

#### *Curriculum and Assessment* Policy Statement



### *FOUNDATION PHASE* GRADER-3

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Department: Basic Education

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**CURRICULUM AND ASSESSMENT POLICY STATEMENT**

**{CAPS) CODING AND ROBOTICS**

**FOUNDATION PHASE GRADE R-3**

CODING AND ROBOTICS



1

**FOREWORD BY THE MINISTER**

Our national curriculum is the culmination of our efforts over a period of seventeen years to transform the curriculum bequeathed to us by apartheid. From the start of democracy we have built our curriculum on the values that inspired our Constitution (Act 108 of 1996). The Preamble to the Constitution states that the aims of the Constitution are to:

* heal the divisions of the past and establish a society based on democratic
* values, social justice and fundamental human rights;
* improve the quality of life of all citizens and free the potential of each person;
* lay the foundations for a democratic and open society in which government is based on the will of the people and every citizen is equally protected by law; and
* build a united and democratic South Africa able to take its rightful place as a sovereign state in the family of nations.

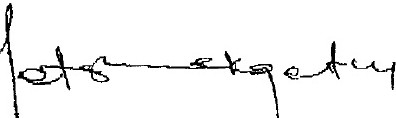
Education and the curriculum have an important role to play in realising these aims. In 1997 we introduced outcomes-based education to overcome the curricular divisions of the past, but the experience of implementation prompted a review in 2000. This led to the first curriculum revision: the Revised National Curriculum Statement Grades R-9 and the National Curriculum Statement Grades 10-12 (2002).

Ongoing implementation challenges resulted in another review in 2009 and we revised the Revised National Curriculum Statement (2002) and the National Curriculum Statement Grades 10-12 to produce this document.

From 2012 the two National Curriculum Statements, for Grades R-9 and Grades 10-12 respectively, are combined in a single document and will simply be known as the National Curriculum Statement Grades R-12. The National Curriculum Statement for Grades R-12 builds on the previous curriculum but also updates it and aims to provide clearer specification of what is to be taught and learnt on a term-by-term basis.

The National Curriculum Statement Grades R-12 represents a policy statement for learning and teaching in South African schools and comprises of the following:

1. Curriculum and Assessment Policy Statements (CAPS) for all approved subjects listed in this document;
2. National policy pertaining to the programme and promotion requirements of the National Curriculum Statement Grades R-12; and
3. National Protocol for Assessment Grades R-12.



**MRS ANGIE MOTSHEKGA, MP MINISTER OF BASIC EDUCATION**

CURRICULUM AND ASSESSMENT POLICY STATEMENT



2

CONTENTS

1. Section 1 Introduction to the Curriculum and Assessment Policy Statement for Coding and Robotics

[Foundation Phase (Grade R - 3) 5](#_TOC_250036)

* 1. [Background 5](#_TOC_250035)
  2. [Overview 5](#_TOC_250034)
  3. [General aims of the South African Curriculum 6](#_TOC_250033)
  4. [Time Allocation 7](#_TOC_250032)

1. Section 2: Definition, Aims, Skills and Content. 9
   1. [Introduction 9](#_TOC_250031)
   2. [What is Coding and Robotics 10](#_TOC_250030)
   3. [Specific Aims 10](#_TOC_250029)
   4. [Specific Skills 11](#_TOC_250028)
   5. [High-Level Competencies - Coding and Robotics 13](#_TOC_250027)
   6. [Coding and Robotics Concepts, Practices and Perspectives 13](#_TOC_250026)
   7. [Approach to Teaching Coding and Robotics 14](#_TOC_250025)
   8. [Synergising Coding and Robotics in Foundation Phase 19](#_TOC_250024)
   9. [Time Allocation 20](#_TOC_250023)
   10. [Resources Required to offer Coding and Robotics in Foundation Phase 21](#_TOC_250022)
   11. [Overview of Foundation Phase Coding and Robotics 25](#_TOC_250021)
   12. Focus of Content Areas 26
   13. [Envisaged Learner 32](#_TOC_250020)
   14. [Career Opportunities 32](#_TOC_250019)
   15. [Progression and Exit Skills Per Grade of Focus Areas 33](#_TOC_250018)
2. Section 3 Content Specific Clarification per Grade per Term 51
   1. [Grade R 52](#_TOC_250017)
   2. [Grade 1 67](#_TOC_250016)
   3. [Grade 2 83](#_TOC_250015)
   4. [Grade3 102](#_TOC_250014)
3. Section 4 Assessment 121
   1. [Introduction 121](#_TOC_250013)
   2. [Assessment 121](#_TOC_250012)
   3. [Problem-based Learning 121](#_TOC_250011)
   4. [Recording and Reporting 122](#_TOC_250010)
   5. [General 123](#_TOC_250009)

[Annexure A - Terminology 124](#_TOC_250008)

* 1. [Coding 125](#_TOC_250007)
  2. [Robotics 125](#_TOC_250006)
  3. [Digital Concepts 125](#_TOC_250005)

[Annexure B - Example Rubrics 127](#_TOC_250004)

* 1. [Problem-solving (Coding) 127](#_TOC_250003)
  2. [Cooperative Learning 128](#_TOC_250002)
  3. [Pair Programming /Completing a Task in Pairs 129](#_TOC_250001)
  4. [Communication/ Discussion (Digital Concepts) 129](#_TOC_250000)

CODING AND ROBOTICS



3

* 1. **Design Thinking 130**

Annexure C - Possible Additional Resources 131

**TABLES AND FIGURES**

**Tables**

Table 2.1: Time allocation for Foundation Phase Coding and Robotics 20

**Table** 2.2: **Coding content focus** 26

**Table** 2.3: **Robotics content focus** 28

Table 2.4: Digital Concepts content focus 30

Table A.5 Coding - Clarification of concepts and terms 124

Table A.6 Robotics - Clarification of concepts and terms 125

Table A.7 Digital Concepts - Clarification of concepts and terms 125

**Figures**

Figure 2.1 Coding and robotics as a STEAM discipline 9

Figure 2.2: Coding and Robotics as a multi-disciplinary subject 9

Figure 2.3: Overview of Coding and Robotics as a Subject 10

Figure 2.4: Computational Thinking Pillars 11

Figure 2 5: Design Thinking and Problem Solving Process 12

Figure 2.6 High-level Curriculum Competencies 13

Figure2.7 Coding Concepts, Practices and Perspectives 13

Figure 2.8 Robotics Concepts, Practices and Perspectives 14

Figure 2.9 Programming resources for Coding and Robotics Coding Resources 21

Figure 2.10 Overview of Foundation Phase Coding and Robotics 25

CURRICULUM AND ASSESSMENT POLICY STATEMENT



4

1. **SECTION 1**

**INTRODUCTION TO THE CURRICULUM AND ASSESSMENT**

**POLICY STATEMENT FOR CODING AND ROBOTICS FOUNDATION PHASE {GRADE R - 3)**

* 1. **BACKGROUND**

The *National Curriculum Statement Grades R* - *12 (NCS)* stipulates policy on curriculum and assessment in the schooling sector.

To improve implementation, the National Curriculum Statement was amended, with the amendments coming into effect in January 2012. A single comprehensive Curriculum and Assessment Policy document was developed for each subject to replace Subject Statements, Learning Programme Guidelines and Subject Assessment Guidelines in Grades R - 12.

* 1. **OVERVIEW**

1. The *National Curriculum Statement Grades R- 12 (January 2012)* represents a policy statement for learning and teaching in South African schools and comprises the following:
   1. National Curriculum and Assessment Policy Statements for each approved school subject;
   2. The policy document, National policy pertaining to the programme and promotion requirements of the National Curriculum Statement Grades R - 12; and
   3. The policy document, National Protocol for Assessment Grades R - 12 (January 2012).
2. The *National Curriculum Statement Grades R- 12 (January 2012)* replaces the two current national curricula statements, namely the
   1. *Revised National Curriculum Statement Grades R* - *9, Government Gazette No. 23406* of 31 May 2002, and
   2. *National Curriculum Statement Grades 10* - *12 Government Gazettes, No. 25545 of 6 October 2003* and *No. 27594* of 17 May 2005.
3. The national curriculum statements contemplated in subparagraphs (a) and (b) comprise the following policy documents which will be incrementally repealed by the *National Curriculum Statement Grades R*

- *12 (January 2012)* during the period 2012-2014:

* 1. The Learning Area/Subject Statements, Learning Programme Guidelines and Subject Assessment Guidelines for Grades R - 9 and Grades 10 - 12;
  2. The policy document, *National Policy on assessment and qualifications for schools in the General Education and Training Band d,* promulgated in *Government Notice No. 124* in *Government Gazette No. 29626* of 12 February 2007;
  3. The policy document, the *National Senior Certificate: A qualification at Level 4 on the National Qualifications Framework (NQF),* promulgated in *Government Gazette No.27819* of 20 July 2005;
  4. The policy document, *an addendum to the policy document, the National Senior Certificate: A qualification at Level 4 on the National Qualifications Framework (NQF), regarding learners with special needs,* published in *Government Gazette, No.29466* of 11 December 2006, is incorporated in the policy document, *National policy pertaining to the programme and promotion requirements of the National Curriculum Statement Grades R* - *12; and*
  5. The policy document, *An addendum to the policy document, the National Senior Certificate: A qualification at Level 4 on the National Qualifications Framework (NQF), regarding the National Protocol for Assessment (Grades R- 12),* promulgated in *Government Notice No.1267* in *Government Gazette No. 29467* of 11 December 2006.

(c) The policy document, *National policy pertaining to the programme and promotion requirements of the National Curriculum Statement Grades R- 12,* and the sections on the Curriculum and Assessment Policy as contemplated in Chapters 2, 3 and 4 of this document, constitute the norms and standards of the *National Curriculum Statement Grades R- 12.* It will therefore, in terms of *section 6A* of the *South African*

CODING AND ROBOTICS



5

*Schools Act, 1996 (Act No. 84 of 1996,)* form the basis for the Minister of Basic Education to determine minimum outcomes and standards, as well as the processes and procedures for the assessment of learner achievement to be applicable to public and independent schools.

* 1. **GENERAL AIMS OF THE SOUTH AFRICAN CURRICULUM**
* The *National Curriculum Statement Grades R* - *12* gives expression to the knowledge, skills and values worth learning in South African schools. This curriculum aims to ensure that children acquire and apply knowledge and skills in ways that are meaningful to their own lives. In this regard, the curriculum promotes knowledge in local contexts, while being sensitive to global imperatives.
* The National Curriculum Statement Grades R - 12 serves the purposes of:
  + equipping learners, irrespective of their socio-economic background, race, gender, physical ability or intellectual ability, with the knowledge, skills and values necessary for self-fulfilment, and meaningful participation in society as citizens of a free country;
  + providing access to higher education;
  + facilitating the transition of learners from education institutions to the workplace; and
  + providing employers with a sufficient profile of a learner's competences.
* The National Curriculum Statement Grades R - 12 is based on the following principles:
  + Social transformation: ensuring that the educational imbalances of the past are redressed, and that equal educational opportunities are provided for all sections of the population;
  + Active and critical learning: encouraging an active and critical approach to learning, rather than rote and uncritical learning of given truths;
  + High knowledge and high skills: the minimum standards of knowledge and skills to be achieved at each grade are specified and set high, achievable standards in all subjects;
  + Progression: content and context of each grade shows progression from simple to complex;
  + Human rights, inclusivity, environmental and social justice: infusing the principles and practices of social and environmental justice and human rights as defined in the Constitution of the Republic of South Africa. The National Curriculum Statement Grades R - 12 is sensitive to issues of diversity such as poverty, inequality, race, gender, language, age, disability and other factors;
  + Valuing indigenous knowledge systems: acknowledging the rich history and heritage of this country as important contributors to nurturing the values contained in the Constitution; and
  + Credibility, quality and efficiency: providing an education that is comparable in quality, breadth and depth to those of other countries.
* The National Curriculum Statement Grades R - 12 aims to produce learners that can:
  + identify and solve problems and make decisions using critical and creative thinking;
  + work effectively as individuals and with others as members of a team;
  + organise and manage themselves and their activities responsibly and effectively;
  + collect, analyse, organise and critically evaluate information;
  + communicate effectively using visual, symbolic and/or language skills in various modes;
  + use science and technology effectively and critically showing responsibility towards the environment and the health of others; and
  + demonstrate an understanding of the world as a set of related systems by recognising that problem solving contexts do not exist in isolation.
* lnclusivity should become a central part of the organisation, planning and teaching at each school. This can only happen if all teachers have a sound understanding of how to recognise and address barriers to learning, and how to plan for diversity.

The key to managing inclusivity is ensuring that barriers are identified and addressed by all the relevant support structures within the school community, including teachers, District-Based Support Teams, Institutional-Level Support Teams, parents and Special Schools as Resource Centres. To address barriers in the classroom, teachers should use various curriculum differentiation strategies such as those included in the Department of Basic Education's *Guidelines for Inclusive Teaching and Learning* (2010).

CURRICULUM AND ASSESSMENT POLICY STATEMENT



6

* 1. **TIME ALLOCATION**
     1. **Foundation Phase**

1. The instructional time in the Foundation Phase is as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| **Subject** | **Grade R (Hours)** | **Grades 1-2 (Hours)** | **Grade 3 (Hours)** |
| Home Lanauaae | 10 | 7/8 | 7/8 |
| First Additional Language |  | 2/3 | 3/4 |
| Mathematics | 7 | 7 | 7 |
| Life Skills   * Beginning Knowledge * Creative Arts * Physical Education * Personal and Social Well-being | 5 | 5 | 5 |
| (1) | (1) | (1,5) |
| (1,5) | (1,5) | (1,5) |
| (1,5) | (1,5) | (1) |
| (1) | (1) | (1) |
| Godina and Robotics | *(*1) | (1) | (2) |
| **Total** | **23** | **23** | **25** |

1. Instructional time for Grades R, 1 and 2 is 23 hours and for Grade 3 is 25 hours.
2. Ten hours are allocated for languages in Grades R-2 and 11 hours in Grade 3. A maximum of 8 hours and a minimum of 7 hours are allocated for Home Language and a minimum of 2 hours and a maximum of 3 hours for Additional Language in Grades R - 2. In Grade 3 a maximum of 8 hours and a minimum of 7 hours are allocated for Home Language and a minimum of 3 hours and a maximum of 4 hours for First Additional Language.
3. In Life Skills, Beginning Knowledge is allocated 1 hour in Grades R - 2 and 2 hours as indicated by the hours in brackets for Grade 3.
   * 1. **Intermediate Phase**

The instructional time in the Intermediate Phase is as follows:

|  |  |
| --- | --- |
| **Subject** | **Hours** |
| Home Language | 6 |
| First Additional Lanauaae | 5 |
| Mathematics | 6 |
| Natural Sciences | 2,5 |
| Social Sciences | 3 |
| Life Skills   * Creative Arts * Physical Education * Personal and Social Well-beina | 3  (1)  (1)  (1) |
| Coding and Robotics | 2 |
| **Total** | **27,5** |

* + 1. **Senior Phase**

(a) The instructional time in the Senior Phase is as follows:

|  |  |  |
| --- | --- | --- |
| **Subject Choice: Ootion 1** | **Subject Choice: Ootion 2** | **Hours** |
| Home Language | Home Language | 5 |
| First Additional Lanauaae | First Additional Lanauaae | 4 |
| Mathematics | Mathematics | 4,5 |
| Natural Science | Natural Science | 3 |
| Social Sciences | Social Sciences | 3 |
| \*Technoloav | \*Economic Manaaement Sciences | 2 |
| Coding and Robotics | Coding and Robotics | 2 |
| Life Orientation | Life Orientation | 2 |
| Creative Arts | Creative Arts | 2 |
| **Total** | | **27,5** |

\* Schools/Learners can follow Option 1 (MST Stream) or Option 2 (Business Stream)

CODING AND ROBOTICS



7

* + 1. **Grades 10-12**

(a) The instructional time in Grades 10-12 is as follows:

|  |  |
| --- | --- |
| **Subject** | **Time allocation per week (hours)** |
| I. Home Language  11. First Additional Language  111. Mathematics  IV. Life Orientation  V. A minimum of any three subjects selected from Group 8 Annexure 8, Tables 81-88 of the policy document, *National policy pertaining to the programme and promotion requirements of the National Curriculum Statement Grades R* - *12,* subject to the provisos stipulated in paragraph 28 of the said policy  document. | **4.5**  **4.5**  **4.5**  **2**  **12 (3x4h)** |

The allocated time per week may be utilised only for the minimum required NCS subjects as specified above and may not be used for any additional subjects added to the list of minimum subjects. Should a learner wish to offer additional subjects, additional time must be allocated for the offering of these subjects.

CURRICULUM AND ASSESSMENT POLICY STATEMENT



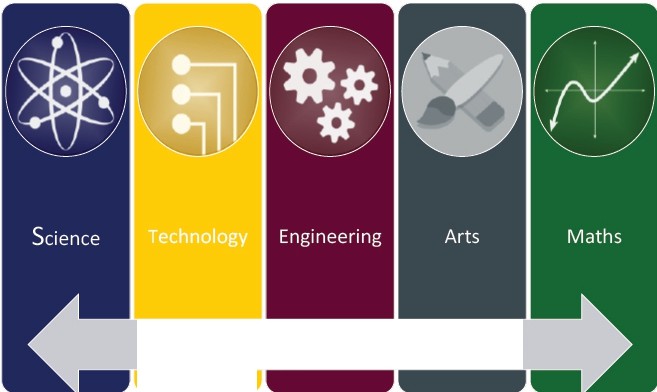
8

1. SECTION 2:

**DEFINITION, AIMS, SKILLS AND CONTENT**

* 1. **INTRODUCTION**

Coding and Robotics represents an interdisciplinary and multidisciplinary subject that integrates various components of STEAM (Science (including Computer Science), Technology, Engineering, Arts, and Mathematics).

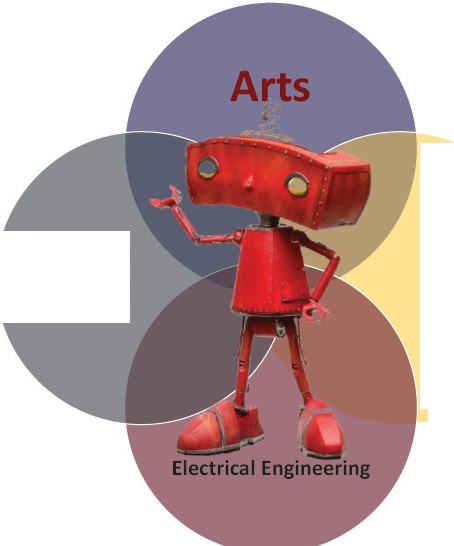


**Coding & Robotics**

*Figure 2.1 Coding and robotics as a STEAM discipline*

The main driving force behind the uptake and surge of Coding and Robotics as a subject at school level is the link to the 4th and 5th industrial revolution (41R, and SIR). In the context of this curriculum the focus resides in the grounding concepts of STEAM related subjects.

**Mechanical Engineering**



**Computer**

**Science**

*Figure 2.2: Coding and Robotics as a multi-disciplinary subject*

CODING AND ROBOTICS



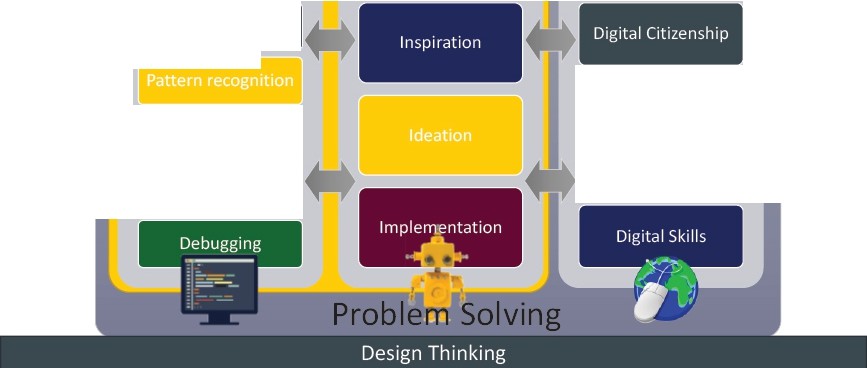
9

* 1. **WHAT IS CODING AND ROBOTICS**

Coding and robotics combine the principles of programming with the design, construction, and operation of robots. Programming concepts, practices, and perspectives are applied to control robots to perform specific tasks. It includes digital concepts that refer to various ideas, principles and processes that are associated with digital technologies and their use.

The Coding and Robotics curriculum is based on the following pillars as depicted in the figure below.

##### Coding and Robotics



Communication

Collaboration

Creativity

Perseverance

**Coding +**

**Robotics**

Solution development

**Digital**

**Concepts**

Decomposition

Abstraction

Digital Awareness

Algorithm Design

Logical and Critical Thinking Computational Thinking

*Figure 2.3: Overview of Coding and Robotics as a Subject*

***Coding*** is the process of creating a logical set of instructions that a human or a computing device can understand and execute, which require a deep understanding of computational thinking and problem solving.

***Robotics*** deals with the design, operation, and use of robots that can be programmed to perform tasks autonomously or semi-autonomously or by direct control. It presents the learners with the opportunity to see their thinking, design, and code in action.

***Digital concepts*** encompass a range of digital literacy skills and awareness that enables learners to leverage digital technologies to their fullest potential and use digital tools responsibly.

* 1. **SPECIFIC AIMS**

The teaching and learning of Coding and Robotics (C&R) aim to develop the following for the learner to be able to:

* develop computational thinking skills to solve problems.
* advance design thinking to develop creative and human-centred approaches to solve problems.
* become part of a generation of creative, innovative systems thinkers that can use coding, robotics, and digital competencies to express their ideas.

CURRICULUM AND ASSESSMENT POLICY STATEMENT



10

* foster creativity, critical thinking, collaboration, communication, and innovation.
* function ethically and effectively in a digital and information-driven world.
* develop a critical awareness of how technologies impact society at large.
* instil self-efficacy and confidence to deal with situations requiring computational thinking, design thinking and problem solving.
* prepare for future careers in STEAM related fields.
* adopt a culture of being self-directed, life-long learners who can apply their skills in a wide range of contexts and situations (adaptable, flexible and resilient).
  1. **SPECIFIC SKILLS**

The following skills are specifically emphasised:

* + 1. **Computational Thinking**

Computational thinking is an attitude and a skill set where one uses specific techniques and strategies to complete tasks successfully and to solve problems systematically. It further helps one in arriving at a solution that both humans and a computer can understand.

**Abstraction**



Focusing on the relevant and important information and ignoring unrelated and irrelevant things.

Helps you to get to the heart of the problem and to find general principles that create patterns

**Decomposition**

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Solving a complex problem by breaking it into small, manageable parts where each part 1s more straightforward and easier to solve

**Pattern Recognition**



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Identifying similarities and differences.

It helps you to make

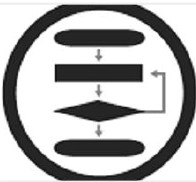
connections between

similar pro.blems and experiences.

Recognising the same patterns in other problems helps you in solving a new problem

**Algorithm**

'



Defining a precise sequence of steps or instructions to perform a task.

An algorithm is a set of rules or instructions that anyone can follow to perform a task or solve a problem

*Figure 2.4: Computational Thinking Pillars*

In Coding and Robotics, computational thinking helps learners to develop problem-solving strategies which they can apply when developing coding solutions (algorithms) as well as robotics solutions. It can also be applied to solve everyday life.

In terms of robotics, learners are demonstrating computational thinking concepts and practices when designing, constructing, and programming a robot. The robot's performance demonstrates the result of the learner's computational thinking practices as they iteratively test and debug their coding.

