which cartoon do you think effective learning took place? What made the difference?

Session 3: Effective use of resources in the planner

The focus for this session is on Section C Resources of the updated planner.

The first two resources in Section C are the planners for each approved LTSM for Term 1 & 2. These planners can be used for more than one year. Small changes may be required if a Term is either unusually long or short.

Activity 1: Assessment plans & resources for Assessment

After the planners for Term 1 and 2, you will find the Assessment plans for Term 1 & 2. These tables show you when you need to include the different types of assessment in each term. From this table you will be able to see the specific assessment tasks provided in each of the approved LTSMs.

In addition the planners include exemplars for formal assessment and marking memos. Grids to show the different assessment levels are included as well as a table to analyse learners' performance for each section. These are found towards the end of Section C.

Questions for discussion

1. What can a DH or lead teacher do to ensure that teachers get maximum benefit from the various assessment resources in the planner?

Activity 2: Planning and preparation

The planner does not give any guidance about how to use the LTSMs for each lesson but does give significant guidance and support by highlighting the core concepts, common misconceptions, additional resources for remediation and extension. The planner may also give guidelines on a teaching approach that DH and lead teachers can use when mentoring inexperienced teachers in their departments. The focus of this activity is to explore the different types of resources available for planning and preparation.

- Refer to *the Guidelines for lesson planning and preparation.* The document gives detailed guidance on how to plan and prepare for each Term. Some of the guidance is quite generic but by following these guidelines teachers will become more effective in planning and delivering the curriculum.
- Refer to the *Overview of the Term 1 and Term 2 topics*. The overviews given here were written with the intention of developing greater conceptual understanding and increased pedagogic content knowledge for teachers. This section will allow you to check your understanding of the core concepts you need to teach.
- Refer to the *Additional Information and Enrichment Activities*. The tables in this section provide links to additional resources that will help you to strength your learners conceptual understanding of the required content. Ideas are also given to extend stronger learners and support learners who may be struggling.

- There are some topics in certain Grades where a particular learner book does not address all the requirements of CAPS in as much detail as required. In these cases additional worksheets have been developed to fill the gap.

Questions for discussion

1. What can a DH or lead teacher do to ensure that teachers get maximum benefit from the various planning resources in the planner?

2. Why do you think the conceptual framework for a lesson is important?

Notes on Pre & Post Workshop Activity

Jika iMfundo Workshop Programme Feedback 10 October 2019		
	Description	**Comments & Suggestions for Improvement**
10 min	**Welcome & Introductions**	
Session 1 (90 min)	**Embracing Change**	
20 min	Reflection on Change in Education	
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Jika iMfundo Workshop Programme Feedback 10 October 2019		
Description		**Comments & Suggestions for Improvement**
Session 3 (60 min)	**Effective use of resources in the planner**	
30 min	Activity 1: Planning and preparation	
30 min	Activity 2: Assessment plans & resources	
General Comment:		
Suggestions for topics in future workshops		
Term 2		Chemistry Physics