* + 1. **Design Thinking**

In education, design thinking (DT) refers to a human-centred approach that encourages creativity and innovation when generating user-focused products, services, or experiences. DT is often expressed as an

activity that involves the three Is processes, namely:

CODING AND ROBOTICS



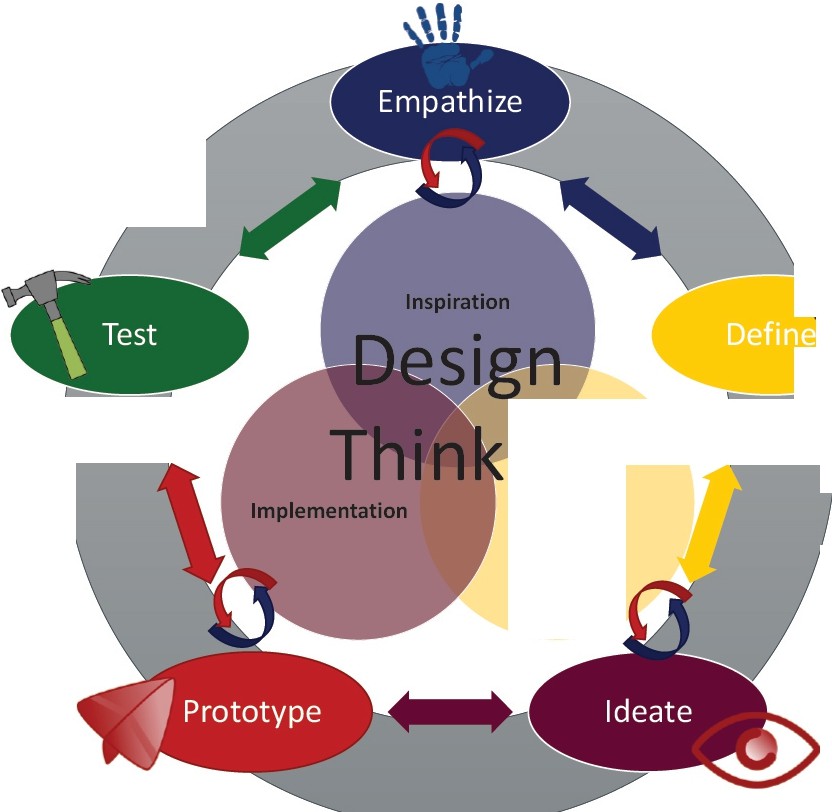
11

* **Inspiration:** where creative thinking is applied to tackle a problem or challenge at hand, by gaining a deeper understanding of the problem and its context as well as to identify opportunities for innovation.
* **Ideation:** involves the generation of a wide range of ideas and potential solutions using various approaches such as brainstorming, prototyping and experimentation.
* **Implementation:** where the ideas and potential solutions are put into action. It includes testing, getting feedback and subsequent improvements of the design or solution.

Related to the three **'Is'** is the notion that Design Thinking is also a problem-solving approach that combines creativity with structure and human-centred methods to understand and tackle challenges which involves empathizing with users, defining their needs, ideating possible solutions, prototyping, and testing those solutions, and iterating based on feedback. The following describes the design process:

* **Empathise:** involves gaining an understanding of who the end user is in a specific context, and how the envisaged solution will be appropriate towards addressing the problem.
* **Define:** relates to specifying in detail what the users' needs are, which could include the goals, skills available, and core principles that will guide the work to be done.
* **Ideate:** pertains to the creation of ideas and solutions using techniques such as brainstorming.
* **Prototype:** concerns the creation of one or several solutions to address the problem at hand.
* **Test:** relates to the process of determining how well the solution solves or address the problem. In this phase, feedback is important as the feedback could be used towards the improvement and enhancement and/or redesign of the complete solution or artefact.

Figure 2.6 depicts the relationship between the Design Thinking and Design Problem Solving approach.



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**Ideation**

*Figure 2 5: Design Thinking and Problem-Solving Process*

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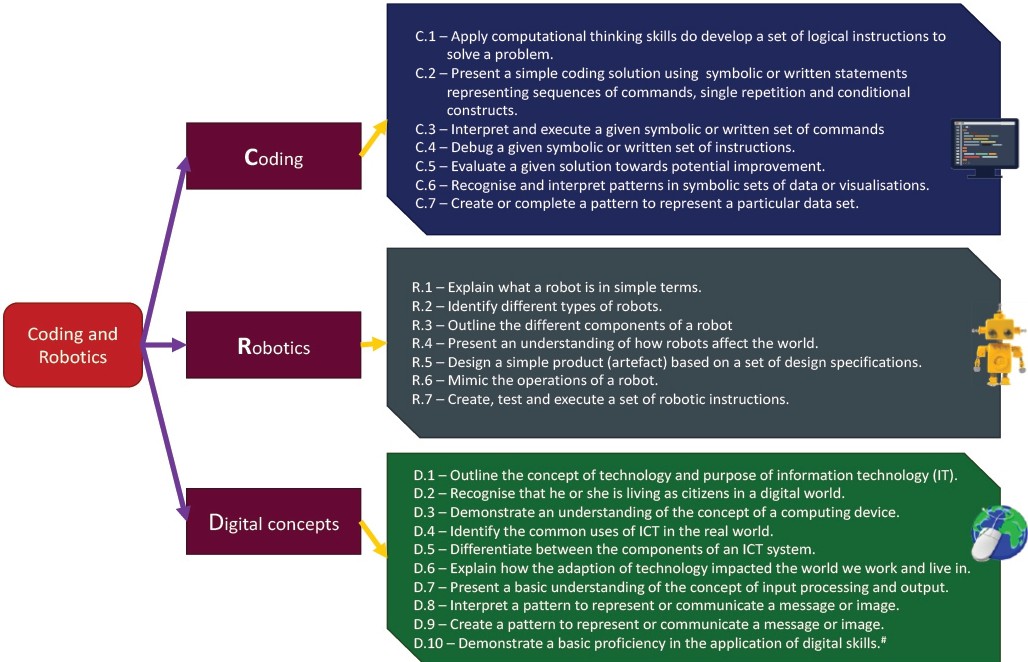


12

* 1. **HIGH-LEVEL COMPETENCIES - CODING AND ROBOTICS**

The three main topical areas of coding and robotics each comprises a set of key learning competencies central to their area of focus.

The following diagram outlines the three main topical areas and the main learning competencies associated with each, at the final stage of curriculum cognition wherein the learner demonstrates competence and proficiency at the appropriate level.



*Figure 2.6 High-level Curriculum Competencies*

A competence is a combination of knowledge skills, attitudes, and values which is reflected in behaviour that can be observed, measured, and evaluated. It refers to the ability to perform a specific task successfully and efficiently or in a manner that yields desirable outcomes.

* 1. **CODING AND ROBOTICS CONCEPTS, PRACTICES AND PERSPECTIVES**
     1. **Coding**

In coding, the following concepts, practices, and perspectives must be developed and practised repeatedly:

**Perspectives**

* Expressing and Creating
* Questioning
* Connecting
* Collaboration
* Perseverance
* Choice of Conduct

|  |  |
| --- | --- |
| **Concepts** |  |
| * Algorithm   •Sequence   * Loop (Iteration) * Conditional (Decisions)   •Operator   * Logic   •Data   * Event   •Debug   * Representation * Parallelism * Automation | |

|  |  |
| --- | --- |
| **Practices** |  |
| * Abstraction * Decomposition * Pattern Recognition * Generalisation * Algorithm Design * Incremental Development * Testing and Debugging * Evaluation * Modularise | |

* Logical thinking
* Creating computational artefacts

*Figure2.*7 *Coding Concepts, Practices and Perspectives*

CODING AND ROBOTICS



13

* + 1. **Robotics**

In addition to the coding concepts, practices and perspectives, in robotics, the following concepts, practices, and perspectives must be developed and practised repeatedly:

**Practices**

* Computational Thinking
* Motion

•Sensor

•Actuator

* Controller
* Logic
* Power Source
* Automation
* Instruction
* Communication
* Coding (Programming)

**Concepts**

* Expressing and Creating
* Innovation
* Questioning
* Connecting
* Collaboration
* Perseverance
* Choice of Conduct

**Perspectives**

* Design Thinking
* Prototyping
* Design and Construction
* Algorithm Design
* Testing and Reconfiguration
* Reflection and Iteration
* Creative Thinking
* Logical thinking
* Creating robotics artefacts
  + 1. **Digital Concepts**

*Figure 2.8 Robotics Concepts, Practices and Perspectives*

Digital concepts are fundamental ideas and principles that underpin and support coding and robotics. They encompass various aspects of technology and computer science, providing the context and application for these fields. In Coding and Robotics, digital concepts are divided into the following topics: Digital Citizenship, Digital Awareness and Digital Skills.

* + - 1. ***Digital Citizenship***

Digital Citizenship helps to develop an awareness of responsible and ethical behaviour in the digital world, which includes the responsible and ethical use of digital tools.

It includes the rights, responsibilities and behaviours (respect, integrity, and safety) displayed by individuals in the digital world. It further includes concepts like respecting others' privacy, avoidance of, and aversion towards cyberbullying, the inculcation and employment of netiquette, digital health and welfare, as well as mindfulness with respect to the impact of online actions and deeds and the taking of responsibility for such actions in the digital environment.

* + - 1. ***Digital Awareness***

The recognition of the competencies, expertise and the mindset needed by individuals to effectively use digital tools entail understanding and the applications of technologies in a world that is becoming more interconnected.

It includes an awareness of different types of computing devices and their purposes, the concepts of hardware and software interactions as well as the exemplification and applications of concept such as input-processing­ output and the awareness that the internet as an example of a network such that in a digital world, devices often need to communicate with each other.

* + - 1. ***Digital Skills***

An essential set of a range of abilities that enable individuals to effectively use digital devices, software, and platforms to perform various tasks. It includes an awareness of patterns to communicate a message as patterns is a fundamental concept in both coding and robotics.

* 1. **APPROACH TO TEACHING CODING AND ROBOTICS**

Coding and Robotics, as a subject, is process-driven as it focuses on coding and robotics processes, rather than just exit skills or products. Coding develops cognitive and critical thinking skills as it emphasises the development of knowledge, skills, strategies, and attitudes that enable learners to become more effective

CURRICULUM AND ASSESSMENT POLICY STATEMENT



14

individuals. Coding and Robots also supports learners to develop metacognitive skills, which include planning, developing, testing, evaluation and reflecting.

* + 1. **Problem-based Learning**

Teaching and learning will follow a problem-based learning approach. Problem-based learning (PBL) is an active and learner-centred approach to learning involving several cognitive processes that aims to develop critical thinking, problem-solving, and collaboration skills. The goal of PBL is to help learners learn how to apply knowledge and skills in real-life situations, rather than just memorising information for tests. PBL also encourages learners to ask questions and seek answers, rather than passively receiving information. It also supports the development of self-directed learning.

In Foundation Phase, learners will be given small, manageable problems which they need to solve using a problem-solving process. To develop and enhance self-efficacy (the learner's belief that he/she will be able to complete the task or solve the problem), the challenge of the task or problem should match the learner's competencies.

Example of a manageable problem and algorithm development using the problem-solving process in Foundation Phase:

**Problem:**

Katlego needs to replant a flower in a different position (see diagram below).

,,

**Step 1: Understand the problem.**

Katlego **sta\_d§a.t (0.** O] facing right (East) (towards a

,, 'l. .--J Highlight the **relevant** information,

whileignoring unimportant or

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* • I

flower) with no flowers in his hand. There is a **Howe**  - irrelevant information **(abstraction)**

-

at location (3, 0). ''-

Develop instructions that will direct Katlego to pick the floweri and plant it at location (3. 2).

After planting the flowe . Katlego should move one space to the right (East) and stop. There are no obstacles, other flowers, or people on the grid.

**Start Finish**

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**Step 2: Analyse the problem**

* Katlego is on the top left block of the grid (position (0, 0))
* The flower must be planted at position (3, 2)
* The flower is exactly three spaces ahead of Katlego.
* The flower is to be planted exactly two spaces down (South) of its current location.
* Katlego is to finish facing right (East) one space right (East) of the planted flower.
* There are no obstacles or other people to worry about.

**Step 3: Develop a high-level solution or**

**algorithm** (abstraction)

Katlego should do the following:

,, -J The high-level algorithm breaks the problem

,, 'l. into *three* rather easy sub-problems ormain

Step 1: Get the flower. • • I

Step 2: Plant the flower. -

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,:;:::! ,..

ideas (decomposition, using abstraction). Thisseems like a good technique.

CODING AND ROBOTICS



15



Step 3: Move East (Forward)

**Step 4: Detailed Algorithm** (Decomposition) Katlego should do the following:

1.

2.

3.

Step 1: Get the flower.

* 1. Move 3 blocks forward.
  2. Pick the flower. Step 2: Plant the flower.
  3. Turn right.
  4. Move 2 two blocks forward.
  5. Plant the flower.

Step 3: Move East (Forward)

* 1. Turn left.
  2. Move one block forward.

---=:::::::::::::::::=:J Each step in the **high-level algorithm** was

broken down intomore specific, detailed

steps,giving more detailed instructions.

**Step 5: Implement and Test the algorithm.**

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Draw a grid and put two objects (one representing Katlego and one representing the flower) in the correct positions on the grid.

Follow the algorithm and move the objects representing Katlego and the flower according to the instructions (algorithm)

Ask the following questions:

* Was the flower successfully moved from its first position to the target position?
* If the answer is yes, the problem is solved else you need to identify the error and fix the algorithm (debug).

Generally, problem-based learning

* enables learners to develop problem solving strategies as well as subject knowledge and skills.
* enables learners to be more engaged in learning.
* stimulates critical thinking.
* promotes self-directed learning as learners generate problem-solving strategies.
* promotes metacognition as learners compare and reflect on solutions.
* assesses learning in ways which demonstrate understanding and competency.

**See Section 4.2** for problem-based learning assessment guidance.

PBL could incorporate strategies such as cooperative learning where learners, in small groups, attempt to solve a coding or robotics problem. Similarly, Pair Programming is used by learners working in pairs in pursuit of a solution to a coding or robotics problem.

* + 1. **Cooperative Learning**

Cooperative learning is an active teaching-learning strategy where learners work in small groups, they help each other learn and in doing so, increase their interest, excitement, knowledge and skills via this learning and teaching modality.

Learning activities and roles are structured and overseen by the teacher, and each member of the group oversees the academic performance of the others. To successfully implement cooperative learning, leading authors in the field (David Johnson and Roger Johnson) emphasise the intentional stimulation of five basic elements (Johnson & Johnson, 2021:55-56) namely:

* **Positive interdependence:** Learners should feel like they are linked in such a way that one cannot succeed unless all in the group succeeds. Teachers should thus find ways of stimulating positive interdependence in their group activities - one possibility is giving learners different roles to fulfil; hence the group cannot move forward unless all roles are successfully fulfilled.
* **Individual accountability:** Learners should know that all will be assessed individually as well. *"The purpose of cooperative learning groups is to make each member a stronger individual in his or her righf'.* One way of stimulating individual accountability is by giving learners individual marks for how well

CURRICULUM AND ASSESSMENT POLICY STATEMENT



16

they contributed to the group activity- this assessment can occur either via teacher assessment or peer assessment - by doing this, everyone will know that they cannot get a free ride during the group activity as their inputs are also individually assessed.

* **Promotive interaction:** Learners' successes are increased due to the sharing of resources, support provided, and praise and encouragement given by their group members. Teachers thus need to stimulate promotive interaction, which can be done by giving different resources to different learners. Giving learners different roles also stimulate promotive interaction.
* **Social skills:** Stimulating social skills becomes an intentional endeavour of the teacher. Teachers could provide learners with resources on how to effectively form part of a team, how to communicate well and how to resolve conflict should it arise.
* **Group processing:** Group processing forms part of reflection during and after the group activity. Teachers can stimulate group processing by giving learners a reflection sheet or by asking them open­ ended questions to stimulate reflective conversations. Questions such as: "What worked well during your group activity"? or *"Describe the best experiences and worst experiences of the group activity".*

Cooperative learning can improve the learner's performance and teaches the value of teamwork, cooperation, communication, self-denial, and initiative taking.

* + - 1. ***Implementing cooperative learning in Foundation Phase Coding and Robotics***

Example of cooperative learning activity for foundation phase on the topic of robotics. Refer to Table 2.3:

*Learners present the concept that a robot comprises of different components, each with a purpose. Reference is made to moving parts, sensors*

The group's task is to use the flashcards provided (graphically illustrating what a robot is, examples of robots and moving/sensory parts of a robot) and to draw their own robot.

Divide the class into groups of four (4) learners. Each learner gets a role of a robot's moving and/or sensory parts:

* + - * + **Learner 1 (Arms)** - Learner that is responsible for finding and collating the resources needed. (e.g.,

flashcards of what a robot is, examples of robots etc.).

* + - * + **Learner 2 (Light sensor)** - Learner that is responsible to ask "Why". As foundation phase learners are naturally inquisitive, having a learner responsible to keep asking "Why" would lead the group to critical thinking.
        + **Learner 3 (Wheel)** - Learner that draws the robot and follows instructions from the other group members.
        + **Learner 4 (Sound sensor)** - Learner that presents the group's robot drawing and explains what they think a robot is and what the different parts of their robot are.

**Refer to Annexure B** for cooperative learning assessment guidance.

Pair programming could also be used as a cooperative teaching and learning strategy to solve programming problems.

CODING AND ROBOTICS



17

* + 1. **Pair Programming**

Pair programming is a pedagogical approach that involves two learners working together on one computer or one piece of paper to complete a shared goal/task. It emanates from the programming industry yet has proven to be successful even at school level. One of the learners fulfils the role of the *"driver'* and one of the learners fulfils the role of the *"navigator'.*

The driver is the learner who may use the computer and handle the keyboard, or draw on the paper and handle the pencil, whereas the navigator is the learner who utilises the resources, and reviews the driver's work throughout, provides

**PAIR PROGRAMMING**

**NAVIGATOR DRIVER**

feedback and suggestions to the driver, points out errors and asks questions to the teacher. Pair programming is a collaborative effort that involves a lot of communication, discussion, and problem-solving.

Although pair programming can be implemented as a collaborative "unstructured" pair activity, it is best to stimulate the five basic elements of cooperative learning, as described above when implementing pair programming in the classroom.

It also appears particularly promising in situations where there are not enough computing devices for learners to work individually as well as for increasing learning and engagement with technology among learners with limited device experience. It is also suggested that learners show higher confidence when programming in pairs. It allows learners to share knowledge and learn from each other, improves learning engagement, and teach each other.

* + - 1. ***Implementing pair programming in Foundation Phase Coding and Robotics***

Example of pair programming activity for foundation phase on the topic of Coding (see Table 2.2 Grade 1):

*A given pattern is identified. A given pattern is extended. A simple pattern is created by the learner and repeated.*

The pair's task is to identify the pattern from the resource given, fill in the blanks by repeating the pattern and then draw their own pattern with the same sequence.

* + - * + **Driver** - The learner acting as the driver will be the one completing the pattern and drawing the pattern decided upon between the two learners.
        + **Navigator** - The learner acting as the navigator may have flashcards with similar patterns (different pictures) on them. They may also ask the teacher for help.

**Note:**

The teacher may swop the learners' roles as the activity progresses to ensure that both learners have a chance to fulfil each role. You may also ask any one of the learners to present their work to the class. Thisensures that both learners feel a need to engage and gives more learnersan opportunityto practice communicationskills.

**Refer to Annexure B** for pair programming assessment guidance.

* + 1. **Deliberate Practise**

A subject such as coding and robotics not only requires thinking skills, but also requires focused teaching and ample practise. This practise should, however, be purposeful, well thought through with gradual increase in complexity.

CURRICULUM AND ASSESSMENT POLICY STATEMENT



18

The curriculum is designed to encourage deliberate practise, as competencies are repeated within and across grades. The concept of deliberate practise is particularly focused on skill acquisition and development and is key in the development of competency and expertise in subjects such as coding.

Deliberate practise is a specific type of practise that involves setting specific goals, receiving feedback, and making focused efforts to acquire and improve skills and performance. It is not simply repeating skills over-and­ over again, but rather adjusting to improve competencies as well as gradually adding additional competencies that lead to mastery. It therefore involves purposeful repetition, feedback-driven metacognition, and extension to improve performance (Ericsson, 2008; Deans for Impact, 2016; Ericsson *et. al.,* 2018).

In terms of extension, deliberate practice involves extending the amount of time spent practising, adding new features, and increasing the complexity of tasks. The goal is to push beyond one's comfort zone to achieve growth and improvement.

* + 1. **Science of Learning**

The curriculum is also informed by the Science of Learning, a multidisciplinary field that combines research from cognitive psychology, neuroscience, educational psychology, and other related disciplines to understand how people learn. It also aims to identify the most effective teaching and learning strategies based on empirical evidence that has been shown to improve long-term retention of information and enhance learning outcomes.

Learning is an iterative process that requires that one continually revisits what one has learned earlier, update it, and connect it with new knowledge. Learning always builds on a store of prior knowledge and is the residue of thought. New learning requires a considerable amount of practise and meaningful connections to existing knowledge. Learning, therefore, requires learners thinking (Brown *et al.,* 2014; Dereck Bok Center, Harvard University, 2023).

Science of learning includes the following learning strategies *(Weinstein et* al., 2018):

* **Retrieval practice:** Bringing learned information to mind from long-term memory.
* **Spaced practice:** Spreading learning activities out over time/reviewing previously learned information at gradually increasing intervals.
* **Interleaving:** Switching between topics while learning.
* **Examples:** When learning abstract concepts, illustrating them with various examples or concrete

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experiences.

* **Dual coding:** Combining words with visuals.
* **Elaboration:** Classroom discussions that require learners to relate new material to what they already know and to recall previously learned information, including asking *why* and *how* questions with learners explaining in their own words.
* **Interactive activities:** Engage actively with learning material using activities that require one to retrieve (recall) previously learned information.
  1. **SYNERGISING CODING AND ROBOTICS IN FOUNDATION PHASE**

In the foundation phase, elements of subjects such as Language, Mathematics and Life Skills can be linked to Coding and Robotics and therefore be integrated into coding and robotics to enhance the learning experience. For example:

**Algorithms** involve sequencing and summarising in literacy and breaking down complex problems into simpler steps in mathematics.

**Modularity:** Involves breaking down tasks into manageable units in computer science, while in mathematics, it involves breaking down a complex problem into smaller, manageable parts.

**Control structures** in coding determine how a set of instructions are executed within a program, while heuristic thinking in mathematics involves using logical thinking and trial and error to solve problems.

CODING AND ROBOTICS



19

**Coding and natural language:** The process of learning to code is also often likened to language acquisition, as learners progress through six distinct stages of understanding. These stages bear close resemblance to the stages of literacy development.

**Design:** Designing robotics artefacts links to aspects of Creative Arts as part of Life Skills.

**Digital concepts:** Aspects such as the impact of technology and being a digital citizen links to Life Skills (Personal and Social well-being).

By developing these skills in Coding and Robotics, learners can develop habits of mind that will be valuable in other subjects.

* 1. **TIME ALLOCATION**

In Grades R, 1 and 2, 1 hour per week (10 hours per term) is allocated for coding and robotics. In Grade 3, the time allocation for coding and robotics is 2 hours per week (20 hours per term).

The following table provides the time allocation per term as a percentage of the total available time per term:

*Table 2.1: Time a/location for Foundation Phase Coding and Robotics*

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Gr R ,1,2 =%per  week  Gr 3= %, per week | Term 1 | | | | Term2 | | | | Tenn3 | | | | Term4 | | | |
| R | 1 | 2 | 3 | R | 1 | 2 | 3 | R | 1 | 2 | 3 | R | 1 | 2 | 3 |
| Pattern Recognition | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 |
| Alaorithms & Coding | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| Robotics | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 |
| Digital Concepts | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Total | 10 weeks | | | | 10 weeks | | | | 10 weeks | | | | 10 weeks | | | |

**Note:**

Sections 2.12.1 (coding content) 2.12.2 (robotics content), 2.12.3 (digital concepts content) and Section 3 (unpacking of the content) describe many concepts and competencies across the three strands that are linked and support each other. Various competencies across the three strands can therefore be linked and dealt with in an integrated fashion.

CURRICULUM AND ASSESSMENT POLICY STATEMENT

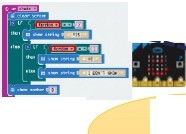


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* 1. **RESOURCES REQUIRED TO OFFER CODING AND ROBOTICS IN FOUNDATION PHASE**

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*Figure 2.9 Programming resources for Coding and Robotics Coding Resources*



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Refer to Figure 2.9:

Foundation phase follows an unplugged programming approach. Literature suggests that interactive unplugged programming in early years of education significantly influence improving learners' performance of computational thinking skills and learning engagement and it also confirms the teaching value of interactive unplugged programming (Li *et al.,* 2023). An unplugged approach therefore reduces cognitive loads as it helps learners to the learn the

"Computer programming is ahighly cognitive skill, which requires masteryof multiple domains, and is acknowledged as being difficult to learn, making it essential to take into account the cognitive loads (Cls) imposed on learners, as well as their abilities to absorb this knowledge during the teaching and learning process". *Berssanette* & *de Francisco(2022).*

foundational concepts and principals of computational thinking and coding without getting overwhelmed by the intricacies of programming environments. It therefore serves as an effective steppingstone for beginners to develop their problem-solving and programming skills before transitioning to coding environments.

Unplugged codding resources include:

* Outside grid on play area or in class
* Coding cards (arrows or symbols)
* Playful artefacts/toys used in coding problems (e.g., Flowers, sweets, insects) - Bee collecting nectar, Robot sorting trash (trash items, cans, plastic bottles) - Paper cups - Egg holders - Porn pom's - Ice cream sticks - Simple uni-fix blocks.
* \*Optional: Free and open-source educational software/apps, e.g., Scratch Jnr with a device such as a tablet or PC
* \*Optional: programmable educational robots
* Learners acting as robots with simple props (Box) etc.



Outside Grid

Coding activity sheets and coding cards



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Strings and beads Paper cups



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\*Note:Software and/or devices are optional as the curriculum is designed to be implemented without devices.However educational devices, where available, could be used for enrichment

Coding Cards

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* + 1. **Robotics Resources**



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Pipe cleaners, porn porns, recycled bottle caps, ice cream sticks.



Beads

Refer to Figure 2.9:

* Basic stationary (cardboard, coloured paper. blocks books, rubber bands, glue)
* Other material such as uni-fix/counting blocks, pom-pom's, string, pipe cleaners, marbles.
* Recycled items (newspaper, brown paper bags, used toilet rolls, used boxes (e.g., cereal or pill boxes/holders, egg holders, trash items such as used cooldrink cans, plastic bottles, bottle caps), paper cups, straws.
* Salted playdough (wires, battery, light bulb)
* \*Optional: Programmable educational robots/virtual robots [Scratch Junior object, e.g., CAT, is an example of a virtual robot]
* Pictures of different types of robots and robot components
* DC motor, battery pack, small light bulb



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rubber .b.ands

Outside Grid Split pins/paper fasteners with cardboard

Twine, straws, glue, paper binders,

DC motor, battery pack, light bulb and holder (optional). Clay/Play

d\_o\_,ugh. Se\_lit pins



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pes of old cardboard boxes Stones and Marbles



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* + 1. **Digital Concepts Resources**
* Sample technologies and components (e.g., Mobile phone, tablet, Laptop (with screen, keyboard and mouse), etc.)
* Pictures of computing devices, input devices, output devices
  1. **OVERVIEW** OF **FOUNDATION PHASE CODING AND ROBOTICS**

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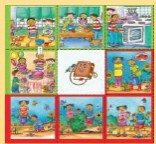
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Physical reinforcement and concrete strengthening



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Physical reinforcement and concrete strengthening



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Debug. reflect. trace and improve

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solving

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i flect and improve

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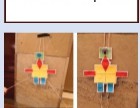
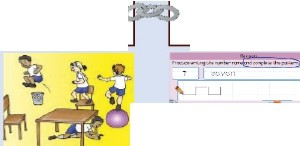
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Physical reinforcement and concrete strengthening



Generic sequencing

of everyday life C

scenarios and

algorithms

*Figure 2.10 Overview of Foundation Phase Coding and Robotics*

CODING AND ROBOTICS 25

* 1. **Focus OF CONTENT AREAS**
     1. **Coding**

*Table 2.2: Coding content focus*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Competency** | **Grade R** | **Grade 1** | **Grade 2** | **Grade 3** |
| **(Novice level)** | | | |
| **C.1** | Rudimentaryoperations are | Rudimentaryoperations are | Elementarytasksand logical | Foundational tasks and |
| **Apply computational**  **thinking skills to developa set of** | presented using sequences of pictures.  Logically order a set of pictures to accomplisha set | presentedusing sequences of picturesand orelementary three-word sentences.  Logicallyorder a set of | instructionsareidentified to solvea problem.  Elementaryoperations are presentedusing sequences | logical instructions are identified tosolvea problem from which unnecessaryor irrelevant detailsareignored. |
| **logical** | task. | picturesor three-word | of picturesandor simple | Foundational operations are |
| **instructions to solve aproblem.** | Order, arrange or searcha set of picturesand symbols  accordingtogiven criteria. | sentences toaccomplisha set task.  Order, arrange or search a | sentences.  Logicallyorder a set of pictures or simple sentences | presentedusing sequences of picturesandor simple sentences. |
|  |  | set of pictures, symbols, | toaccomplishaset task. | Logicallyorder a set of |
|  |  | characters, and numbers accordingto givencriteria. | Order, arrangeor search a set of pictures,symbols, | pictures, simple sentences to accomplishaset task. |
|  |  |  | characters,numbers, and | Order, arrange or search a |
|  |  |  | words accordingtogiven | set of pictures, symbols, |
|  |  |  | criteria. | characters,numbers, and |
|  |  |  |  | words or sentences |
|  |  |  |  | according togiven criteria. |
| **C.2**  **Present a simple coding solution using symbolic or writtenstatements representing sequences of commands, single repetition, and conditional constructs.** | Symbols are used to represent actions and operations toaccomplisha task.  Each symbol represents a singletask.  Thesolutionmay be presentedpartiallyrequiring thelearners to completea problem  Problemscouldinclude:   * Grid-based scenarios * Story-based scenarios * Movement-based scenarios(e.g., dance moves) * Robotenactrnent scenarios | Symbols areused to represent actions and operationstoaccomplisha task.  Symbols may be grouped to represent repetition.  Thesolutionmay be presentedpartially, requiring thelearners to completeit  Problems could include   * Grid-based scenarios * Story-basedscenarios * Movement-based scenarios(e.g., dance moves) * Robot enactment scenarios | Symbols or written statementsareused to represent actions and operations toaccomplisha task.  Symbols may be grouped to represent repetition.  Symbols / blocks may be used torepresent a condition.  Symbols may includeblock­ code type images with linkages.  Thesolutionmay be presentedpartially,requiring thelearners to completeit  Problems couldinclude:   * Grid-based scenarios * Story-based scenarios * Movement-based scenarios(e.g., dance moves) * Robot enactment scenarios | Symbols (normal orpuzzle type or writtenstatements are used torepresent actions and operationstoaccomplish atask.  Symbols / puzzlesblocks may be groupedtorepresent repetition(ora statement indicatingrepetition)  Symbols/ blocksmay be used torepresent a condition (or a statement indicating condition)  Symbols may includeblock­ codeimages withlinkages.  Thesolutionmay be presentedpartially,requiring thelearners to completeit  Problems could include   * Grid-based scenarios * Story-based scenarios * Movement-based scenarios(e.g., dance moves) * Robotenactrnent scenarios |
| **C.3** | A rudimentaryset of | A rudimentaryset of | An elementary set of | A foundational set of |
| **Interpret and execute a given symbolic or**  **writtenset of** | commandsinrelation to C.2. are correctly executed physically, onpaper or with an educational tool. | commandsinrelationto C.2 are correctly executed physically, on paper or with an educational tool. | commandsin relationto C.2 are correctly executed physically, on paper or **with** an educational tool. | commandsinrelationto C.2 are correctly executed physically, on paper or with an educational tool. |
| **commands** | Onelearner could takeon | One learner could take on | One learner could take on | One learner could take on |
|  | theroleofinstructor andor | theroleof instructor and or | theroleof instructor andor | theroleof instructor andor |
|  | interpreter(executer) | interpreter(executer) | interpreter(executer) | interpreter(executer) |
| **C.4** | A rudimentaryset of | A rudimentaryset of | An elementary set of | A foundational set of |

**CURRICULUM AND ASSESSMENT POLICY STATEMENT**



**26**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Debug a given symbolicor writtenset of instructions.** | commands to solve a problem is inspectedforan error and corrected.  Debuggingrelatesto acode set orset ofinstructions in relationtoC.1, C.2. and C.3. | commandsto solve a problem is inspectedfor an error and corrected.  Debugging relatestoa code set orset of instructionsin relation to C1., C.2. and CJ. | commands to solve a problem is inspectedfor an error orerrorsand corrected.  Debuggingrelates toacode set orset ofinstructionsin relationtoC.1, C.2 andCJ. | commands to solve a problem is inspectedfor an error orerrorsand corrected.  Debuggingrelatestoacode set orset ofinstructionsin relationtoC **1.,**C.2. and CJ. |
| **C.5**  **Evaluatea given solutiontowards potential improvement.** | Reflect and report on a given solution.  Ask the followingquestions (critical thinking):   * Whathappened? * Why hasit happened? | Reflect and report on a given solution.  Ask thefollowing questions (critical thinking):   * Whathappened? * Why has it happened? * What canbe learnt?   Thelearners aregiven the opportunity toreflect on their thinking.  A rudimentaryset of commandstosolve a problem is inspectedand an alternateis suggested.  Theevaluationrelates to a code set or set of instructions in relationtoC**.1,** C.2 and C.3 | Reflect and report on a given solution.  Ask thefollowing questions (critical thinking):   * Whathappened? * Why hasit happened? * What can be learnt?   Thelearners aregiven the opportunity to reflect on their thinking.  An elementary set of commands to solve a problem is inspectedand an alternateissuggested.  Incorporating   * Reducingthe numbers of steps   Theevaluationrelates to a code set or set of instructions inrelationto C.1, C.2, C.3 | Reflect and report on a given solution.  Ask thefollowing questions (critical thinking):   * Whathappened? * Why hasit happened? * What can be learnt?   Thelearners aregiven the opportunity to reflect on their thinking.  A foundational set of commands to solve a problem is inspectedand a better alternateissuggested. Incorporating   * Reducingthe numbers of steps * Grouping ofrepetitive steps   Theevaluationrelates to a code set or set of instructions inrelationto C.1, C.2, C.3 |
| **C.6**  **Recogniseand interpret patterns in symbolicsets of data or visualisations.** | A rudimentarypatternis  identified incorporatinga singleset of elementary: numbers,pictures, colours, symbols,or shapes.  Thedifferences andor similaritiesbetween sets of data patternsincluding imagesareidentifiedand motivated.  Thelearners canrecognise and explainthe composition of thepattern.  Thepatternis copied by the learner either usingphysical objects,physical (kinaesthetic) movements or on paper | A rudimentarypatternis  identifiedincorporatinga single set of elementary: numbers, pictures, colours, symbols, or shapes.  Thedifferencesand or similaritiesbetween sets of datapatterns including images areidentified and motivated.  Thelearnerscan recognise and explainthe composition of thepattern.  Thepatternis copied by the learner either usingphysical objects, physical (kinaesthetic) movements or on paper | An elementary pattern (which  could includean inverse) is identified incorporatinga single set of elementary: numbers,pictures, colours, symbols, or shapes.  Thedifferencesandor similaritiesbetween sets of datapatternsincluding imagesareidentifiedand motivated.  Thelearnerscan recognise and explainthe composition of thepattern.  Thepatternis copied by the learner either usingphysical objects, physical (kinaesthetic) movements or on paper | A foundationalpattern {which  could includean inverseor a grid artefact)is identified incorporatingasingle set of elementary: numbers, pictures, colours, symbols, or shapes.  Thedifferencesandor similaritiesbetween sets of data patternsincluding imagesareidentifiedand motivated.  Thelearnerscan recognise and explainthe composition of thepattern.  Thepatternis copied by the learner either usingphysical objects, physical (kinaesthetic) movements or on paper |
| **C.7**  **Create or complete a pattern to represent a data set.** | **N/A** | Identify a givenpattern. Extenda givenpattern.  Createand repeat a rudimentarypattern.  Patternconformstothe prescriptions of C.6. | Identifya givenpattern.  Extendagivenpattern.  Create and repeat an elementary pattern and explain its composition.  Patternconformstothe prescriptions of C.6. | Identifya givenpattern. Extendagivenpattern.  Create and repeat a foundational patternand explain itscomposition.  Patternconforms to the prescriptions of C.6. |

**CODING AND ROBOTICS**



**27**

* + 1. **Robotics**

*Table 2.3: Robotics content focus*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Competency** | **Grade R** | **Grade 1** | **Grade 2** | **Grade 3** |
| **(Novice level)** | | | |
| **R.1**  **Explain what a robot is insimple terms.** | Present arudimentary  explanation of what arobot  .  IS. | Present an elementary explanation of what arobot is,includingreference their purpose. | Present an elementary explanation of what arobot is,includingreference to their purpose andmode of operation.  Referenceto moving and sensoryparts are made. | Present afoundational explanation of what arobot is,includingreference to their purpose andmode of operation.  Referenceto moving, sensoryand processingparts are made. |
| **R.2**  **Identify different types of robots.** | Identify general examplesof  robots. | Identify general examplesof  robots andwhat they do. | Identifyrobots that areused  in factories and robotsthat are not used in factories (Service robots) | Identify domestic robots and  professional use robots. |
| **R.3** | N/A | Thelearnerspresent the | Thelearnerspresent the | Thelearnerspresent the  concept that arobot comprises of different components, each witha purpose.  Referenceis made to the followingconcepts as part of the outline:   * Robotscomprise of mechanical parts. * Requirespower. * Requiresome formof programm.ing. |
| **Outline the different components of a**  **robot** |  | concept that a robot  comprisesof different components each witha purpose. | concept that arobot  comprises of different components, each witha purpose. |
|  |  | Reference is made to moving | Referenceis made to |
|  |  | parts, sensors. | sensors, apower sourceand |
|  |  |  | motors |
| **R.4**  **Present an understanding of how robots affect the world.** | Provide arudimentary explanation of what robots are used for. | Providearudimentary explanation of what robots are used for with references to specific tasks. | Provide an elementary explanation of what robots are used for withreferences tospecific tasks, including dangerous and repetitive ones. | Provide afoundational explanation of what robots are used for withreferences tospecificconceptsthat robots can be programmed to react to their environment |
|  |  |  |  | The discussionincorporates elements of R.1and R.2 |
| **R.5** | Createarudimentary artefact | Createa rudimentaryartefact | Createan elementary | Createafoundational artefact to represent arobot or equivalent  Step by step instructions can be applied orgiven.  The activity may be open where variousmaterials are supplied to the learners to have them create their own robot and/or related artefact  Thelearnersreflect and talk / ideateabout what their robots can do includingthe compositionof the various parts and thepurpose of each.  Stringsand/ or pins orlever mechanismsand /or pullies ***may*** be added to mimic movement  Different materialscan be |
| **Design a simple artefact based on** | torepresent a robot or  equivalent | to represent a robot or  equivalent | artefact to represent arobot  or equivalent |
| **a set of design**  **specifications.** | Step by stepinstructions can  be applied orgiven. | Step by step instructions can be applied orgiven. | Step by step instructions can  be applied orgiven. |
|  | The activitymay be open | Theactivity may be open | The activity may be open |
|  | where variousmaterials are | where variousmaterials are | where variousmaterials are |
|  | supplied to the learnersto | suppliedtothelearners to | supplied to the learners to |
|  | have them create their own | have themcreate their own | have them create their own |
|  | robot and/or related artefact | robot and/orrelated artefact | robot and/or related artefact |
|  | Thelearnersreflect and talk/ | Thelearnersreflect and talk/ | Thelearnersreflect and talk/ |
|  | ideateabout what their | ideate aboutwhat their | ideateabout what their |
|  | robots cando. | robots can do. | robots can do. |
|  |  | Strings and /or pinsmay be | Stringsand/ or pins may be |
|  |  | added tomimicmovement | added to mimic movement |
|  |  | Different materialscan be | Different materialscan be |
|  |  | used, e.g., pipecleaners,ice | used, e.g., pipecleaners, ice |
|  |  | cream sticks, straws etc. | creamsticks, straws etc. |
|  |  | Thecreation of the artefact | The creationof the artefact |
|  |  | could alsotake on the formof | could alsotake on the formof |
|  |  | a gamee.g.(Assembleby | a game e.g.(Assembleby |

**CURRICULUM AND ASSESSMENT POLICY STATEMENT**



**28**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | numbers) | numbers). throwsome die.  Assembleusing | used, e.g., pipecleaners, ice creamsticks, straws etc. |
|  | prefabricatedparts if  (available) e.g., building | The creationof the artefact  could alsotake on the formof |
|  | blocks. | a game e.g. (Assembleby |
|  | Theinstructions contain | numbers). throw somedie. |
|  | various steps that shouldbe  read and orinterpretedas | Assemblyusing prefabricated  parts if (available) e.g., |
|  | part of the assembly. | buildingblocks. |
|  | The assembly shouldrequire a set order (one stepshould | Theinstructions contain various steps that shouldbe |
|  | follow the other) | read and/orinterpreted as |
|  |  | part of the assembly. |
|  |  | The assembly shouldrequire a set order (one stepshould |
|  |  | follow the other) |
| **R.6**  **Mimicthe**  **operations of a robot** | Thelearnersmimicthe operations of a robot based ongiven instructionor for a purpose. | Thelearnersmimic the operations of arobot based ongiveninstruction or fora purpose. | Thelearnersmimicthe operations of a robot based ongiven instruction or fora purpose. | Thelearnersmimic the operations of a robot based ongiven instruction or fora purpose. |
|  | Rudimentaryinstructions are performed,inpersonor using a tool, or on paper. | Rudimentaryinstructionsare performed, in personorusing a tool or on paper. | Elementaryinstructionsare performed, inperson orusing a tool, oronpaper. | Foundational instructionsare performed, in person orusing a tool, or on paper. |
|  | Relatesto C.1, C.2, C.3, C4 and C.5. | Relates to C.1, C.2, C.3, C.4 and C.5. | Relatesto C.1, C.2, C.3, C.4 and C.5. | Relatesto C.1, C.2, C.3, C4 and C.5. |
| **R.7**  **Create, test, and execute a set of** | Arudimentaryset of instructionsare compiled and executed to perform a task. | Arudimentary set of instructions are compiledand executedtoperforma task. | An elementaryset of instructionsare compiledand executed to performa task. | Afoundational set of instructions are compiledand executed to performa task. |
| **robotic** | This outcome and | Thisoutcomeand | This outcome and | This outcome and |
| **instructions.** | instructionsrelatetoC.1, | instructions relate to C1, | instructionsrelate to C1, | instructions relate to C.1, |
|  | C.2, C.3, C4 and C.5. | C.2, C.3, C.4 andC.5. | C.2, C.3, C4 and C.5. | C.2, C.3, C4 and C.5. |
|  | The executioncan alsobe | Theexecution can also be | The execution can also be | The execution can also be |
|  | done anddemonstratedin | done and demonstrated in | done anddemonstratedin | done anddemonstratedin |
|  | the contextof R.6 | the contextof R.6 | the contextof R.6 | the contextof R.6 |

**CODING AND ROBOTICS**



**29**

* + 1. **Digital Concepts**

*Table 2.4: Digital Concepts contentfocus*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Competency** | **Grade R** | **Grade 1** | **Grade 2** | **Grade 3** |
|  | **Novice Level** | | | |
| **0.1** | Present arudimentary | Present arudimentary | Present an elementary | Present afoundational |
| **Outlinethe concept of** | explanation of what technologyis. | explanation of what technologyis. | explanation of what technologyis. | explanation of what technologyis. |
| **technology and purposeof information** | Learnerscanpoint out examples of technology. | Learnerscan point out examples of technology and  relate itsuseto everyday life. | Learnerscan point out examples of technology and  relate itsuse and purpose to | Learnerscan point out examples of technology and  relate itsuse and purpose to |
| **technology** (IT}. |  | Learnersrelate the concept of technologyto thatof a tool. | everyday life.  Learnersrelate the concept of technology to that of atool. | everyday life.  Learnersrelate the concept of technology to that of atool. |
|  |  |  |  | Thelearner'sanswer include |
|  |  |  |  | that the technological artefact has a common purpose or |
|  |  |  |  | goal. |
|  |  |  |  | The answer alsoincludes the |
|  |  |  |  | concept that technologies often comprise of different |
|  |  |  |  | components. |
| **0.2** | Thelearnerspresent a | Thelearnerspresent a | Thelearnerspresent an | Thelearnerspresent a |
| **Recognise that he or she is livingas**  **a citizen in a** | rudimentaryunderstanding that the digital world is all around us. | rudimentaryunderstanding that the digital worldis all aroundus. | elementaryunderstanding that the digital worldis all around us. | foundational understanding that the digital worldis all aroundus. |
| **digital world.** | Thelearnersunderstand that | Thelearnersunderstand that | Thelearnersunderstand that | Thelearnersunderstand that |
|  | electronicdevices (dangers | electronicdevices (dangers | electronic devices (dangers | electronicdevices {dangers |
|  | of electricity) should be used | of electricity) shouldbe used | of electricity) shouldbe used | of electricity) shouldbe used |
|  | safely (e.g., don't use | safely (e.g., don't use | safely (e.g., don't use | safely (e.g., don't use |
|  | electronicdevices whilst | electronic devices whilst | electronic devices whilst | electronic devices whilst |
|  | crossing the street) and in | crossing the street) and in | crossing the street) and in | crossing the street) and in |
|  | moderation(screen time) | moderation(screen time) | moderation(screen time) | moderation(screen time) |
|  |  | Present a rudimentary | Present an elementary | Present afoundational |
|  |  | understandingof thedangers | understanding of the dangers | understanding of the dangers |
|  |  | of going online. | of going online. | of going online. |
|  |  | Present a rudimentary | Present an elementary | Present afoundational |
|  |  | understandingof theconcept | understanding of the concept | understanding of the concept |
|  |  | of cyberbullyingand how to | of cyberbullyingand how to | of cyberbullyingand how to |
|  |  | deal with it | deal withit | deal withit |
|  |  | Theconceptualisationis | Thelearnersunderstand that | Thelearnersunderstand that |
|  |  | presentedintermsof D.1 | protectinginformationwitha | protectinginformationwitha |
|  |  |  | password helps keep it | password helps keep it |
|  |  |  | private. | private. |
|  |  |  | Introducethe concept of a digital footprint at an | Recognise the concept and dangers of sharingpersonal |
|  |  |  | elementarylevel. | informationlikeusernames |
|  |  |  | The conceptualisationis | and orpasswords. |
|  |  |  | presentedin termsof D.1 | Understand the responsible |
|  |  |  |  | use of technology. |
|  |  |  |  | Introducethe concept of a |
|  |  |  |  | digital footprint at a |
|  |  |  |  | foundational level. |
|  |  |  |  | Present an understanding of |
|  |  |  |  | the necessity toreport |
|  |  |  |  | unsuitableuse of electronic |
|  |  |  |  | communication, the access |
|  |  |  |  | of inappropriatecontent and |
|  |  |  |  | or contact |

**CURRICULUM AND ASSESSMENT POLICY STATEMENT**



**30**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  | The conceptualisationis presentedin termsof O.1 |
| **0.3** | Thelearner presentsa | Thelearnerpresents a | Thelearnerpresents an | Afoundational explanationof |
| **Demonstratean understandingof** | rudimentaryexplanationof what a computing deviceis. | rudimentaryexplanationof what a computingdeviceis. | elementaryexplanationof what a computing deviceis. | what a computing deviceis, is presented |
| **the concept of a computingdevice.** | Learnerscanpoint out  examples of computing | Learnerscan point out  examples of computing | Learnerscan point out examples of computing | Learnerscan point out examples of computing |
|  | devices. | devices. | devices. | devices. |
|  |  | Thelearner's answer should | Thelearners answer should | Thelearners answer should |
|  |  | incorporatethe concept that a computing devicecan | incorporatethe concept that a computing devicecan | incorporatethe concept that a computing devicecan |
|  |  | follow and interpret instructions.  Links with O.1 | follow and interpret instructions.  Links with O.1 | follow and interpret instructions and produce output/result orrender an outcome. |
|  |  |  |  | Links with O.1 |
| **0.4**  **Identifythe commonuses of**  **ICTin the real** | **NIA** | Arudimentarylist of the use of IT related technologies and devices are named in terms of theiruse. | Anelementarylist of theuse of IT related technologies and devicesare named in terms of theiruse. | Afoundational list of the use of IT related technologies and devicesare namedin terms of theiruse. |
| **world.** |  | Links with 0.1and0.2 | Links with O.2and O.2 | Links with O.1and O.2 |
| **0.5**  **Differentiate between the componentsof an**  **ICTsystem.** | **NIA** | **NIA** | Thelearners differentiateata rudimentarylevel between the concept of hardware (touchable) and softwareas "Apps". | Thelearners differentiateat an elementary level between the concept of hardware (touchable) and software as "Apps". |
|  |  |  | Basic examples are listedin | Learnerslists examples of |
|  |  |  | relation to 0.1, 0.2 and 0.3 | different types of hardware |
|  |  |  |  | and software. |
|  |  |  |  | Basic examples are listedin |
|  |  |  |  | relation to 0.1, 0.2 and 0.3 |
| **0.6** | **NIA** | **NIA** | Thelearnerscan present a | Thelearnerscan present an |
| **Explain howthe**  **adaptation of technology** |  |  | rudimentaryexplanationof how technology impact society at large. | elementaryexplanationof how technology impact society at large. |
| **impactedthe** |  |  | The discussionincorporates | Typical examplesare listedin |
| **world we work and** |  |  | concepts of O.1and O.2 | relation to various sectors. |
| **live in.** |  |  |  | The discussionincorporates concepts of O.1and O.2 |
| **0.7** | Thelearnerspresent a | Thelearnerspresent a | Thelearnerspresent an | Thelearnerspresent |
| **Present abasic understandingof the concept of input processing and output.** | rudimentaryunderstanding that input results insome formof output. | rudimentaryunderstanding that input results insome form of output.  Input Instructions are executedthat resultsinan action. | elementaryunderstanding that input results insome formof output.  Input Instructions are executed that results inan action. | foundational understanding that input results insome formof output.  Input Instructions are executed that results inan action. |
|  |  | Theconcept that different forms of input results in | Output as a form of communicationfrom the | Output as a form of communicationfrom the |
|  |  | different actions are | device | device |
|  |  | emphasised. | The concept that different forms of input resultsin | The concept that different forms of input result in |
|  |  |  | different actionsis | different actionsis |
|  |  |  | emphasised. | emphasised. |
|  |  |  |  | The concept that processing takes placebetween input |
|  |  |  |  | and output formspart of the learnersunderstanding. |
| **0.8**  **Interpret a pattern to represent or** | Interpret arudimentary patternand present a correspondingmessage in | Interpret arudimentary pattern andpresent a correspondingmessage in | Interpret an elementary patternand present a correspondingmessage in | Interpret afoundational patternand present a correspondingmessagein |

**CODING AND ROBOTICS**



**31**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **communicate a message or image.** | symbolicform.  Done inrelation to C.6. | symbolicform.  Translate(decode) an elementarypatterntoa simpleword, image, or phrase (3-wordmaximum phrase).  Done inrelation to C.6 | symbolic form.  Translate(decode) an elementarypattern to a simple word,image, or basic sentence.  Done inrelation to C.6 | symbolic form.  Translate(decode) a foundational patterntoa simple word,image, or simple sentence.  Patternmay include2-0 matrixesfor both encoding and decodingpurposes.  Done inrelation to C.6 |
| **0.9**  **Create a pattern to represent or**  **communicate a** | Createarudimentarypattern torepresent an image or communicatea message or an image. | Createa rudimentarypattern  to represent an image or communicatea message or an image. | Createan elementary pattern  torepresent an image or communicatea message or an image. | Createafoundational pattern  torepresent an image or communicatea message or an image. |
| **message or image.** | Done inrelation to C.6 and | Translate(encode) a | Translate(encode) an | Translate(encode) a |
|  | 0.8. | rudimentarypattern to a | elementarypattern to a | foundational patterntoa |
|  |  | simpleword, image, or | simple word,image, or basic | simple word,image, or |
|  |  | phrase (3-wordmaximum | sentence. | simple sentence. |
|  |  | phrase). | Doneinrelation to C.6.and | Doneinrelation to C.6and |
|  |  | Done inrelation to C.6 and | 0.8 | 0.8. |
|  |  | 0.8. |  |  |
| **0.10**  **Demonstrate a basic proficiency in the application of digital skills.** | **NIA** | **NIA** | **NIA** | **NIA** |

* 1. **ENVISAGED LEARNER**

The Coding and Robotics learner shows an interest in technology and its application in the world. The learner can think logically and critically and is able to solve problems. Furthermore, the learner is creative and innovative as well as disciplined, focused, and persistent. The learner can also work well with others to achieve a common goal.

* 1. **CAREER OPPORTUNITIES**

Today, digital technologies are integrated in all aspects of our lives. Digital competencies such as Coding and Robotic skills make one more employable and effective in any job and support further studies.

The growing ubiquity of digital technologies and the developments around the Internet of Things (loT), automation and artificial intelligence (Al) have seen the inclusion of skills such a computational thinking, design thinking, software development (coding) and robotics in every sector of employment and entrepreneurship. Therefore, Coding and Robotics aims to equip learners with knowledge and skills that will allow them to thrive in any career and specifically in careers such as software development, robotics engineering, artificial intelligence, etc.

CURRICULUM AND ASSESSMENT POLICY STATEMENT



32

* 1. **PROGRESSION AND EXIT SKILLS PER GRADE OF Focus AREAS**

As Coding and Robotics is a process driven subject, the exit skills cannot be broken up into terms. The exit skills must be repeated and practised in every term, but in a progressive way. Conceptual knowledge must be continuously developed to enable procedural knowledge. Some skills can integrate into Language, Mathematics and Life Skills but there are subject specific skills that can only be developed in Coding and Robotics as a separate subject.

**Grade•R1 Grade•11 Grade•21 Grade·3**

Supply the missing instruction for Sipho Super Bunny to follow fhe polh and gef lo the carrot.



**:-a;**

L.r....

Al

## l;



Supply the missing instructions for Sipho Super Bunny (SSB) lo follow the path and gel to the carrot.

JI

--

## l; k

*I'*

Study the following image and answer the questions that follow.



SSB con only perform fhe following commands.

i=> Forvard

***i.*** Tu-nAlglt

,,.. Tu-nLeft

\_k;

k--

Sipho con only move one block ot o fime. Write down the

/Iinstructionsand how many timesSSBmust move and turn

right or feft to get to the green tile following path A.

A

*,:*

§J□§J is

§J□§J[ID□

,0..

**1'¢=>**

1:1 Which poth (A,Bor Cl, counting the number of tilesis the longest?

1:1 Toking which path (A, 8 or CJ will allow SSB to

collect the most carrots?

-:-.,\_.

|  |  |  |
| --- | --- | --- |
|  | *b.*  ..,. ,, | |
| c , 1f:t  t .. | | |
| c. | | .: |

L,.

*I'*

**r:11,·**



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*I'* L-.., •

.,.,,•

Sipho con *only* move one block of o time. Write down the insfruclions and how many limesSSB must move to gel to the carrot.

**Note:**

Complexity of activities increase, from Grade R to Grade 3, for example,in terms of number of instructions, more complex grids, adding restrictions or limitations. adding new instructions and adding the concept of the repetition construct.

In Grades R and 1, focus on concrete, practical activities, e.g., using a grid on the floor.

SSB con jump over logs. When he jumps, he moves 2 spaces (tiles) forward.

, ; *I'*

c:

:---;.

l;

*u.\_*

**:---,i**

*I'*

Lu..

**I 2**

Sipho con only move one block of a time and jump Write

A**[l] [lj [i] [ll [i] [l]**

SSB can jump over logs. When he jumps, he moves 2 spac, (tilesl forward.

c=';

###### 3

down the instructions and how many timesSSB must jump or move to get to the carrot.



**2**



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SSB can only perform the lollowing commands.

Content and Activity Progression

**Grade•R1 Grade·1• Grade•21 Grade·3**

***t***

Study lhe following image and answer the questions that follow.

*,:*



./

•

**L,J.**

i=> Forward

**0.** ;

***i.*** Tu,,R,j,t

l..,..i... -

- J

-' I

Tu,,Left

J

**F<**

i.\_..,

.,. How mony carrots will SSBhove collected before he reaches the mushroom?

GI How many carrotswill SSB have collected oncehe has walked the whole path?

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§],.,,I

l I I

Sipho con only move one block ot a time, jump ond turn left and right. Write down the instructionsond how many times SSB must move or jump and turn right or left to get to the **green tile and carrot.**

, **t!'!\_**

Study the following image and answer the questionsthat follow.

1. :-- i. - - .

,.\_ I I I

-;--; -

**1** - I

•

**C**

* '

*'t:.I' p*

-

**B**

'*A*f*i*l*l*/



I - I **§I I**

>:<



**IAJ §](ID§]'!**

',,

**§] [!] 00§100 §1[!]**

SSB con only perform the following commands.

c:>

Fcrward

.,. How moy carrots willSSB hove coOected if he stands on block

A?

.,. How moy carrots willSSB hove conecled if he stands on block B?

.,. How may carrotswillSSB hove oncehe os collected all the

corrals?

GI The carrots follow o certain pattern how many carrots must be placed on block C to complete the pattern?

**Sequencing** & **Problem solving**

In the DBE Moth English grade I workbook (p 69) the daysof the week are given in sequence. Such an exercise can easily be converted loo sequencing and problem-solving activity. The example below con be phrased os o problem os follows:

SSB must identify the days of the week in the correct order. How should SSB work to crosseach day buf not cross the some tile twice?

SSB con only perform fhe following commands.

i=> Fcrward

***i.*** T**u-nRlrj,t**

,. Tu-nleft

Sipho Super Bunny con only move one block ot o lime. Write down the instructions ond how many times SSB must move ond turn right or left fo gel lo the carrot.

***i.*** Tu-n RicJ,t

,. Tu-nleft

Junp

Pickl.I'

Sipho con only move one block ot a time, jump ond turn left and right and pick up c carrot ot hisexisting position. Write **down the instructions and how many times SSB must move or** jump and turn right or left lo gel lo the green tile and corral.



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Content and Activity Progression



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**Grade•R1 Grade·1• Grade•21 Grade·3**

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Le , \_.0 .:-;:-i/

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*,:*k  ;-

[l] [!J [!J [!]

The following symbolis used to represent and )l ... then construct.

I@] §] [!]

I) I 211-.

@] c::> **[i]§]@]**

I 2.

The following symbol is used to represent and !I then

construct.



then

then

SSB does not like purple carrots at all. The following symbolic algorithm represents the solution on the direction Iha! Sipho SB should turn If he lands on the pink me. II could be interpreted as: II I am on the pink tile turn right.

Typically. !he learners will be required to supply the missing code element or to construct the solution algorithm for themselves.



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SSB doesnot ike purple carrots at all. The following symbolic algorithm represents the solution on fl1e direction that Sipho should tum if he lands on lhe pink tile. II could be interpreted as: If I om on the pink tile turn right.



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**llltJOO OO llJ**

/ /

**>M**-**IC.**

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I (3

Content and Activity Progression



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**O>**

**Note:**

Interms of coding, typically,problems couldrequire learners to

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read code and explain what it does

work through (trace) / act out code (physically or simulated) to determine the output or the correctness

provide missing code instructions (codeinstructions are provided with some instructions or code elements missing) that learners need to complete translate verbal/writteninstructions (algorithm) to code.

add some functionality/instructions to an existing program.

rewrite a set of coding instructions to be more efficient, e.g.using a loop construct for code that is repeated choose the correct solution from 2-3 options

compare different solutions to evaluate efficiency

debug an algorithm or program (find the bug, describe the bug and correct it)

* develop a solution/algorithm(codeinstructions) based on a given problemor for an open-ended problem through planning, implementing, testing and debugging. dependinq on the competency/(ies) the learner needs to demonstrate.

**Note:**

Coding and Robotics, as a subject, in theFoundation Phase, is based on developing skills that underpin the processes of coding and robotics. To enable coding and robotics skills development it should be developed unpluggedat first to reduce cognitive loadand allowlearners to focus on, and ground coding concepts. Schools that have educational programming or robotics toolsand software could use these in combination with the unplugged approach. However, the curriculum is designed in such a way that it can be done unpluggedthroughout.

The table below describes the exit skills (shaded cells (per phase and per grade)).

* + 1. **Coding Competencies**

**Coding Content**



**Links to high level phase competencies (C.6, C.7**

Exit Skills per Grade

Recognise and interpret patterns in symbolic sets of data or visualisations. Createor complete a pattern to represent a data set. \_,,...,....

....

1. Pattern Rec29.nition

**Exit Skills** to be mastered

**Prior knowledge must be covered in activities and progressed within the grade and across the phase.**

* 1. **Identify a pattern.**

**Identifya complete pattern present as a data set.**

1.1 ldently arudimentary pattern.

(minimum 2 elements in core - repeated three times)

1.1Identify an elementarypattern.

(minimum3 elementsin core - repeated threetimes)

1.1Identifya foundationalpattern. I 1.1Identify a more complexpattern.

(minimum3 elementsin core - repeated (minimum4 elementsin core - repeated four times) four times)



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**--..J**

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| --- | --- | --- | --- | --- |
| **1.2 Recognise pattern.** | 1.2 Recognise arudimentary type of pattern | 1.2 Recogniseelementary type of pattern | 1.2Recognisefoundational type of | 1.2Recognisemore complex type of |
| **Recognise and interpret patterns** | **(depends** on context) e.g. (colour, shapes, | (depends on context) e.g. (colour, | pattern (depends oncontext) e.g. (colour, | pattern (depends oncontext) e.g. (colour, |
| in **symbolic sets of data or** | texture, rhythm, sounds, movement) | shapes, texture,rhythm, sounds, | shapes, texture, rhythm, sounds, | shapes, texture,rhythm, sounds, |
| **visualisations.** |  | movement) | movement) | movement) |
| **1.3 Copy** | 1.3 Copy arudimentary pattern(**depends** on | 1.3Copy anelementarypattern (depends | 1.3Copy foundational patterns (depends | 1.3Copy more complex patterns |
| **Copy a pattern presented as a data** | context) e.g. (colour, shapes, texture, rhythm, | on context) e.g.(colour, shapes, texture, | on context) e.g.(colour, shapes, texture, | (depends on context) e.g.(colour, |
| **set.** | sounds, movement) | rhythm, sounds,movement) | rhythm, sounds, movement) | shapes, texture,rhythm, sounds, movement) |
| **1.4. Complete** | 1.4 Complete arudimentary pattern(**depends** | 1.4Completean elementarypattern | 1.4Completefoundational patterns | 1.4Completemore complexpatterns |
| **Complete a pattern presented as a** | on context) e.g. (colour, shapes, texture, | (depends on context) e.g.(colour, | (dependson context) e.g.(colour, | (depends on context) e.g.(colour, |
| **data set.** | rhythm, sounds, movement) | shapes, texture,rhythm, sounds, movement) | shapes, texture, rhythm, sounds, movement) | shapes, texture,rhythm, sounds, movement) |
| **1.5 Extend** | 1.5Extend arudimentary pattern(depends | 1.5 Extend an elementary pattern | 1.5Extend foundational patterns | 1.5Extend more complex patterns |
| **Extend a pattern presented as a** | on context) e.g. (colour, shapes, texture, | **(depends** on context) e.g. (colour, | (depends on context) e.g. (colour, | (depends on context) e.g. (colour, |
| **data set.** | rhythm, sounds, movement) | shapes, texture, rhythm, sounds, | shapes, texture, rhythm, sounds, | shapes, texture,rhythm, sounds, |
|  |  | movement) | movement) | movement) |
| **1.6 Describe** | 1.6 Describea rudimentary pattern (depends | 1.6 Describe anelementary pattern | 1.6 Describefoundational patterns | 1.6 Describemore complexpatterns |
| **Describe apattern presented as a** | on context) e.g.(colour, shapes texture, | (depends on context) e.g.(colour, | (depends on context) e.g.(colour, | (depends on context) e.g.(colour, |
| **data set.** | rhythm, sounds, movement) | shapes, texture, rhythm, sounds, movement) | shapes, texture, rhythm, sounds, movement) | shapes, texture,rhythm, sounds, movement) |
| **1.7 Explain** | 1.7 Explainmore complexpatterns (depends | 1.7 Explain an elementary pattern | 1.7 Explainfoundationalpatterns | 1.7 Explainmore complexpatterns |
| **Explain apattern presented as a** | on context) e.g.(colour, shapes, texture, | **(depends** on context) e.g. (colour, | (depends on context) e.g.(colour, | (depends on context) e.g.(colour, |
| **data set.** | rhythm, sounds, movement) | shapes, texture, rhythm, sounds, | shapes, texture, rhythm, sounds, | shapes, texture,rhythm, sounds, |
|  |  | **movement)** | movement) | movement) |
| **1.8 Create** | ***NIA*** | 1.8 Create an elementary pattern | 1.8Create afoundational patterns | 1.8Create amore complex patterns |
| **Create apattern presented as a data set.** |  | (depends on context) e.g. (colour, shapes, texture, rhythm, sounds, | (depends on context) e.g.(colour, shapes, texture, rhythm, sounds, | (depends on context) e.g.(colour, shapes, texture,rhythm, sounds, |
|  |  | movement) | movement) | movement) |



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| --- | --- | --- | --- | --- |
| **1.9 Debugging**  **Debug a pattern presented as a data set.** | 1.9Debugginga rudimentarypattern  (dependsoncontext)e.g.(colour, shapes, texture, rhythm, sounds,movement)  (Identify and correct one error in thecore- two elementsof a pattern thatwas repeated wrongly) | 1.9 Debuggingan elementarypattern  (dependsoncontext)e.g.(colour, shapes, texture,rhythm, sounds, movement)  (Identifyandcorrect one error in thecore  -threeelementsof apattern that was repeatedwrongly) | 1.9 Debugginga foundational patterns  (depends on context) e.g. (colour, shapes, texture, rhythm, sounds, movement) (Identifyand correct one error in the core -three elementsof a pattern | 1.9 Debugginga more complexpatterns  (dependsoncontext)e.g.(colour, shapes, texture,rhythm, sounds, movement) (Identify andcorrect one error in thecore -four elementsof a pattern that |
| that was repeated wrongly) | was repeated wrongly} |
| **1.10 Compare**  **Compare patterns presented as a data set.** | 1.10 Compare arudimentarypattern (dependson context)e.g.(colour, shapes, texture, rhythm, sounds,movement)  (Twopatterns in thecore - two elements | 1.10 Compare an elementarypattern (dependson context)e.g.(colour, shapes, texture,rhythm, sounds, movement) | 1.10 Compare foundational patterns (depends on context) e.g. (colour, shapes, texture, rhythm, sounds, movement) | 1.10 Compare a more complexpattern (depends oncontext) e.g.(colour, shapes, texture,rhythm, sounds, movement) |
| differ withone element) |
| **1.11 Order** *I* **Sequence Order/Sequenceapattern presented as a data set.** | 1.11Arrange a data set in alogical order to completea task(set of two-three items/steps) | 1.11Arrange adata set in alogical order to completea task(set of two-three items/steps) | 1.11 Arrange a data set in a logical order to complete a task (set of three-five items/steps) | 1.11Arrange adata set in alogical order to completea task(set of five-seven items/steps) |

**Examples of patterns:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Grade R  *,;,-J••*,>••(••  ***JA.***  **H.,.\_**  https:ljWW1;v.fairypoppins.com/patteming-oclivities/ | Grade 1  **A pattern is identified and grouped.**  **dt**i **'**.**J..,** Drawhoop< to mowthe9'""1"o' ffIVO.  • 1ci1\*1'11c1•1•1i61••1ti16•1  DBEGrade 1 Workbook 2 (1-'\aths) - p38 | Grade 2  ;,.,..., **0-c:ncltJ,,.... I.hepcilMm** o,;-1,\_ **ned.**   * ,--=-=rn 1[·mJ   I rn II m I   * + •=i [6<TIIIODZSl   **ADAnAnAn** I ]I A!Al I  **OADOADOAD** [ ][ ]  •A·•o·,.,."·" •'f·'""-·> ==  ci. **IIOAIIOAIIOA. ==-'**  DBEGrode 2 Workbook 1 (Moths) - p58 | Grade 3  Daily behaviour routine pattern | | 0**..t**•**,**" *\_*••*:*•*\_,.,:,§/'*  ,..,..•.'.  ,,  .*,*;*:*• |
|  |  | |
| Wake uc.... Get up  **n G•** | Have a shower  ***'1.*** |
| Get dressed Brush myhair | Eat breakfast |

**Note:**

Pattern Recognition helps programmers to refine algorithms when developing coding solutions e.g., identifying repeating instruction patterns to be placed in loop constructs.

Also, pattern recognition leads to analysing patterns in data. By identifying patterns, we can predict what will come next and what willhappen again and again in the same way and helps to make generalisations. A pattern may be numerical, visual or behavioural.



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| Coding Content | Exit Skills per Grade | | | |
| Links to high level phase competencies  C.1, C.2, C.3, C.4, C.5  (Alsolinks to C.6 and C.7) | * 1. Apply computational thinking skills do develop aset of logical instructions to solveaproblem.   2. Present a simplecoding solution using symbolic or written statements representing sequencesof commands, singlerepetition, and conditional constructs (Refer to next table- Implement the algorithm).   3. Interpret and execute a givensymbolic or written set of commands   4. Debug a given symbolic or written set of instructions.   5. Evaluate agiven solution towards potential improvement. | | | |
|  | | | | |
| 2. lgorithm Design | **New skills tobe mastered** | | **Prior knowledge must be covered**in **activities andprogressedwithin the grade and acrossthe phase.** | |
| **2.1Listento** / **Read**problem  **statement** | 2.1 Listen to arudimentary problem  statement or instruction. | 2.1Listen anelementaryproblem  statement or instructions. | 2.1Listento/ Read afoundational  problemstatement orinstructions. | 2.1Listen to/ Read more complex  problemstatement or instructions. |
| **2.2 Understandtheproblem. (Visualisethe problem)** | 2.2 Respond orally *I* kinaesthetically / pictorially to show understanding. | 2.2 Respond orally/ kinaesthetically/ pictorially to showunderstanding. | 2.2 Respond orally/ kinaesthetically/ pictorially/ symbolically to show understanding. | 2.2 Respondorally/ kinaesthetically/ pictorially/ \*symbolically/ written steps to showunderstanding. |
| **2.3 Sequencing (Algorithmdevelopment)**  **Solvetheproblem** | 2.3a Abstraction: Outline main ideas.  2.3b Decomposttion: Illustrate *I* unpack steps to solve a problem. (e.g., objects, shapes, colours, pictures)  (Minimum of 2-3 steps) depending on the problem.  2.3c Sequencing of the steps (i.e., Algorithm)  The solution may be presented partially requiring the learners to complete  it. (Maximum of 1 missing instruction) Problems couldinclude:   * Grid-based scenarios * Story-based soonarios * Movement-basedscenarios (e.g., dance moves) * Robot enactment/simulation scenarios. | 2.3a Abstraction: Outline main**ideas. 2.3b**Decomposttion: **Illustrate** *I* unpack  **steps** to **solve a**problem. **(e.g., objects,**  **shapes, colours, pictures)**  (e.g., **objects, shapes,** colours, **pictures,** directional **symbols)** (minimum of 4-5 **steps) depending** on the complextty of problem.  2.3c **Sequencing** of the **steps (i.e., Algorithm)**  The solution **may be presented partially requiring the learners** to **complete** tt.  (**Maximum** of 2 missing **instructions) Problems** could **indude:**   * **Grid-based scenarios** * **Story-based scenarios** * **Movement-based scenarios (e.g., dance moves)** * **Robotenactment/simulation soonarios.** | 2.3a Abstraction:Outlinemainideas.  2.3bDecomposition: Illustrate/ unpack steps to solve aproblem.(e.g., objects, shapes, colours, pictures)  (e.g., objects, shapes, colours,pictures, directional symbols, and alphabet letters) (minimumof 5-6 steps) depending onthe complexity of problem.  2.3c Sequencing of the steps (i.e., Algorithm)  Thesolutionmay be presentedpartially requiring thelearners to completeit.  (Maximumof 5missinginstructions) Problemscouldinclude:   * Grid-based scenarios * Story-basedscenarios * Movement-basedsoonarios(e.g., danoomoves) * Robot enactmenUsimulation scenarios. | 2.3a Abstraction: Outlinemainideas.  2.3bDecomposition:Illustrate/ unpack steps to solveaproblem.(e.g., objects, shapes, colours,pictures)  (e.g., of objects, shapes, colours, pictures, directional symbols, alphabet letters and short sentenoos)(minimumof 6-7 steps) depending onthe complexityofproblem.  2.3cSequencing of thesteps (i.e., Algorithm)  The solutionmay be presentedpartially requiringthelearners to completeit.  Problemscouldinclude:   * Grid-basedscenarios * Story-basedsoonarios * Movement-based scenarios(e.g., dancemoves) * Robot enactment/simulation scenarios. |
| **2.4 Visual** / **written representation (Createthecode)** | 2.4 Presenting a visual solution/algorithm with objects, arrows, or pictures. | 2.4 Presenting a visual solution/algortthm with objects, arrows, or pictures. | 2.4 Presenting a visual solution/algorithm with objects, arrows,pictures, symbols, or words. | 2.4 Presentinga visual solution/algorithm withobjects, arrows, pictures, symbols, or shortwrittencommands. |
| 2.5 Implementation: **Execute-Test-Debug (Adjustments applied**until **outcomes reached)**  In**person (acting out) or on paper tracin** | 2.5aImplement the solution/algorithm.(A rudimentary set of commandsin relation to the designedalgorithmarecorrectly executedphysically, onpaper or with an educational tool) | 2.5aImplement the solution/algorithm.(An elementary set of commandsin relation to the designed algorithmare correctly executedphysically, onpaper orwithan educational tool) | 2.5a Implement the solution/algortthm.(A simple set of commands inrelation to the designed algorithm are correctly executed physically, onpaper or wtthan educational tool) | 2.5a Implement the solution/algorithm. (A simple set of commands in relation to the designed algortthm are correctly executed physically, on paper or with an educational tool) |

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| Find errors and correct | 2.5b Test:Did theimplementationreach the criteria?  2.5cTrace the error(determine the cause)  2.5dDebug to findproblemin solution/algorithmand do correction. | 2.5bTest:Did theimplementationreach the criteria?  2.5c Trace the error (determine the cause)  2.5dDebug to findproblemin solution/algorithmand do correction. | 2.5b Test: Did the implementation reach the criteria?  2.5c Trace the error (determine the cause)  2.5d Debug to findproblem in solution/algorithmand do correction. | 2.5b Test: Did the implementation reach the crtteria?  2.5c Trace the error (determine the cause)  2.5d Debug to find problem in solution/algortthmand do correction. |
| **2.6 Evaluate**  **(Determine whether the solution solved the problem or which solution is better/best)** | 2.6Evaluate: Didthe solutionmeet the criteria to solve theproblem? | An elementary set of commandsin relation to the designed algorithmare correctly executed physically, on paper or with an educational tool. | A foundational set of commands inrelation to the designed algorithm are correctly executed physically, on paper or with an educational tool. | A foundational set of commands in relation to the designed algortthm are correctly executed physically, onpaper or wtth an educational tool. |
| **2.7 Compare and reflect (Learn from all solutions)** | 2.7a Compare different solutions to identify the different approaches.  2.7b Reflect andfind themost optimal solution.  (The evaluationand comparisonrelate to the solution/smade by all thelearners) | 2.7a Compare different solutions to identify the different approaches.  2.7bReflect andfindthemost optimal solution.  (Theevaluation andcomparisonrelate to the solution/smade by all thelearners) | 2.7a Compare different solutions to identify the different approaches.  2.7b Reflectandfind themost optimal solution.  (The evaluationand comparisonrelateto the solution/smade by alI thelearners) | 2.7a Compare different solutions to identWy the different approaches.  2.7b Reflect and find the most optimal solution.  (The evaluation and comparison relate to the solution/s made by all thelearners) |

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| --- | --- | --- | --- | --- |
| **Examples** | **Computational ThinkinQ Examples OF TYPES OF CT** | | | |
| **Example 1** | **Abstraction**  *;:.*  *ii;*  ,f  *'t*  ·;--,.  A world map is an abstraction of the earth in terms of longitude and latitude, helping us describe the location and geography of a place | !;\  *r-*I*---*"*-*I*-.*  -•- 11•1o...,  *---7(\* \  - -•- **1**-**9**-**----** S- I-· **t**-  ....... ·-  Break up the task of making breakfast in several smaller tasks: Make toast  Bake egg Make coffee | **Pattern Recognition**  **p** •  . I- L I- (·.1, I. I,\_  l,,\_j,J\_,,. L,\,,,,,,V1 J.A,J-"-"  uI- --=-- . - -  Irregular heartbeat can be Identified looking at deviations from the normal pattern.  This can help to diagnose medical conditions | **Algorithm**  **How to make toast**  □**Lll•i**  ToertbR.. luttcrlDut Add},a  Steps/Instructions for making toast (1 subtask in making breakfast) |
| See problem-solving example on page 10/11. |
| **Example 2** |
| See example Section 3 Grade 3 Term 4 on page 117/118 |



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| --- | --- | --- | --- | --- |
| Coding Content | Exit Skills per Grade  Apply computational thinking skills do develop a set of logical instructions to solve aproblem.  Present a simple coding solution using symbolic or written statements representing sequences of commands single repetition and conditional constructs. | | | |
| Links to high level phase competencies C.1, C.2 |
|  | | | | |
| 3. Coding\_: | **New skills** to be mastered | | **Incidental learning** | |
| **3.1Event trigger (Start)** | 3.1Specific instruction on to trigger event  (start anaction) and an end set of commands.(Place- e.g., beacon/flag, beginning of anactivity- counUwhistle). | 3.1 Specific instructionon to trigger event  (start anaction) andanendset of commands.(Place- e.g., beacon/flag, beginning of anactivity- counUwhistle). | 3.1 Specificinstructionon to trigger event  (start anaction) and anend set of commands.(Place-e.g., beacon/flag, beginning of anactivity- count/whistle). | 3.1 Specific instruction on to trigger event  (start anaction) andanendset of commands.(Place- e.g., beacon/flag, beginningof anactivity- counUwhistle). |
| **3.2 Instruction:**  **Apply computational thinking skills to develop a set of logical instructions (algorithm) to solve a problem.**  **(See table 2)** - **Algorithm design.** | **3.2 Sequence (Instruction set):** Rudimentaryoperations arepresented usingsequencesofpictures(Maximum-1 up to 4)  Logically order a set of pictures to accomplisha set task.(Maximumup to 4)  Order, arrangeor searcha set of pictures and symbols accordingto given criteria.  Followrudimentaryinstructions(until barrierishit - not block-by-block) using objects, arrows, andpictures:   * Forward/ Backward * Up/ Down * Any other single action(Incidental)   (Turnleft /Turn right isimplied- by implication, learners turn to face the directiontheywill move in next) | **3.2 Sequence (Instruction set):** Elementaryoperations arepresented usingsequences of picturesand orsimple three-word sentences.(Maximumup to 5)  Logically order a set of picturesor three­ word sentencesto accomplisha set task. (Maximumup to 5)  Order, arrange or searcha set of pictures and symbols, characters, andnumbers accordingto givencriteria.  Followelementaryinstructionsusing a grid, objects, arrows, or pictures:   * Forward/ Backward * Up/Down * Over/Under * Right/ Left (Implied/Incidental) * (Any singlecommand, e.g., Jump, Turn around, etc.) | **3.2 Sequence (Instruction set):** Foundational tasks as logical instructions areidentifiedto solve aproblem. (Maximumup to 7)  Foundational operations arepresented using sequences of pictures and or simple sentences.(Maximumup to 7)  Logically order a set ofpicturessimple sentencesto accomplisha set task. (Maximumof?)  Order, arrangeorsearch a set of pictures, symbols, characters, numbers, andwords according to given criteria.  Decomposemore complex instructions using a grid, objects, arrows, orpictures:   * Forward/ Backward * Right/ Left/ Turn around * Up/ Down * Jumpover/ Shoot * Grab*I* Release * Pickup/ Put down | **3.2 Sequence (Instruction set):** Foundational tasks as logical instructions areidentified to solve aproblemfrom whichunnecessaryorirrelevant details areignored.(Maximumup to 9)  Foundational operations arepresented usingsequences of picturesand orsimple sentences.(Maximumup to 9)  Logically order a set of pictures simple sentences to accomplisha set task. (Maximumup to 9)  Order, arrange or searcha set of pictures, symbols, characters, numbers, andwords orsentences according to given criteria.  Decomposemore complexinstructions usinga grid, objects, arrows, orpictures:   * Forward/ Backward * Right/ Left/ Turn around * Up/Down * Jump over/ Shoot * Grab/ Release * PickUP/ Put down |
| **3.3 Decision (Condition):Incorporate decisions (conditional constructs) as part of the solution code.** | **N/A** | **N/A** | 3.3 Decision(Condition):Decide on an actionbasedon a condition.E.g., Purple  /orangecarrot | 3.3 Decision(Condition):Decideonan actionbased on a condition.E.g.Purple  /orange carrot |
| **3.4Repetition:**  **Incorporate repetitions (loop concepts) aspart of the solution**  **code.** | **3.4Repetition (Loop concept):** Repealing anaction, instruction. (Incidental learning) | **3.4 Repetition (Loop concept):**  Repeating anaction,instruction. | **3.4 Repetition (Loop concept):**  Repeatingan action,instruction. | **3.4 Repetition (Loop concept):**  Repeating anaction,instruction. |
| **3.5 Input-Processing-output: Demonstrate howinput and processing result in output. Debug (reflecting on) a given**  **symbolic or written set of instructions.** | **3.5Implement: Problem-solving:** Algorithmdesignprocesshere.(Incidental learning) | **3.5 Implement: Problem-solving:** Algorithmdesignprocesshere.(Incidental learning) | 3.5 **Implement: Problem-solving:**  Algorithmdesignprocesshere. | 3.5 Implement:Problem-solving: Algorithmdesignprocesshere. |

Examples: Example 1



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Grade R

Grade 1

Grade 2

uences of commands, singlerepetition, and conditional constructs

Grade 3

C.2- Present a simple coding solution using symbolic or writtenstatements representin,

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**Writing Algorithms**

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squares to move.

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Use the arrows to guide the schoolbus to school

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https:/[/www.twinkl.co.za/](http://www.twinkl.co.za/)

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**Note**

A **solution(set of instructions/algorithm)** can include coding constructs such as repetition (loops) and decisions (IF...THEN)



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**Example 2:**

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| **Grade R Grade 1 Grade 2 Grade 3** | | |
| **C.3** - **Interpret and execute a given symbolic or written set of commands (algorithm** | | |
| One learner could take on the role of instructor One arner could take on the role of instructor and or interpreter(executer) . and o,interpreter(executer)  .• ... ... ***1iffl***  1,hc:n, i"V'O,or- cA t.iO'\t.h:i\ i1k>ol<r3 ....,.., .  ..,\_••"'• 1,,b,g?'t/'o\bo4m, >CWJl rc":l"'° **.**  *I*  I..; **,.11.o 1-ll.s ,.ll.s** ,.I\**.**  **.** II  .•  1 1**t**1 1♦1-.1.1.- 1.1  l  .- 1,-  I  DBE Grade R Workbook 1 (English)- p15   * 11 t ...   **Game based rules and commands**  A set of game rules are nothing more than an Code a classmate  algorithm (instructions to execute). The game of **LoEowl**□**Etw'.I1ww**  match two cards or snap can easily be presented **Lil wLii**  and conceptualised. This in terms of the teacher  and not so much the learners. **rij** riil  rijrlj[E1(Ern:J(E  *!\_* }·'• :.. • l kdottodlnM J\ I'  .::£ .tt .-.\_;..- .t,. 1N,,lmot.c:h1.htec1.-d,...,\.ht.h.WtY.k,or,pos,IL. **Lfj [;j**  - ..*-..l* + **Mo-Y?'O.** .  I ...**l** , , 1 II■■- SJr lho ,J....ipo<1.11,,,,, cr ,Jo- ")  0 • *IJ* :t, ■■II ■ ,.,,flh, ..,.,hlf,h..do.f"',th,m I.. ./ **Code 11 Clnssmnte**  ' - «1 thet.oble 'OwnW"n *2*cordaot o tomi:  *:* "> , .., ■■■■ lf""-,1,n'•f"',• m S",r.,.,.,n /  - .... R,:,amMom\..-,..4,°'°•!j"Jp.ii.i.h.mT},.f'lr-;te.--.to )  .. - r,....:1(11th. hil'l5r:ar••t.h.,,,;,...\_,. ,  ••••• Y®='''°!"'. =:"l' .i. ,,r,l, ***I***  DBE Grade R Workbook 2 (English)- p54 The rules of snap are simple, the same for the memory game.  [https://www.twinkl.co.za/](http://www.twinkl.co.za/) | One learner could take on the role of instructor and or interpreter(executer)  1 LOOk 81IM Claoc:9 mo\!QSPfO'vidE!d onmeG&lllng LOOi:!Y: Wo!1Csneet  ***-o,,. ;I.t.•cat;on***  n n rLJ  --- A::JlN  *I*  &;i da,, dap    9i't'lln:d Wf.'.rt fSJ.Nf"CIHtffd l.W.flt  ( .,.i·. r, -wrf" rnr-  Iii',...  ***1'***0.' *..!)* 0'-.> *ll -'*Chip •  '·' **,...ft** • ,- **t'**J**I**  -LA-rtUp *·*-.:*•*(U*•*r*=*i) 1>-·1111g1,-H1p  ' f'tt'nl  ,,\_:ij1,"w  01iP o-., Clfp  *1'-do* J  .,--,  hlb'l.eV91'  https://code.org/curriculum/course1/12/Teacher# Activttl'..1 | One learner could take on the role of instructor and or interpreter(executer)  **Your Task**  Worlt:!'lg In ;ma.!l grou ycu e 90111g :o wrt:" e  col• *for* g i..-.; o pcari.-.•r °"°",..clca.. o..,••·  Yo-J 0'9 9oi.t9 to wri.fafr.t i. frudiou o set *Uum* from th" rte--t t) t.\ f!nchwi".t!" di."; *er,* bl '\dfolcW..  *Y*o-J wiU wrift *±h* eod" /.·owl'\ t s roup, thatt your eotT.put.:rr *p r.* v1:llm:nd ·:.t ti."rtort l:r.t. bll'!.dfold;,i, whd tfu ttdtr p »-i1ll coll  ....d. !:lo" h.,,\_.. wti.H....  Ai ;o:in ,a ;·our cc-mi:ufc :i.::, *oif* H.t lir.t you ml r.cte' toQ.d; y-ear codt en.1httrt :sci.I\.  Onct y-,;:rI,T'.c.lUr or.t m--::;:r wouc,m 11"..., ,q b  thl nm.  **Reflection**  Whet wt d:ffi:ul± about"ri.thg th, co:'.t?  *Vlha:* d.) you :hill.ti mo.1 b, c ehcl! c *for* ttd.= who wntt thim  /M(;Oflll)U::ff17  *CA,*  http\_s[://www.twinkl.co.za/](http://www.twinkl.co.za/) |

**Note:**

Itis important to note that there will always be a degree of overlap between Coding content and Robotics (R.7) content e.g. developing algornhms and coding instructions for the Coding strand and developingalgorithms and code instructions in the Robotics strand (R.7) as programming (coding) concepts are applied to control robots to perform specific tasks.

* + 1. Robotics Competencies

Robotics Content

Links to high level phase competencies

R.1

R.2

R.3

R.4

Explain what arobot is in simpleterms. Identify different types of robots.

Outlinethedifferent components of arobot

Present anunderstanding of howrobots affect the v.orld.

Exit Skills per Grade

R.1, R.2, R.3, R.4, R.5, R.6, R.7

1. Robotic **Skills**

R.5

R.6

R.7

Design a simple product (artefact)based on a set of design specifications. Mimic the operations of a robot.

Createtest and execute a set of robotic instruction.,.s...,,.

...

**New skills to be mastered**

Incidental learning

* 1. Identify types of robots Identify different types of robots.
  2. Identify dlferent types ofrobots I 4.1Dlferent examples of robots and what

they do arelisted.

* 1. Theidentificationclassification relates 4.1Theidentificationclassificationincludes to robots that areused infactories and domestic andprofessional userobots. robots that arenot used in factories

(Service robots)

* 1. **Explain** • **What robots are? Provide an elementary explanation of what a robot is.**



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* 1. **Explain• Howthey work? Outline the different components of a robot.**
  2. **What can robots do?**

**Explain what arobot is in simple terms and what arethey used for**

* 1. **Act as robots**

**Mimic the operations of a robot from a set of instructions Relates and links to**

1. **Algorithm design and**
2. **Coding for the grade.**

**(The instructions are given, and the learners need to execute the instructions physically or on**

* 1. Arudimentary explanation of what a robot is,is presented.
  2. Thelearners present the concept that a robot comprises of different components each wtth a purpose (incidental learning).
  3. Arudimentary explanation of what robots are used for is given.
  4. Thelearners mimic the operations of a robot based on given instruction or for a purpose.

Simple instructions are performed, in person or usinga tool, on paper.

* 1. An elementary explanation of what a robot is,is presented including reference to their purpose.
  2. The learners present the concept that a robot comprises of different components each wttha purpose.
  3. An elementary explanation of what robots are usedfor is given that references speclic tasks.
  4. The learners mimic the operations of a robot based on given instruction or for a purpose.

Simple instructions areperformed, in person or using a tool.

* 1. A foundational explanation of what a robot is,is presented including reference to their purpose and mode of operation.

Referenceto moving and sensory parts are made.

* 1. Thelearners present the concept that a robot comprises of different components each wtth a purpose.

Reference is made to a power source and motors.

* 1. A foundational explanation of what robots are used for is given that references specific tasksincluding dangerous and repetitive ones.
  2. Thelearners mimic the operations of a robot based on given instruction or for a purpose.

Instructions are performed, inperson or usinga tool.

* 1. A foundational explanationof what a robot is,ispresentedincludingreference to their purposeandmode of operation.

Referenceto movingand sensory and processingparts aremade.

* 1. Thelearnerspresent the concept thata robot comprises of different components eachwithapurpose.

Referenceismade to thefollowing concepts as partof the outline:

* + - Robots compriseofmechanical parts.
    - Requirespower.
    - Require some formof prOQrammin,...
  1. A foundational explanation of what robots areusedfor isgiven thatreferences specificconcepts thatrobots canbe programmed to react to their

environment.

* 1. Thelearnersmimic the operations of a robot based on giveninstruction or for a purpose.

Instructions areperformed,in person or usinga tool.



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| paper, or usingbodycoding (or optional, an educational tool)) |  |  |  |  |  |
| **4.6Learnersdevelopcode instructionsbasedon an algorithm.**  **Create,test, and executea set of roboticinstructions.**  **Relates andlinksto:**   1. **Algorithmdesign and** 2. **Coding for thegrade.** | 4.6Arudimentary set ofinstructions are compiled and executedtoperforma task. | | 4.6 Anelementaryset of instructions are compiledand executed to perform a task. | 4.6 Afoundational set of instructions are compiledand executed toperform a task. | 4.6 Afoundational set of instructions are compiledand executed to perform a pr task. |
| **4.7Learnersdevelopmore complexcodeinstructionsbased onanalgorithm.**  **Present acodingsolutionusing symbolicor writtenstatements representing sequencesof commands, singlerepetition, and conditional constructs.** | 4.7 Symbols areused to represent actions and operations to aocomplisha task.  Eachsymbol represents a singletask. (\*\*Minimumof 3 d ferent actions/symbols) (Maximumof 6 steps)  (Incidental) | | 4.7 Symbols areusedto represent actions and operations to acoomplisha task.  Symbolsmay be grouped to represent repetition.  (""Maximumof 5 different actions/symbols) (Maximumof 8 steps)  (Incidental) | 4.7 Symbols (normal or block(puzzle) type) or wrttten statements are used to represent actions and operations to aocomplisha task.  Symbols/ blocks *may* be groupedto representrepetition.  Symbols/ blocks *may* beused to represent a condition.  (""Maximum of 5 different actions/symbols) (Maximumof 10 steps)  Symbols *may* indude block-codetype imageswtthlinkages. | 4.7 Symbols (normal or block(puzzle) type or wrttten statements are used torepresent actions and operations to acoomplisha task.  Symbols/ blocks *may* be grouped to represent repetttion(or a statement indicatingrepetttion)  Symbols/ blocks may be used to represent a condition (or a statementindicating condttion)  (..Maximum of 6 different actions/symbols) (Maximum of 14 steps) |
|  |  | |  |  | Symbols *may* include block-code type imageswithlinkages. |
| **4.8Designand make:**  **Designa simple artefact basedon a set of designspecifications.** | 4.8Arudimentary artefact iscreatedto represent arobot orequivalent.  Step by step instructions canbe appliedor given.  The activitymay be openwherevarious materials are supplied to thelearners to have themcreate their ownrobot and/or relatedartefact.  Thelearnersreflectand talk about what theirrobots cando. | | 4.8Anelementaryartefact iscreatedto represent arobot or equivalent.  Step by step instructions canbe appliedor given.  The activitymay be openwherevarious materials aresuppliedto thelearners to have themcreate their ownrobot and/or related artefact.  Thelearnersreflect and talk about what their robots can do.  Strings/ sticks and or pinsmay be added tomimicmovement.  Different materialscanbe used, e.g., Pipe cleaners,ice creamsticks, straws, recycled materials(toiletrolls,lids, pill cases, egg containers) etc. (Life Skills­ Art) | 4.8Afoundational artefact iscreated to represent arobot orequivalent.  Step by step instructions canbe appliedor given.  The activitymay be openwherevarious materials aresuppliedto thelearners to have themcreate their ownrobot and/or relatedartefact.  Thelearnersreflect and talk about what theirrobots cando.  Strings and orpinsmay be added to mimic movement.  Differentmaterialscanbeused, e.g., Pipe cleaners, ice creamsticks, straws, recycled materials(toiletrolls, lids, pill cases, egg oontainers) etc. | 4.8 Afoundational artefact is created to represent arobot or equivalent.  Step by step instructions canbe appliedor given.  Theactivtty *may* be openwhere various materials aresuppliedto thelearners to have them create their own robot and/or related artefact.  Thelearnersreflect and talk about what their robots can do includingthe composition of the various parts and the purpose of each.  Strings andor pinsor lever mechanisms and or pullies *may* be added to mimic movement.  Different materialscanbe used, e.g., Pipe cleaners,icecream sticks, straws, |



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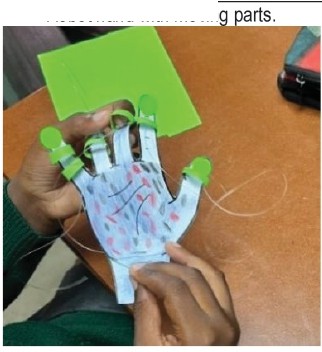
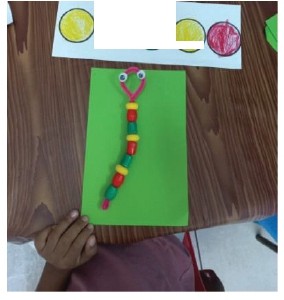


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|  |  | The creation of the artefact could also take on theform of a game e.g.(Assembleby numbers) (Life Skills-Physical Ed) | The creation of theartefact could alsotake ontheform of a game e.g.(Assembleby numbers) Throwsome dice.(Mathematics)  Assemblyusing prefabricatedparts if (available) e.g., Buildingblocks.  Theinstructions contain various steps that shouldbe read and or interpreted as part of the assembly.(Lang)  The assembly shouldrequire a set order (one step shouldfollowthe other) | recyded materials (toilet rolls, lids, pill cases, egg containers) etc.  The creation of the artefact could also take on the form of a game e.g. (Assemble by numbers) Throw some dice.  Assembly usingprefabricated parts i  (available) e.g., Building blocks.  The instructions contain various steps that should be read and or interpreted as part of the assembly.  The assembly should require a set order (one step should follow the other) |

**Examples:**



Grade R

Grade 1

Grade 2

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Grade 3

Robot hand with movin

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Design a robot on paper with shapes and

Design and construct a paper bag robot.

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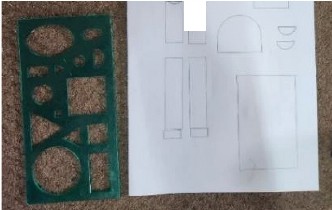
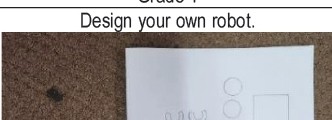
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constructing the robot afterwards.

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* + 1. **Digital Concepts Competencies**



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| Digital Concepts | Exit Skills per Grade | | | |
| Links to high level phase competencies | * 1. Outline the concept of technology and purpose of information technology(IT).   2. Recognise that he or she is living as citizens in a digital world. | | | |
| **D.1, D.2, D.3, D.4, D.5, D.6, D.7,** | * 1. **Demonstrate an understanding of the concept of a computingdevice.**   2. **Identify the common uses of ICT** in **the real world.** | | | |
| **D.8, D.9** | * 1. **Differentiate between the components of an ICT system.**   2. **Explain howthe adaption of technology impacted the world we work and live in.** | | | |
|  | * 1. **Present a basic understanding of the concept of input processingand output.**   2. **Interpret a pattern to represent or communicate a message or image.** | | | |
|  | **D.9 Create a nattern torenresent or communicate amessaaeor imaae.** | | | |
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| **5. Digital Conce ts** | **Exit Skills** to bemastered | | **Prior knowledge must be covered in activities and progressed within the grade and across the ohase.** | |
|  |
| **5.1 Recognise**  **Outline the concept of technologyand purpose and identify the common uses of**  **Computing Device** in **the real world.** | **N/A** | 5.1Arudimentarylist of theuse of IT related technologiesand devices are namedin terms of their use.(Cellphone, laptop, smart*TV)*(Incidental learning)  Linkswith0.1and0.2 | 5.1Anelementarylist of theuseof IT related technologiesand devices are namedin terms of their use.  Linkswith0.2 | 5.1A foundational list of theuseof IT related technologiesand devices are namedin terms of their use.  Linkswith0.1.3 and0.2.3 |
| **5.2 Identify**  **Differentiate between the components of a Computing System by interpreting patterns to represent or communicate a message or image.** | 5.2 Arudimentary explanationof what technologyis,ispresented.(Incidental  learning)  Learners canpoint out examplesof technology.(Incidental learning) | 5.2 A elementaryexplanation of what technologyis, ispresented.  Learners canpoint out examples of technology andrelateitsuseto everyday life.  Learnersrelate the ooncept of technology to that of anelectronic device. | 5.2 Afoundational explanationof what technologyis, ispresented.  Learners canpoint out examples of technology andrelateitsuseandpurpose to everydaylife.  Learnersrelate the ooncept of technology to that of anelectronic device. | 5.2 A foundational explanation of what technologyis, ispresented.  Learners canpoint out examples of technology andrelateitsuseandpurpose to everydaylife.  Learnersrelate the ooncept of technology to that of anelectronic device.  The students answerincludes thatthe technological artefact has a oommon or specific goal.  The answer alsoincludesthe ooncept that technologies oftencompriseof different components. |
| **5.3 Operating**  **Demonstrate an understanding of the concept of a computing device.** | 5.3Arudimentary explanationof what an electronic deviceis, ispresented. (Incidentallearning)  Learners canpoint out examplesof electronic devices. | 5.3Anelementaryexplanation of what an electronic deviceis,ispresented.  Learners canpoint out examples of electronic devices.  Thelearners answer shouldincorporatethe concept that anelectronic devicecanfollow andinterpret instructions.  Linkswith0.1 | 5.3Afoundational explanationof what an electronic deviceis,ispresented.  Learners canpoint out examples of electronic devices.  Thelearners answer shouldincorporatethe concept that anelectronic devicecanfollow andinterpret instructions.  Linkswith0.1 | 5.3A foundational explanation of what an electronic deviceis,ispresented.  Learners canpoint out examples of electronic devices.  Thelearners answer shouldincorporatethe concept that anelectronic devicecanfollow andinterpret instructions andproduce output/result orrender anoutcome.  Linkswith0.1 |



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| **5.4 Create** I  **Create a pattern to represent**  **or communicate a message or image.** | N/A | 5.4 Arudimentarypattern is createdto represent animageor communicatea message or animage.  A basic pattern is enooded to a simple word,image-tosymbols, or 3-word maximum phrase.  Donein relation to C.6and0.8 | 5.4Anelementarypattern iscreated to represent animageor communicatea message or animage.  A basic pattern is enooded to a simple word,image-tosymbols, orsimple sentence.  Donein relation to C.6.and0.8. | 5.4Afoundationalpattern iscreated to represent animageor communicatea message or animage.  A basic pattern is enooded to a simple word,image-to symbols, orsimple sentence.  Donein relation to C.6and 0.8 |
| **5.5 Apply**  **Present a basic understanding of the concept of input, processing and output by demonstrating a basic proficiency in the application of digital skills.** | 5.5 Thelearnerspresent an understanding thatinputresults in some form of output. | 5.5 The learnerspresent anunderstanding thatinput results in some form of output.  Input oInstructions areexecutedthose resultsin an action.  The concept thatdifferent forms of input resultsin different actions areemphasised. | 5.5 The learnerspresent anunderstanding thatinput results in some form of output.  Input oInstructions areexecutedthose resultsin an action.  Output as aformof communicationfrom the device  The concept thatdifferent forms of input results in different actions are emphasised. | 5.5 The learnerspresent anunderstanding thatinput results in some form of output.  Input oInstructions areexecutedthose resultsin an action.  Output as aformof communicationfrom the device  The concept thatdifferent forms of input results in different actions are emphasised.  The concept thatprocessing takes place between input and outputformspart of the learnersunderstanding. |
| **5.6 Digital Citizenship Recognise that he or she is living as citizens in a digital world by explaining howthe adaption of technology impacted the world, we oork and live in.** | 5.6 Thelearnerspresent an understanding thatthe digital world is all aroundus.  The learnersunderstand that electrical devices(Dangers of electricity) shouldbe used safely(e.g., don't useelectronic deviceswhilst crossing the street) anduse in moderation(screen time) | 5.6 The learnerspresent an understanding that the digitalworldis all aroundus.  The learnersunderstand thatelectrical devices(Dangers of electricity) shouldbe usedsafely(e.g., don'tuse electronic deviceswhilst crossing the street) anduse in moderation (screentime).  The conceptualisationis presented in terms of **0.1** | 5.6 The learnerspresent an understanding that the digitalworldis all aroundus.  The learnersunderstand thatelectrical devices(Dangers of electricity) shouldbe usedsafely(e.g., don'tuse electronic deviceswhilst crossing the street) anduse in moderation (screen time).  The learnersunderstand thatprotecting informationwith a password helpskeep it private.  The concept of a digital footprintis also introducedat anelementarylevel.  The conceptualisationis presented in terms of **0.1** | 5.6 The learnerspresent an understanding that the digitalworldis all aroundus.  The learnersunderstand thatelectrical devices(Dangers of electricity) shouldbe usedsafely(e.g., don'tuse electronic deviceswhilst crossing the street) anduse in moderation (screen time).  Present anunderstanding of the dangers of going online.  Present abasic understanding of the concept of cyberbullying andhow to deal with it.  The learnersunderstand thatprotecting informationwith a password helpskeep it private.  The concept and dangers of sharing informationIike personal information usernames andorpasswords are recognised.  The responsible useof technologyis referencedas part of the concept.  The concept of a digital footprintis also introducedat anelementarylevel.  The learnerspresent anunderstanding of thenecessary toreportunsuitable use of |



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|  |  |  |  | electronic oommunication, the access of content and or contact.  The conceptualisationispresented in terms ofD.1 |
| **5.7 Patternsas data (Data representation)** | *NIA* | 5.7a Interpret arudimentarypattern to represent or oommunicatea message or image.  A rudimentarypatternisinterpreted anda correspondingmessage in symbolicformis presented.(Incidental}  5.7b Create arudimentarypatternto represent or oommunicatea message or image.  A rudimentarypatternis createdto represent an imageor communicatea message or animage.(Incidental} | 5.7a Interpret an elementarypattern to represent or oommunicatea message or image.  An elementarypatternisinterpretedand a correspondingmessage in symbolicformis presented.  5.7b Create anelementarypattern to represent or oommunicatea message or image.  Anelementarypatternis createdto represent an imageor communicatea message or an image. | 5.7a Interpret afoundational pattern to represent or oommunicatea message or image.  A foundational pattern isinterpretedand a correspondingmessage in symbolicformis presented.  5.7b Create afoundational pattern to represent or oommunicatea message or image.  A foundational pattern iscreatedto represent an imageor communicatea message or animage. |

**Note:**

Most of the Digital Concepts content could be integrated with aspects of Coding or Robotics content,e.g.if learnersare working on adevice, learnerscould be asked to demonstrate an understanding of the concept of a computing device (5.3),referring to their uses, components and the concept of input-processing-output.

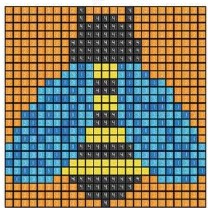
**Examples:**

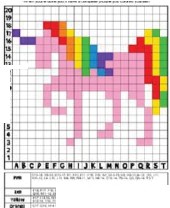
**Example 1** (Patterns as data (5.7))



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| **Grade R** | **Grade 1** | **Grade 2** | **Grade 3** |
| **D.9: Create a pattern to represent orcommunicate a messa e or ima e.** | | | |
| **Star jump Sway to the right**  **and left**    **Bounce up and down**  **Mary had a little lamb, little lamb, little lamb**  \***Ma,\_r**\***y had a little lamb.**    **Its fleece was white as snow**  6.6.6.6.6. | AbOSIC ponemIS encOded too Slmpleword. lmoge. cr3·word  maximump..-ose.  Done inrelo11on to and QA    ---··-·----··--·-··-·--·-·-··-····---\_,.  **Pbt@**..**O**,.,.. **IP@r**,**r**.**1**\_**T**,.**@**...**c**,.**t**\_,**1**\_**¥**, **>6«:tlYlr@i**  12•o,....,.. -.• 6-bccl 6 • Y,t""' 8 • Plt-='  1.0,.-t,fti.. 3•tl,. 5.0,-,..,. 7•R.d  https'./)superstorworbheets com/logic-worksheets/plxel­  CciO-il'IQ-PQQe)/ | Abo$lc ponern is neod&d10a simp word, Image, *or*  simple sentence.  poneIn relollon lo .en**11,**d**§,2.**  L,.& ha...&o   * •• ••1 •• • • • ••• •• •• •• ••   ••• • +-•• I·••-·r': • • •• ••••• /  **A 8** C 0 F G H ,,  • • • • • • • •  .•• .•• • *'*•*!.* •• • •  K l M H 0 • 0 • ;  .-r •• •• •  - • •• ••••  S T U y w ' *y* z  I I I I I I C I It  DBEGrode 2 Workbook 2 (Life $kills) - | A boslC pottam Isencoded too simple wo«d,rmoge, or  simple-senre-nco.  Done In relotton lo ond D.®  **lA**-**III**-**O**-**W 0**-**1**--**1**·**1**--**C**-**C**·**I.**--**Q**-**U**-**I(;** -**CU**  ••0·T •  I  --- .....  . I ••· ,  ?"-·--  tlttp$://www.wooJr.<;om/m)'stery•pi::tute-.gd<:1•cOo•\_·ng.  pc\_gas-roruosy-foty-ta'es/ |

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**Example 2** (Digital Technologies with input that results in output and various components such as touch screen (inpuUoutput), remote (TV)))

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| Grade R | | Grade 1 | Grade 2 | Grade 3 |
| * 1. Identify the common uses of ICT in the real world.   2. Differentiate between the components of an ICT system.   D.7 Present a basic understanding of the concept of input processing and output. | | | | |
| *-A.* .,,. \_,\_  **'4D0 t1·[;1**  rn(2)  ***n***□ ***a***  tti   * **l!'J!'al**   . .ID ·i- | Mobile Phone Technology with concept of input that results in output | I Tablet - concept of input that results in output  '@  **l'!I 0** | Laptop with keyboard (input) or mouse (input) and screen (output)    ;,\_,;,./ | Smart TV with remote control device (inp |

1. SECTION 3



51

**CONTENT SPECIFIC CLARIFICATION PER GRADE PER TERM**

The following tables provide the content clarification per term and per grade.

This section should be read in conjunction with Figure 2.6, Table 2.2, Table 2.3 and Table 2.4

In Foundation Phase, the curriculum is designed to integrate with other Foundation Phase subjects as indicated in the term plans. This integration could also strengthen the specific concepts and content in the subject it is integrated with.

Content clarification is done with examples as Coding and Robotics is a new subject.

**Note:**

Thissection contains examples that clarify the content and competencies. These examples serve as illustrationsto better understand the topics and the abilities students are expected to develop.

However,teachers should see these examples as a starting point for teaching the content and competencies. While the examples are beneficial, teachers should not limit themselves to just those activities. They are encouraged to include other exercises and tasks to ensure deliberate practise and a deeper understanding of the concepts and skills being taught.

The content and competencies are also grouped based on the main topic areas. This organisation helps teachers understand which skills and knowledge are related and how they are connected. The content and competencies are therefore not necessarily listed in the order they must be taught. Teachers have flexibility in how they sequence the topics based on the context of their teaching environment and the needs of their leaners.However, there is an indicationof how different competencies relate to each other. This linkagecould help teachers understand the progression of skills and how they support or build upon one another.

Teachers should therefore develop their Annual Teaching Plans (ATPs) sequencing content and competencies in a manner that wilI make sense for their learners and their teaching and learning environment to foster a positive learning experience. The goal of developing the ATPs is to maximize the learners' learning outcomes and achievement.

CODING AND ROBOTICS

* 1. **GRADER**



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**Note:**

Teachers must include the following competencies and content in their Annual Teaching Plans (ATPs), distributed across the terms and sequenced, organised, grouped (and synergised with other subjects in Grade R, where applicable), and in a manner that will facilitate learning, ensure ample retrieval and deliberate practise, with feedback to ground principles and concepts, maximizing learners' learning outcomes and achievement, whilst also ensuring a gradual learning curve, in a way that will make optimal use of available time and resources.

* + 1. **Term 1**

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| **Content (Grade R** / **Term 1)** | I **Notes/Examples** |
| **Pattern Recognition** | I **Could be integrated with Mathematics** |
| **C.6: Recognise and interpret patterns in symbolic sets of data or visualisations:** C.6 develops**pattern recognition** (part of computational thinking) that  **Identify a complete pattern presented as a data set** iseventuallyusedto developcoding solutions as part of computational  **Examples:** thinking to identifypatternsin the oodingproblemand/or data by   * • identifying similarities ordifferences that canhelp to solve theproblem   or refinethe algorithm.  learnersneedto understandthat apatternis a design thatrepeats. | |
| Algorithm Design and Coding: Algorithm Design and Coding mostly go together. | |
| C.1: Apply computational thinking skills to develop a set of logical instructions to solve a problem **Could be integrated with language** | |
| **Examples:** Everysequence hasa beginning, amiddleand an end (just like astory). Introduce theconcept of analgorithm(set of logical instructions or  **Picture Stories:** oommands, carried outin a specific sequence) as well as the concept  ------------. **Beginning** of abasic structure of aprogram(begin,middle, end).  -----------, . What is the first step? Where do I start? -  I Picture storiesarepresentedin alogical order (sequencedcorrectly  I ... **Middle** with a beginning and anend}.  I  I  I What are the in-between steps? What is the order of these? - When ***sequencing,***we learnabout patterns andrelationships, and to  I  I  I understand the order of things.By learningto sequence, wedevelop  ""': -----------, **End** " the abilityto understand and arrangepurposeful patterns of actions,  What is the final step? How does it end?  I II **Ill** behaviours,ideas, or thoughts thatsupports thelogical sequencingof  oodinginstructions. | |
| **C.3: Interpret and execute a given symbolic or written set of commands Could be integrated with Language** | |
| **Examples:** Providelearnerswitha set of symbolicinstructionswhich theyneedto  interpret and carry out.  ...,.....1o1M""-t ? ';J:,p,,,. .,,,.,-1-a.t--J"i"..,..... **Note:**  \lw.'rlo,,l"',).,.\_.,\_.-t-Vd\l,o"",•W.., In ooding, one develops sets of logically orderedinstructionswhich the  - learners do notneed to understand theword algorithmat  this stage. Theconcept of 'algorithm' is introducedas a oomputer canunderstand and carryout. The computer can only  · set oflogical instructions orcommands that are carried understandinstructions andfollow them***exactly*** theway they are  ' **t** ••• \_J out in a specific sequenceandthat ahumanora presentedandinterpreted. computer canunderstand andfollow/execute.    DBE Grode R Workbook I (English) - P.JA | |

**Content (Grade R / Term 1) Robotics**

**R.1: Explainwhat a robot is in simple terms Activity**

Learners givetheir ideas of what arobotis.

Techer then discusses theseideas andleadslearners towardsrobot concepts. Teacher can showpictures of robots.

robot- KidsI BritannicaKidsI HomeworkHelQ

**R.2: Designa simple product (artefact) based on a set of design specifications**

**Examples: r··** -,- :,:

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Identify thepatternsused, thencreatean artefact withthesamepattern:

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**Notes/Examples**

**Could be integrated with Creative Arts Could be integrated with Life Skills**

Eventuallylearnersneedto understand thata robotis amachinebuilt

by humans andprogrammed toperform tasks,which ahumancan alsodo, e.g.arobot vacuumdeaner. Arobot can thus substitute a person,performing a task thattheperson could do.Robots can only do what they areprogrammed to do (follow a set of instructions).

**Could be integrated with Life Skills /Creative Arts**

Link withpattern recognition(C.6) - learnersfirstneedto identifythe

pattern.

Learners canuse differentpatterns.

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Learners can afterwardsidentify eachother'spatterns.

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Eventuallylinks to R.5- learners designa 'robot' that can'do'

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something.

**R.6: Mimic the operations of a robot Examples:**

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**Links to C.3**

Learnersneed to interpret and mimic(execute) the given symbolic

Help thebaby find itsbottle.

Learners act out the threesets of instructions ona grid to seewhich set would get thebaby to the bottle.

One can extend theproblemto move one block at a lime, thenmore options canbe provided, e.g.:

**0 *1'1'***

instructions(set of arrowcommands/instructions(algorithm))

One arrowimpliesmovement until end of grid orobjectishit(not one block at a lime)

**f) *1'***



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**0 *1'***

**8 1'**

**Digital Concepts**

**0.2: Recognisethat he or she is living as citizens in a digital world**

**Limiting screentime:**Explaintolearners that theyneed to balance timespent onscreens with other activities such as playing outside, spending timewith family and friends, listening to stories(e.g.someonereadingto them), etc.

**0.3: Demonstrate an understanding of the concept of a computing device**

**Examples:**As most people, today, usedigital technologies to communicate, learn andwork, emphasisetheresponsible and ethicaluseof digital technologiesand onlineplatforms as digital citizen.Provideexamples ofresponsibleuseandbehaviour.

Ask questions about the digital technologiesthatlearners arefamiliarwith.Use, e.g.oldmobilephone to demonstratedigital technologiesand ask learners whattheyuseit for- emphasisingresponsibleusesuchas safe use, etc.

**Assessment- Term 1**

Continuous Assessment - Refer to Section 4

**Could be integrated with Life Skills**

**0.2 and 0.3 can be done together.**

Couldbe linked to when learnersmimic the operations of arobot, explaining thata mobilephoneneeds instructions(input) from theuser (interpretsinstruction-processing) to work (provideoutput).

Aspects that couldbe discussed:

* Safeuseof electronic devices
* Limited screenlime
  + 1. **Term 2**



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| Content (Grade R / Term 2) | Notes/Examples |
| Pattern Recognition(± 2 hours) | Could be integrated with Mathematics |
| C.6 Recognise and interpret patterns in symbolic sets of data or visualisations. | **Reinforce from Term 1** |
| **Identifya pattern:**Identifya completepatternpresentedas a data set (reinforcefrom Term1 using different andmore oomplexexamples/ activities)  **Recognise pattern:** Recogniseandinterpret patternsin symbolic sets of data or visualisations  **Example: Recognise apattern:**  **"II'** ••  **t** start  t **t** stop  **X**  What typeof rockneeds to be placedonthe **X** to completethepattern? | Identifya patternisreinforcedfrom Term1 as it isusedin reoognising apattern.  Patterns take variousforms and arefoundin poems, music, dance, symbols, etc. |
| **Algorithm Design and Coding** | AlgorithmDesign and Coding mostly go together. |
| C.1 Apply computational thinking skills do developa set of logical instructions to solvea problem | Reinforced from Term 1. |
| **Examples:**  Sequence the two sets of pictures.  j  }  -!  **1**  **j**  i  !•  !  **X.**  *1*  **1**  J  - ..□ ..  DBE Grade R Workbook 1 (Enqlish) - Q .t What is themissing command to be paced inthe□? | It isfurther reinforcedwhenC.2 isintroducedas ii isalsousedin Term 2with C.2.  Before a solution*I* set of instructionsispresented, it isdesignedand developedusing oomputational thinking.  (One arrowrepresentsmovement untilbarrier ishit) In Term2, C.1 couldbeusedwithC.2  **Note:**  For GradeRand Grade1, the directional arrowsimply/includea changeof direction of thesprite/character to automaticallyface the directionforfollowingthepathin whichit must continue.  Forterms1 and2 of GradeR the solutions couldbepresentedin simplisticform, i.e.anarrowrepresentsmovement forward till it hits thebarrier(nomatterhowmany steps/blocks). |



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| **Content (Grade R /Term 2)** | **Notes/Examples** |
| **Simplistic movement solution vs. Consice step movement**  (move till barrier is hit) (move with single seps / one block at a time)  .......**f** '"  **p**•• • •  ,, start  **t** stop  .,. ..., | From term3 onwards, each arrowcanrepresent asingle step/movement,i.e. onblock at atime.  **Note:**  ***Coding*** is theprocess of creating a logical set ofinstructions that a human or computing devicecanunderstand and execute,which require a deep understandingof computational thinkingandproblem solving |
| **C.2 Present a simple coding solution using symbolicor written statements that represent sequences of commands, single**  **repetitionand conditionalconstructs.** | **Links to C.1and C.3.** |
| **Example 1 Example 2**  Simplistic coding problemwith  s-oluti•onprovided and with ***Start*** and ***Stop*** events. Simplecoding problem without solution  **Whic**.**h**.**tw**.**o**.**ways sh**.**ou**.**ld tho Flurb step to get to the supplies?**  I -- I **1.-=-., I** - .. ..  I **t t**  **.J .J**  -+**.J**- ' **A** | Sometimes an activitywill combinecompetencies, e.g.combineC.2 andC.3  In thefirst example, codinginstructions are presented, andlearners needto interpret and executetheinstructions(C.3).  In the second example, learnersmust firstidentify and choose the correctarrows, thenthey canpack thearrowsin the correctorder (develop a set oflogicalinstructions(C.1) andpresent the solution (C.2) and eventuallyfollow/execute theinstructions or acting out their solution(the code) - (C.3).  In some problems, the combination of competencieshappensnaturally andintuitively and cannot alwaysbe separated.  Themore complexproblems grow, themore competencies are induded. |

**Content (Grade R / Term 2)**

**C.3 Interpret and execute a given symbolic or written set of commands**

**Example 1:**

**The bvtteffty mvst reach the flower,**

Restriction of on lnstrucllon set with only 4 lnstrucllons.

**Example 2:**

Rules for crossing the street.

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**Notes/Examples**

**Links to C.2. Can also link to R.6**

Reinforcefrom Term1

Providelearnerswitha grid scenarioand symboliccommands or a real-life scenariowithinstructions tofollowwhen crossingthe street, which theymust interpret.

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Initially thegridsizeshouldnotbe larger than3x3

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Stop

Look Left

Look right

Look left again I If no cars, cross

**Robotics I Could be integrated with Creative Arts**

1. **1Explainwhat a robot is in simple terms I Reinforce from Term 1**

**R.2 Identifydifferent types of robots** Use as prior knowledgeof whata robotis to identifytypesof robots.

**Examples:** Canbe donewithR.1

Provideexamples ofrobots andnon-robots andletlearnersidentify therobots. Thenidentify the type ofrobots anddiscuss the different tasks it performs.

**R.5 Design a simple product (artefact) based on a set of design specifications**

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**Example 1:Design a robot Example 2: Make a wiggly worm**

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Provideinstructions/specifications(visually or verbally) Bringin idea ofmovement(robot can'do' something)

Thelearnerscouldbe givenanempty template of arobot and asked tofill therobotwithpatterns. The appearanre of therobot couldbe enhancedby adding googly eyes. Small motor skills are also developedif thelearners are tasked to cut rertainpatterns to complete their robot.

The arms, legs andhead of therobot can thenbe attached to small piecesofpipecleaner.Thiswill allow theparts to be moved. The learnerscanthenin aseparateactivitybe taskedto code simple

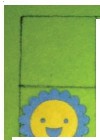
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**R.6 Mimicthe operations of a robot**

(.,' dancemoves for therobot.

https://[www.youtube.com/watch?v=xMAPpjdWQq8](http://www.youtube.com/watch?v=xMAPpjdWQq8)

**Links to coding; set of instructions (algorithm)**



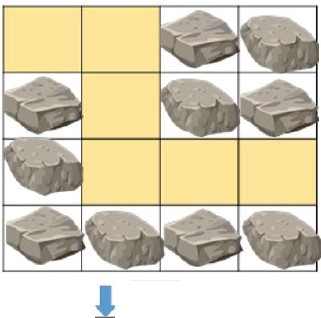
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| **Content (Grade R / Term 2)** | | | | | | | | | | | | | | | **Notes/Examples** |
| **Reinforcefrom Term1using different and morecomplex activities.**  **Example:**  . Left  **down** ; ... .. ,. **l** | | | | | | | | | | | | | | | Reinforce from Term **1**usingdifferent activities and graduallyincrease complexity of activities.  Carry out a pattern of robotic movements.  Teacher couldhighlight aspects about what arobotis suchas:   * Robot hasarms and legs. * Robot followsinstructions. * Robot can move accordingtoinstructions.   Alsolink to C.2 and C.3 |
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| **Digital Concepts** | | | | | | | | | | | | | | | **Could be integrated with Life Skills** |
| **0.2 Recognisethat he or she is living as citizens in a digital world** | | | | | | | | | | | | | | | **Reinforce and extend from Term 1** |
| **Reinforceand extendfrom Term1, e.g. Protectingpersonal information:**  Explainconcepts,usingexamples/pictures/roleplayrelevant to their dailylives, such as: What ispersonalinformation,  Whyisitimportant tokeep it private? | | | | | | | | | | | | | | | 0.2 and0.3 canbe donetogether.  Reinforceand extendfrom previous termswithdifferent examples and activities.  Aspects that couldbe discussed:   * Limitedscreentime * Protection of personal information |
| **D.3 Demonstrate an understanding of the concept of a computing device** | | | | | | | | | | | | | | |
| **Reinforce fromTerm 1.**  Learners can bringpictures of devices and explainhow the devicereceives input,whatinput Itreceives and howitprovides output and what output it provides.  How does the deviceknow what output to provide? | | | | | | | | | | | | | | |
| **Assessment- Term 2** | | | | | | | | | | | | | | |  |
| Continuous Assessment - Refer to Section 4 | | | | | | | | | | | | | | |  |

* + 1. Term 3

Content (Grade R / Term 3) Pattern Recognition:



1. 6 Recognise and interpret patterns in symbolic sets of data or visualisations.

Identify apattern: Identifya completepattern presented as a data set (repeat from Term 1&2 using different examples/activities)

**Recognise pattern:** Recogniseandinterpret patterns in symbolic sets of data or visualisations(repeatfrom Term 2 using different examples/aclivities)

**Copy:** Copy a pattern presented as a dataset

**Example:** Identify, recognise, interpret and copy (mimic) thefollowingpattern, then oompletethepattern

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Could be integrated with Mathematics Links to C.1, C.2 and C.3

Reinforce andextendfrom Term 1

Patterns take variousforms and arefoundin poems,music, dance, symbols, data, etc.

This couldbeintegratedwith Languages as well.

Patterns can have various forms: Poems, music, dance, symbols, etc.

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Patternrecognition is theprocess toidentify and extract meaningful patterns from a dataset. It involvesusing analysing a set of data to find regularities or repealing structures that canbe usedtomakepredictions, classify objects, orsolveproblems.

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Algorithm Design and Coding

* 1. Apply computational thinking skills do develop a set of logical instructions to solve a problem.

**Example:**What is themissing command to be plare in thein theblue square? • .•

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**Note:**

The first arrow is to step onto the grid andthelast arrow is to step out of thegrid.

This type of scenariois case-dependent - otherlimes theywill start from within the gridand end insidethe grid.

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Algorithm Design and Coding mostly go together.

**Links** to C.2

In C.1 a partial solutionis given, and thelearner must oompletethe solution.

Providingpartial solutions serves as scaffoldingfor developingthe oompletesolution.

C.1andC.2 iscontinuouslyreinforcedfrom previous terms

as computational thinkingisalwaysused to design and developan algorithm/solutionbefore presenting thesolution. Once theset of instructions(solution) is developed, ii canbe translatedto oode:in thisinstancearrows

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| Content (Grade R / Term 3) | | | | | | | | | |  |
| C.2 Present a simple coding solution using symbolic or written statements that represent sequences of commands, single repetition, and  conditional constructs | | | | | | | | | | Links to C.1 and C.3 |
| ••• **[,JJ••·** | | | | | | | | | | Translate(code) the solution(algorithm) intoarrows(code)­  thisis the solution to theproblem(Links to C.1) |
| **C.3 Interpret and execute a given symbolicor written set of commands** | | | | | | | | | | **Links to C.1, C.2 and C.4** |
| **Example1:Interpret code Example 2:Complete code**  Interpret the code (from the above solution), thenexecutethe code Providethemissinginstructionfor SSB to followthepath andget to the carrot.    ••• **[,JJ••·**  Once the set of instructions is developed and L: •  translatedinto code (symbolic code (arrows), another  learner can interpret it and act it out on a grid.  -*>*,*--*-*--:* ,,  i ..,,r.. | | | | | | | | | | Providevarious activities to developinterpretationand execution of code:   * Providecode for learners to complete. * Providecode that learnersneed to mimic/act out. * Providecode,leavingouta stepthatlearnersneed tofillin. |
|  | |  |  |  |  |  |  |  | if? |
| **C.4 Debug a given symbolic or written set of instructions.** | | | | | | | | | | **C.1, C.2, C.3 and C.4 are all steps** in **algorithm design.**  Once theset of instructions are acted out ona grid, it is possibleto seeifit works correctly.  If it does not work correctly, thelearnersmustfindthe problemandcorrect it.  Sometimes, activitieswithincorrect solutions shouldbe given to learners andtheyneedto findtheproblemand oorrectit as is thecase withthe examplesontheleft.  https-J[/www.kodable.com/hour-of-rode/unplooged-coding](http://www.kodable.com/hour-of-rode/unplooged-coding) |
| Which fuzzhas >the [!]  correct code? ..,  liJ  Findthe error in the giveninstructions  https:/[/www.kodable.com/hour-of-rode/unplooged-coding](http://www.kodable.com/hour-of-rode/unplooged-coding) | **Debug**  Wb•t's wro.ng.wiUI thiJpic.turc1CircleLhing$Uiatahouldn't be here.Hint there ere 7 things  Name: tlutsbouldn't behenA: ge:  -  .. **- L--:'.:**  -  •  Findthe'errors' in thegivenpicture | | | | | Find theerrorin the givenpattern.The learnerscan alsobe givenanoption to oorrect thepatternwith thenecessary object. | | | |

Content (Grade R / Term 3) Robotics

* 1. Explain what a robot is in simpleterms.
  2. Identify different types of robots.

R.5 Designa simple product (artefact) based on a set of design specifications.

**Example:**Design you ownRobot

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After designing theirrobot, learners answer questions such as:

* Whatis yourrobot called?
* Whatthingscan your robot do?
* Whatis yourrobotmade of?
* Where does your robotlive?

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Could be integrated with Creative Arts and Language

Reinforce and extend from previous terms with different examples and activities

**Could be integrated with Life Skills (Creative Arts)** Learners canideate(designthinking development) about theirrobots.

**7** .Robots Activity Booklet(Ages 5 - 7)(teacher made) - Twinkl



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1. **6 Mimicthe operationsof a robot.**

**Example:**Usingcardblockswith arrows andpictureinstructions, learnersmimic arobot carryingout instructions

**Digital Concepts**

**Links to C.3**

Robots only act uponinstructions(onlyfollowinstructions). Thelearner can act as arobot and act out theinstructions providedto therobot. Instructionscouldbe in symbolic or writtenformat or verbal.

Could be integrated with Life Skills and Language



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| **Content (Grade R / Term 3)** |  |
| **D.2 Recognisethat he or she is living as citizens in a digital world.** | **Link to D.3** |
| **Possible discussion:**  **Limit screen time**  Need to balancelime spent onscreenswith other activities such as playing outside, spendinglime with family andfriends, listening to stories(e.g. someonereading to them), etc.  **Protecting personal information**  Whatispersonal information?  Whyisii important to keep ii private? | Reinforce and extendfrom previous termswith different examples and activities.   * Limited screentime * Protectionofpersonal information |
| **D.3 Demonstrate an understanding of the concept of a computing device.** | **D.3 can be done in relation to D.7** |
| **Example**  A computingdeviceis amachine thatcan receive input, do somethingwith theinput and providearesult or output,for example, amobilephonecan be used to play games or watch videos thatis stored on thephone. | Reinforce and extend from previous terms.  A computingdevicereceives input, whichresultsin output after processing. |
| **D.7 Present a basic understanding of the concept of input processing and output.** | **Link to D.3** |
| **Example**  Usingamobilephone, illustrate the concepts ofinput andoutput: a touch screen serves as bothinput and output device. To get output, theuser must provideinput, e.g.pressingthephoneicon.  Demonstrate,usingamobilephone or remote-<:ontrol toy,howinputresults in output. | Reinforce and extendfrom previous terms withdifferent examples and activities Input triggersinstructions that resuIts loopin output.  Output couldbe on the screen or throughearbudswhen  listening to music. |
| **Assessment- Term 3** |  |
| ContinuousAssessment - Refer to Section4 |  |

* + 1. **Term 4**



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| **Content (Grade R / Term 4)** | | **I Notes/Examples** |
| **Pattern Recognition** | | **I Could be integrated with Mathematics or Language** |
| **C.6 Recognise and interpret patterns in symbolic sets of data or visualisations. Reinforce and extend from previous terms, gradually Identifya pattern:**Identifya completepatternpresentedas a data set (repeatfrom Term**1**usingdifferent examples/activities) **increasing complexity.**  **Recognise pattern:** Recogniseandinterpret patternsin symbolic sets of data or visualisations.  **Copy:**Copy apatternpresentedas a dataset **Complete:**Completeapatternpresentedas a dataset **Example:**Completethepattern | | |
| **Algorithm Designand Coding** | **I AlgorithmDesignand Coding mostly go together.** | |
| **C.1Applycomputationalthinking skillsdo developa set of logicalinstructionsto solve a problem. Reinforce and extend from previousterms using**  **C.2 Present a simple coding solution using symbolicor written statements representing sequences of commands, repetitionand different activitiesthat gradually increase in conditional constructs. complexity**  C.3 **Interpret and execute a given symbolicor written set of commands** | | |
| **Example 1:Pictures communication for washing hands** First example:learnersneedto sequencepicturesin the correct  order.  \) Secondexample:learnersneedto interpret theinstructions  **/1\ DI 6** providedandpack themonthegridto get the dog home.  = **n --www**  **Example 2: Note:**  Use the arrowcardsprovidedandpack themin the correct sequenceso thatthe dog canreturntohishome. Example 2 is anexample of a Parsonspuzzle type of problem.  Then*ad* as the dog andfollowyour instructions on thegrid. Interms of problemsthatprovidea partial solutionwhere some code instructions aremissing andlearnersmustfillin themissing  ... **tt Note:** code instructions, the ooncept of ParsonsPuzzles oouldbe helpful as ii provides scaffoldingfor learningprogramming. It  The aboveproblemhasmore than one solution(route) helpslearners to developlogical thinking,  ... Asklearnershowmanyroutes canbepackedusing the The concept is atype of scaffoldedprogramoonstruction tasks availablecards. wherethelearner isgivena set of code blocks of asingle or  Let learnerscomparetheir solutions and discuss their different multiplelines of code, and the task is to piece together aprogram  routes. from theseor to fillin missing oode from these.  Parsonsprogrammingpuzzlesare anevidence-basedteaching practicethatreducesthe oognitiveloadandlime spentfor learners(Parsons&Haden, 2006).  **Example3:**Pack thecardsprovided andput themin thecorrectsequence so that the dog canfirstpickupitsboneand thenreturn to itshome. | | |



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| **Content (Grade R / Term 4)** | | | | | **Notes/Examples** |
| ... ...  ... **t**  ......  **Example4: Provide missing code**  Followtheinstructions andprovidemissingcode from thecode instructionsprovided '°"  SiphoSuper Bunny(SSB) needto collect the carrot.Fillin themissinginstructionsfrom thecode providedin theright:  **'U'¢=3**  **L** - -- - •  ***t*** L:.• I **r** I *I'*  -,,�  **l**.-.1.   1. :... - -   §J□§J[ID□ **c:¢{].,**  **1'** ¢:, | | | | | Third example:Now, the complexitycanbeincreasedby adding obstades (fire) andlimitations/conditions(mustfirst pickupthe bone).Thelearner mustinterpret the grid and theinstructions provided, thenpack the arrowsin the correct sequence to solve theproblem.  ThelearnernowmustuseC.1, C.2 andC.3in combinationto  complete the task, which alsoincreases complexity. Can alsolinktoR.7  **Note:**  Complexity of problems can alsobe increasedby   * providingmore arrows thanrequired and/or * a bigger grid with limitations that rule out obvious solutions and/or * Provide code withmissinginstructions |
| **C.4 Debug a given symbolic or written set of instructions.** | | | | | **Link to C.1, C.2 and C.3** |
| **Example:1**  Tumelousedthefollowinginstructions to solve theproblemontheright.  ........  Act it out theabove instructions to see if it iscorrect.  If it isnot correct,findthe error andcorrectit.  **Example2 (pairprogramming)**  Alearner/group oflearners areprovidedwith a gridwith obstacles and a set ofinstructions to meet anoutcome. Onelearner act as arobot and execute(act out) theinstructions developedto seeifit works.  If thereisamistake, thenext learner/group oflearnersmust debug andcorrect, thentest again...repeatuntilii is |  |  | **it** |  | Provide anincorrect set ofinstructions tolearnerswhich they  need to act ii out to determineif the solutionis correct, find the error and correctii. |
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| correct | | | | |

**Content (Grade R / Term 4)**

* 1. **Evaluate a given solution towards potential improvement.**

**Example 1**

Providelearnerswith two possible solutions/algorithms/set of instructions, e.g.routes ona grid that achieve the same outcome. Let themact both out anddecidewhich oneis thebest /most efficient (shortest) solution.

**Example2**

Providelearnerswith a set ofinstructions to find anitemonagridthat couldbe shortened(not the shortest route to theitem). Ask themto determineif thereisapossible shorterroute, andprovide the shorterrouteinstructions

**Notes/Examples**

**Links to C.1, C.2, C.3 and C.4**

Assess 2-3 solutionsprovided foreffectiveness and determine which is themost effective and

Assess a solution/set ofinstructions to see ifit couldbe improved, e.g.shortened.

**Robotics I Could be integrated with Creative Arts and Language**

* 1. **Explain what a robot is insimple terms. Reinforce and extend from previous terms with**
  2. **Identify different types of robots. different examples and activities**
  3. **Present an understanding of how robots affect the world. I Link to R.1and R.2**

**Example**

Asklearnershow they thinkrobots canhelporharmus.Discusspossibilities such as robots doingwork in dangerousplaces where humanscannot go, robots usedin industryfor assemblingcars, etc.

* 1. **Design a simple product (artefact) based on a set of design specifications.**

**Example activity:**

Robots are changing theworld by helpinghumans do thingswith greater efficiency and doingthings thatwere not possible before

**Can link to R.4**

Learners shouldideate about their robots:who they areandwhat

Robot with cardboardandpaper pins /split pins withmovingarms andlegs.

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they can do,howtheycanhelppeople.

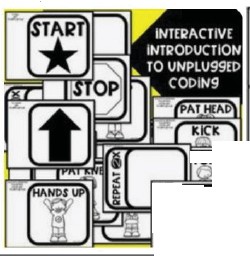
LinkingtoR.4, letlearners explainhowtheir robot will affect the world, answeringquestions about theirrobots(the explanation canbe integratedwith Language).

Addingstringtomake theparts move, thelearnerscanwrite symbolic oode using coding cardsfor therobot to perform instructions. Such as, move right arm, move left armetc.

* 1. **Mimicthe operations of a robot.**



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**Example activity**

Useinstructioncardswith pictures/images ona gridtolay out instructionsfor arobot thatlearnerscan *ad* out. Incorporatelimitations such as obstacles/noiJO areas, etc.

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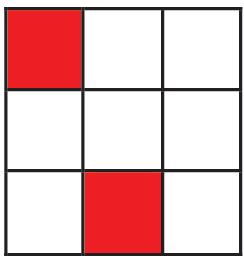
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**Link to C.1, C.2, C.3**

Addinglimitations and obstaclesincreasesthe oomplexity of the task, e.g. *no-go* areas such as redblocks indicatinghot lava





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| **Content (Grade R / Term 4)** | **Notes/Examples** |
| **R.7 Create test and execute a set of robotic instructions.** | **Links to C.1, C.4 and C.5** |
| **Example:**  Providea gridwith a problem tobe solvedusingcoding cards.   * Learners solve theproblem by developing the algorithmand codingitusingcoding cards. * Learners then execute (implement) their solution onthe grid to test it. * Leaners thencorrect their solution/instructionsif not correct | Reinforce and extendusing different activities- see previous  examples. |
| **Digital Concepts** | **Could be integrated with Life Skills and Language** |
| **D.1 Outline the concept of technology and purpose of information technology (IT).** | **Link to D.2, D.3, D.7** |
| **Examples** of technologyincludecomputers, smartphones, TVs, video games andeven 'robots' thatperform specific tasks.  Information Technology(IT)is a type of technology that dealswith information, suchas data,images, and sound. ITindudes thingslike computers, software, and theinternet.  The**purpose** of ITis to helppeople access anduseinformationmoreeasily and efficiently | Technology isall aroundusandwe useit every day to  communicate,learnand havefun. Provideexamples of technology |
| **D.2 Recognise that he or she is living as citizens in a digital world.** | **D.2 and D.3 can be done together.** |
| **Limit screen time**  Need to balance time spent onscreenswith other activities such as playing outside, spending time with family andfriends, listening to stories(e.g. someone readingto them)  **Protecting personal information**  What ispersonal information?  Why isitimportant to keep itprivate? | Reinforceand extendfrom previous termswithdifferent examples and activities.   * Limitedscreentime * Protection of personal information   Teaching young children about theimpactand dangers and  benefits ofbeing a digital citizen is anongoingprocess that requiresregularreinforcementusingvarious examples |
| **D.3 Demonstrate an understanding of the concept of a computing device.** | **D.3 can be done in relation to D.7** |
| **Reinforce from previous terms**  Input triggersinstructions thatresult in output - demonstrateusingvarious types of output devices(screen, microphone/earbuds) for different types of output such as text, sound | Reinforceand extendfrom previous termswith different examples and activities. |
| **D.7 Present a basic understanding of the concept of input processing and output.** | **Revise and reinforce from previous grades using**  **different examples/devices/pictures and activities.** |
| **D.8 Interpret a pattern to represent or communicate a message or image.** | **Links to C.6** |
| **Example** Colour dots to represent instructions and create an image  Theimagebelow provides amessage about tomorrow'sweather.Use the colour codes to colour the  ***Cek..r* lN tMf'" e<>W 11rth.dc,t., io- ..l-.,1,,tM p<-t<.r•a**  blocks/shapes andinterpret themessage provided after colouring.  *•I •*  • •  ' • ,,r-...\_ •  • • **•**.1•'  •"-.•/ • I I•  • • • •  '------'---"''"-----L--J...•.J,**-**•**t**,  ILM.J•l.K ::,,;ir [..l.t,:  DBEGrade R Workbook 2 (English) - |  |



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| **Content (Grade R / Term 4)** | **Notes/Examples** |
| **D.9 Create a patternto represent or communicate a message or image.** | **Done in relation to C.6 and D.8** |
| **Example:**  Use a pattern to communicate, e.g. learner showing a blue circle with a red square to indicate that , n ,? /1  he/she is thirsty and needs to go to the bathroom. *I/£,* r.-0 I\  Use hand symbols: ' - )  \ I ) ' I  pencil silence water bathroom question | learnerscouldusesymbols to communicateto teacherin class |
| **Assessment- Term 4** |  |
| Continuous Assessment - Refer to Section 4 |  |

**Note:**

In termsof coding, typically, problems couldrequirelearners to

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work through(trace)/ act out code (execute) to determine the output or correctness, followedby debugging the code ifnecessary provide missing codeinstructions(code instructions areprovided with some instructions or code elementsintentionally omitted) choose the correct solutionfrom2-3coding options

compare different solutions to evaluate their efficiency

translate verbal/writteninstructionsinto code (e.g.from instructiontopacking arrows)

rewrite a set of codinginstructions to be more efficient, e.g. indicatingnumber of times aninstruction shouldbe repeatedinsteadofpresenting each stepsequentially or develop the solution algorithm(code instructions) themselves through the stages ofplanning, testing and debuggingusingcomputational thinking.

depending on the competency thelearner needs to demonstrate

* 1. **GRADE 1**



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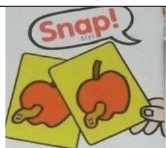
**Note:**

Teachers must include the following competencies and content in their Annual Teaching Plans (ATPs), distributed across the terms and sequenced, organised, grouped (and synergised with other subjects in Grade 1, where applicable), and in a manner that will facilitate learning, ensure ample retrieval and deliberate practise, with feedback to ground principles and concepts, maximizing the learners' learning outcomes and achievement, whilst also ensuring a gradual learning curve, in a way that will make optimal use of available time and resources.

* + 1. **Term 1**

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| **Content (Grade 1 / Term 1)** | | **Notes/Examples** |
| **Pattern Recognition** | | **Could be integrated with Mathematics or Language** |
| **C.6 Recognise and interpret patterns in symbolic sets of data or visualisations.** | | **Reinforce and extend from Grade R** |
| Learnerscan recognise and interpretpatterns with shapes, colours, or both.  *LL LL*  **Or** numbers, e.g. **1 2 3**  **Or** objects **.t** ,. ,.\_**a** | | C.6develops**pattern recognition** (part of oomputational |
| thinking) thatis eventuallyusedto developcoding solutions as |
| part of computational thinkingtoidentifypatternsin thecoding |
| problemand/or data by identifying similarities or differences that |
| canhelp to solve theproblemor refine the algorithm. |
| **Algorithm Design and Coding** | |  |
| **C.1 Apply computational thinking skills do develop a set of logical instructions to solve a problem.** | | **C.1 and C.2 can be done together** |
| **C.2 Present a simple coding solution using symbolic or written statements representing sequences of commands using single** | | Reinforceand extendfromGradeR |
| **repetition and conditional constructs.** | | **Note:** |
| **Example 1**  Draw the missing arrows to show the futz how to get through themate  II  **+,1** II **II II II** II I  https:/[twww.kodable.com/hour-0f-<:0](http://www.kodable.com/hour-0f-)de/unplugged-<:Oding  **Example 2- Picture Story**  Retell a storywith3 to 5pictures that learnersputin sequence. | Note:Moveuntil barrierishit (not one block at a time) |
| Mostly,for Grade1, likeGradeR, the directional arrows |
| imply/indude achange of directionof the sprite/character |
| automaticallyfacing the direction to followthepathin whichit |
| mustcontinue. |
| **Note:** |
| A codingsolution(program) is a sequence of symbols |
| (instructions) thatspecifies a specific task tobe completed |

**Content (Grade 1 / Term 1) Notes/Examples**



**St.cp Sequencing**

**8r.:«k\_/lut Cards**

https://www.twinkl.oo.za'resource/t-s-1640-7-step-seguendng-<:ards-eating breakfast

**C.3 Interpret and execute a given symbolicor writtenset of commands**

**Example 1:** Game-basedrules andcommands suchas the game ofmatch two cards or Snapcanbe presented and conceptualised.

**Example 2:** Followtheinstructions andprovidemissingcode from thecode instructionsprovided

Sipho SuperBunny(SSB) need to oollectthecarrot.Fill in themissinginstructionsfromthe code providedin theright:

**Example3** - **Providethemissing code**

Sipho SuperBunny(SSB) needsto collect the carrot.

Thefollowingcode isprovidedfor SSB to get to the carrot.

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**Link to C.1 and C.2**

Reinforceand extendusing different andmore oomplexactivities

**Note**

Toensure anaoceptablelearningcurve/ progression, teachers caninitiallyprovide oode that learnerscan choosefrom, e.g. providelearnerswith thefollowing to code instructions to choose from tofillin themissing oode, e.g.

As learnersprogress, theycouldbe expected to fillin missing instructionswithout giving theminstructions to choosefrom.

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| --- | --- | --- | --- | --- |
| Study thegridontheright andprovidethemissingcode instructionfor SSB to collect the carrot, |  | **.**.**-.-.ii...**  **LiiJ....** | |  |
| **Robotics** |  |  |  | **Could be integrated with Creative Arts or Language** |
| **R.1 Explainwhat a robot is insimple terms.** |  |  |  | **Link to R.2** |
| **Example:**Explanationscouldincludeaspects suchas:   * A robotfollowsinstructions/ canbe 'programmed'. |  |  |  | Reinforcefrom GradeR  Learners explainwhata robot isin their ownwords, according to |

* + A robothasdifferent parts.
  + Robots canperformactions acoordingtoinstructions.

their ownunderstanding.

Teacher can ask questions to elicit answers.

**R.2 Identify differenttypes of robots. Link to R.1**

Reinforcefrom GradeR using examples such as:



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* Domestic, e.g.robot vacuumcleaners
* Industrial, e.g.robots thatassemblecars
* Education, e.g. to learn to oode such as programmablerobotslikeLEGO Mindstorms andDash andDot

Learners shouldunderstand thatRobots can come in all shapes and sizes,from tiny ones thatdeanfloors to giant ones thatbuild cars!Theyhave different parts, likeabrain(calleda computer), eyes (calledsensors), and arms andlegs(calledactuators) thathelpthemmove andwork

Reinforceand extendfrom GradeR

Providepictures of different types of robots and discuss the'work' that theydo.



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| **Content (Grade 1** / **Term 1)** | | | | | **Notes/Examples** |
| **R.5 Designa** simple product **(artefact) based** on **a set of** design **specifications.** | | | | | **Link to R.1 and R.2** |
|  | | . | | |
| **Example:** |  |  | | | Learnersideateabout theirrobots.  Who theyare,whattype they are andwhattheycan do, howthey canhelppeople.  (theideationcanbeintegratedwithLanguage).  One oould addstrings, e.g.to the arms to make the armsmove andlearnerscouldwrite symboliccodeusingcoding cardsfor the robot to performinstructions. |
| Usingpaperpins/ split pinsanda design template | ***S>***g | .. }  '-  1- r  *I)* | ,-I | I |
|  | | I r,, | | |
| **Digital Concepts** | | | | | **Could be integrated with Life Skills or Language** |
| 0.2 Recognise that he or she is living as citizens in a digital world. | | | | | Reinforceand extendfrom GradeR withdifferent examples and activities.  -limit screenlime  -protectourpersonal information |
| We livein a technology-drivenworldwithcomputingdevires all aroundus.  **Example:**Weneed to:  **Limit screentime**  Need to balancetime spent on screenswith other activitiessuchas playing outside, spendinglime withfamily andfriends, listeningto stories(e.g.someone reading to themor start reading themselves as soonas theycan),  **Protectingpersonalinformation**  Whatispersonal information,  Whyisit important to keepit private? | | | | |
| **0.3 Demonstrate an understanding of the concept of a computing device.** | | | | | **Links to D.2** |
| **Example**  Use learners' pre-knowledgeabout the ooncept of input-prooossing-output to explain,in simple terms,whata oompuling deviceis.  **Possible explanation**  A computing deviceis something you canuse to do thingslikeplay games, watch videos, or talk topeoplewho arefar away.  Computing deviceshave screenswhere youcan see whatyou aredoing, and youcanusebuttons on touch screens to control the device They alsohave somethingcalledaproressor thathelps themto do thethingswe want themto do. | | | | | Extendfrom GradeR  A computing deviceis amachine that canworkwithinformation suchas numbers, words,pictures, moviesorsound.This informationisalso calleddata. It can also storeinformation/ data suchas aphonenumber or photos and can display the information or data if you give the correctinstructions.  A computing device can alsodo oomputationsand canproress  data very quickly. |
| **Assessment** - **Term 1** | | | | |  |
| Continuous Assessment - Refer to Section 4 | | | | |  |

* + 1. **Term 2**



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| **Content (Grade 1 / Term 2)** | | | | | | | | **Notes/Examples** |
| **Pattern Recognition** | | | | | | | | **Could be integrated with Mathematics or Language** |
| **C.6 Recognise and interpret patterns in symbolic sets of data or visualisations.** | | | | | | | | **Link to C.1** |
| **Example 1:** Completethepattern  **5 6 7** - - **10**  **Example 2:**What colour/swill thelast doll's shoesbe?  ***T"* r\** ''\ *I'* **r\** *?"* ''\ Example **1:**Patternrule: **+1**(count in ones).  '" '" ***,J*** '" ***,J*** '" ***,J*** '" ***,J*** Example 2:Patternrule: yellow, pink, yellow,pink...  **fl *1\***, *('\* **fl** *\_(\* **fl *1\ .1\* /l** *\_(\* **fl *1\***  !\  \ *I I I I* \  ***7***  ***C* b c:: b *C* b b *C* b**  StickFigureKidsCliRArt - CliRarts.oo  **Example3**  What arethe steps youfollowto buy thingsin astore, e.g. selectproducts, scan at till, packin bag,pay cash orwithcard.  Learners can communicatetheir pattern ormakeuse of pictures to demonstrate thesequena:lof events, e.g.providea selection of picturesin randomorder demonstratinga personwith a trolley, acashier scanningitems, apersonpaying at the till, itemsbeingpackedin bags | | | | | | | | Byidentifyingpatterns,we canpredictwhat will comesnextand whatwill happen again and againin the sameway.  A patternmay benumerical, visual orbehavioural.  Patternrecognition eventuallyleads to analysingpatternsin data. |
| **Algorithm Design and Coding** | | | | | | | |  |
| **C.1Applycomputational thinking skills do develop a set of logicalinstructionsto solve a problem.** | | | | | | | | **C.1 and C.2 can be done together** |
| **Example:**Learners developa solutionusingcomputational thinking. Providelearnerswith directional cards.  Learners developa set ofinstructionsfor thedog topickup thebone andgo home, using the cardsreceived. | | | | | | | | Learners createtheir own solutionsusingcode cards(arrows, letters, words)which theypresent.  **Note:**  A problemsuchas this examplecouldbe adapted to ensure that thereis only onesolution or when more than one solution, one route *may*be more effective(shorter), askinglearners to evaluate the effectiveness(shortestroute) andrecommend themost effectiveroute, etc. |
|  | **w** |  |  |  | | | |
| +-  **f+-** | | **Note**  Fromthe arrowsprovided, thisproblem |  |
|  | **it** |  |  | ... ..... | couldhavemore than one solution.  Let learners evaluate and discuss their solutions. |  |
|  |  | \_/- |  |
| **l l** | | |
| **C.2 Present a simple coding solution using symbolic or written statements representing sequences of commands, single repetition, and conditional constructs.** | | | | | | | | **C.2 and C.3 can be done together** |



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| **Content (Grade 1 / Term 2) I Notes/Examples** |
| **C.3 Interpret and execute a given symbolic or written set of commands** Theconceptofrepetitioncodingconstruct(loop)isintroduced  I usingnumbersbelowthearrows.  **Example 1: Example 2:** Thenumberbelowthearrowindicates thenumberof times the SiphoSuperBunny(SSB) canonlymove oneblockat a time. SSBmust walkalong thepathandcollect all thecarrots.Studythe instructionmustberepeatede, .g.  mustfollowandhowmany times SSBmust carryout each I ***,--1\- ,--1\-***  Study theimagebelowandwritedown theinstructionsSSB followingimageandanswer thequestions thatfollo hasthe samemeaningas  instructionto get to thecarrot. 1***J'*** / I *'---y' '---y'* 2  *,:* - Thelearnersin grade**1**canalsosubstitute thearrowsymbols withcharactersrepresenting variousactions.  L1. **ti** i=> Forward  --- ., ---  **jl' Down**  -- *11* \_.,- ir **UP**  L: **. :::...:....·l**.,.. . , I ¢=i **L** ert  Thesolutionfor Example**1**canthereforealsobe representedas:   * How manycarrotshaveSSB collectedwhenit reaches the -**f**·**l**·**m**-··**m**- **U F**   >«: mushroom? **3) (2) (2)** I I  I • How many carrots will SSB have collected when he reachedtheendof thepath? |
| **Robotics{± 2 hours) I Could be integrated with Creative Arts** |
| **R.1Explain what a robot is in simpleterms.** R.1, R.2 andR.3canbe done together  **R.2 Identifydifferent types of robots.** First learnersexplainwhata robotis andnamedifferent types of  **R.5 Designa simple product (artefact) based on a set of designspecifications.** robotswhichcangive theminspirationfor designingarobot(R.5).  **Example:** Then, provideinstructions to design/drawarobot  Providedesigninstructionsfordesigning/drawingtherobot Thentheycanideateabout thetype of theirrobotw, hatitcando andhowit willimpacttheworld |
| **R.6 Mimicthe operations of a robot. I This happens in relationto C.1, C.2, C.3 and C.4**  Some activities could be reused andpresentedin a game board format In the examplebelow -- .;,. . Learnersusedirectional codingcards to pack out theinstructions coding cards are printed andlaminated and SSB isheldup with a paper binder. Thelearners --------= j- and thenact out thecodinginstructions.  can each be presented a set of coding cards.  The different laminatedmazes can be exchanged. The coding cards andicons are reusable. Some codingcards may be left blank where instructions could be added and wiped off. |





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| **Content (Grade 1** / **Term 2)** | **Notes/Examples** |
| **Digital Concepts** | **Could be integrated with Life Skills and/or Language** |
| **D.1Outline the concept of technology and purpose of informationtechnology (IT).** | **Reinforce and extend** |
| Technologyis designedwithapurposeof solvingproblemsthatmeet humanneedsandwants.Itrefers to tools,machines, or devices thatmakeour liveseasier or better.  **Examples** of technologyincludecomputers, smartphones, TVs, videogames andeven'robots' thatperformspecific tasks.  InformationTechnology(IT)is atypeof technologythat dealswithinformation, suchas data,images, andsound.ITindudes thingslikecomputers, software,and theinternet.  The**purpose** of ITis to helppeopleaccess anduseinformationmoreeasilyandefficiently. | Reinforcefrom GradeR usingdifferent examplesandactivities. Technologyisallaroundus, andweuseit everyday to communicate,learn, andhavefun. |
| **D.2 Recognisethat he or she is living as citizens in a digital world.** | **Link to D.1** |
| **Interact appropriately with others online.**  **Using appropriate examples/role play, discuss:**  Whatdoes itmean to interact online?  Whyisitimportant to treatother withkindnessandrespect?  Emphasisesafepracticessuchas not sharingpersonalinformationandlimitingscreen time. | Reinforcefrom previous terms:  LimitScreen time andProtectPersonalInformation Extendto:  Interactappropriatelywithotherswhenonline |
| **D.3 Demonstrate an understanding of the concept of a computing device.** | **Reinforce and extend from Grade R** |
| Provideexamplesandpicturesof oomputingdevicesandexplainwhatmakes thesedevicescomputingdevices.  **Example:**  A computingdeviceis amachine thatcanreceiveinput, do somethingwith theinput andprovidearesult oroutput,for example, a mobilephonecanbe usedto playgames or watch videos thatis storedonthephone.If youprovide theoorrect instructions, it canopen the videoso youcanwatchit. It canalsodo some mathematicssuchas calculations. | Reinforceandextendfrom previousgradesand termsusing d ferent examplesandactivities |
| **Assessment-** Term 2 |  |
| Continuous Assessment - Refer to Section 4 |  |

* + 1. **Term 3**



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| **Content (Grade 1 / Term 3)** | | | | | | | | | **Notes/Examples** |
| **Pattern Recognition** | | | | | | | | | **Could be integrated with Mathematics or Language** |
| **C.6 Recognise and interpret patterns in symbolic sets of data or visualisations.** | | | | | | | | | **Reinforce and extend from previous terms** |
| **Example:** What colour/swill the last doll's shoes be?    StickFigureKidsClipArt - Cliparts.co | | | | |  | The first dollhastwo yellow shoes.  The second dollhas one yellowand onepink shoe. The third dollwill thenhave two pink shoes.  If thefourth dollhas onepink and onepurple shoe, thef th dollwill have two purple shoes. | |  | Identifythepattern rule to predict thenext doll's shoe colours. Adapt activities to suitlearners' level. |
| **C.7Create or complete a pattern to represent a data set.** | | | | | | | | | **Link to C.6** |
| **Example 1:**  Brushing your teeth:Give learners a set ofinstructions consisting of pictures. Leave out important steps, e.g. taking the cap off the toothpaste tube. Theymust pack the activityin sequence andthen test and debug.  **Example 2:**  Learnersfollowinstructions/patterns to design their ownfruit basket pattern, by sticking and cuttingcolouredpaper in alternatepattern formations.The final product is thencutout and presented. The completedpattern can thenbe usedas part of alarger design. | | | | | | | |  | Learners to order into correctsequence and complete the sequence. They can only test they execute the code (do it themselves). |
| **Algorithm Design and Coding** | | | | | | |  |  |  |
| **C.1Apply computationalthinking skills do develop a set of logical instructions to solve a problem.** | | | | | | | | | **Link to C.2** |
| **Example:**Developinstructions for the dog to firstpick up the bone and then go home.Dog starts walkingin the direction itis facing andmust  avoid the tree. \_. | | | | | | | | | Reinforceand extendfrom previous termsusing different activities that graduallyincreasein complexity, e.g. codinga problem ona gridwith obstacles or limitations.  **Note:**  Thisproblem canbe adapted to provide more directional cards (or none- openended) and then ask learners to find the shortest route or to find all theroutes, comparethe different routes and identify the shortestroute, etc. |
|  | **w** |  |  | **t 1** | \_**1**. | **Note:**  Though thereis more thanone possible route, the directional cards provided limit the possible solution(s) | |  |
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**Content (Grade 1 / Term 3)**



* 1. **Present a simple coding solution using symbolic or written statements representing sequences of commands, single repetitionand conditional constructs.**

**Example 1:**

learners act out code (solutionin C.1) to see if ii iscorrect.

**Notes/Examples Link to C.1**

**Learners can act code developed in C.1.**

Picturestories arepresentedin a logical order (sequenced correctlywith a beginning and anend).

**Example**2- PictureStory

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Everysequencehasabeginning,amiddleandanend(just likeastory).

When ***sequencing,*** we learn about patterns andrelationships,

and to understandthe order of things.By learning to sequence,

I I **Beginning**

I I

I I What isthe first step?WheredoI start?

I I

I I

I I

I I **Middle**

I I

I I

we develop the abilityto understand and arrangepurposeful patterns of actions,behaviours,ideas, or thoughts that supports thelogical sequencing of oodinginstructions.

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What are thein-betweensteps? What is theorder of these?

**First Next Then last** r· **End**

* 1. **Interpret and execute a given symbolic or written set of commands**

What isthe finalstep?How doesit end?

**Link to C.1and C.2**

**Example1**

**Sequencing & Problem solving**

In the DBEMath English grade 1 vvorkbook (p 69) the days of the week are given in sequence. Such an exercise can easily be converted to a sequencing and problem-solving activity. The example below can be

phrased asa problem as follows:

SSB must identify the days of the vveek in the correct order. How should SSB walk to crosseach day but not cross the some tile twice?

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**Example 2**

Study the following image and answer the questions that follow.

|  |  |
| --- | --- |
|  | |
|  | **C** |
| */t-:\_tp IP*  **B**  *14/*  **A** *7fl* | |



learnersinterpret and execute oode / pretendtobe robots followinginstructions

**Note**

Evidence suggeststhatpupils shouldbe taught - initially

at least - in smallbite-sized chunks. These steps in thelearning process shouldbewell-thought outand gradual as well as allow plenty of opportunityforpractise(see, forexample, Rosenshine, 2012; Coe et al., 2014; Sealy, 2019).

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**u.>d**

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How may carrots will SSB hove collected if he stands on block A?

**4'** Sot,I.MOj



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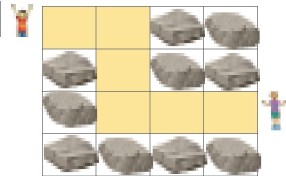
d How may carrots will SSB hove collected if he stands on block B?

'Ci/ How may carrots will SSB hove once he as collected

all the carrots?

'Ci/ The carrots follow a certain pattern how many carrots must be placed on block C to complete the pattern?

**Content (Grade 1** / **Term 3)**



**C.4 Debug a given symbolic or written set of instructions.**

Which solution A, B or C is correct to have Ben meet Thatho?

.. **A •••••••**

**B ••••••• C**••••• -+-+

**Example 2:**The dog mustpick up thebone andgo home. Execute the code provided and debugifnecessary.

***-,.,t***

**111A ......l l ... t ...**

**Notes/Examples**

**Link to C.1,C.2 and C.3**

Learners evaluateand/or execute different solutions tofindthe correct solution.

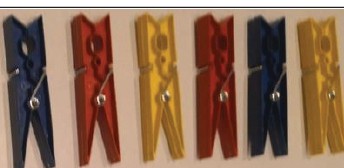
**Note:**

Thechildmust firststep onto the grid(using one arrowor stepping onto) andin the end step outside(using on arrowfor stepping outside)

Note:thelearner must first step

Test anddebug:

leaners execute code, find the error, and oorrectthe oode

C.7 Recognise and interpret patterns in symbolic sets of data or visualisations.

Create a code for eachcolour peg e.g. (8,R, Y). Write down thecode set BRY BRY R BY Debug the code set BR YBR Y BR Y

**Robotics** (± **2 hours)** I **Could be integrated with Creative Arts or Language**

* 1. **Explain what a robot is in simple terms.** Reinforceand extendfrom previous Grades and Terms using
  2. **Identify different types of robots.** different examples and activities.
  3. **Outline the different components of a robot** R.1, R.2 andR.3 canbe done together using various examples of

**Example:** robots.

Showlearnerspictures of robots andnon-robots. Then theyidentify therobots andidentify the different components of therobots. Robotscanhavea bodya, rmsandhandss, ensorsa, Learners explainin their ownwords what arobot is, acoordingto their understanding, while the teacherprompt with *what,why* and *how* questions source, wheelsorlegsandattachments.



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| Content (Grade 1 / Term 3) | | Notes/Examples |
| R.5 Design a simple product (artefact) based on a set of design specifications. | | Link to R.1,R.2 and R.3 |
| Example: Make a string pull robot.  Pack out robot with blocks I Trace blocks (parts that Cut out parts and glue Cut out robot Turn robot face down. make up robot) onto onto white paper Use two strawpieces and  paper/ cardboard stick to back.  Use string to manipulate 'robot'   * J.   .w  **n** - - - -  Implement and test thedesign  - ii ***pr .*** --,-:.ir..!'-•.•••.511111  • | | This activityinvolves steps andinoorporates several skills.Each learnerfirst designs their own geometricrobot using existing shapes(from a shapeset) onpaper.Then theseare traced and cutout on oolouredpaper (developingfinemotor skills) thenstuck to a cardboardand cut out again.Two pieces of straware attached witha stringin a0 shapewith stops added(two small pieces of straw)  Attachingthe top to a wall andpulling the stringswill result in the robot moving.  Learnersideate about theirrobots:   * What they can do * How theycan impacttheworld * How theycan be improved |
| R.6 Mimic the operations of a robot |  | **LinktoR.7** |
| **Example:**  Learnerpretends thatheor sheisarobot that hasbeenprogrammed to pick up and sort objectsby colour andfollowthefollowing steps:   1. Pretend to turn on thepower (e.g.Battery) 2. Use their sensors to "see" theobjects thatneed to be sorted. We might have acamera or other device to detect colours. 3. Usingtheir arms andhands,pick up oneobject at atime andexamineit to see what colouritis. If it'sblue, wewould place it in the"blue" pile. Ifit'sred, we would place itin the"red' pile, and so on 4. Repeat thisprocess until all the objectshavebeen sortedinto their respectivepiles. 5. Once finished sorting, sensors are used to check and make sure that all the objects have been sorted correctly. If there are any errors, pick up the misplaced objects andmove themto the correct pile. 6. Turn off thepower to oonserveenergyfor thenext task | | Learners act as robots and executeinstructions |
| **R.7 Create, test and execute a set of robotic instructions.** | | **Link to R.6, C.1, C.2, C.4** |
| **Example 1:**  Use the arrow cards provided andpack themin the correct sequenceso thatthe dog canreturn tohishome. Then act as the dog andfollowyour instructions on thegrid.  Seehowmany alternativeroutes you canpack with the same cards. | | Learners use the arrows provided to solve the problem. Learners can compare their solutions to see if the problem could have more than one solution.  Challenge learners tofindall thepossible solutions. |



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| **Content (Grade 1 / Term 3)** | | | | | **Notes/Examples** |
|  |  |  | **A** | ........ **t t**  How many possible routes couldbe packed using thearrowsprovided? | Ask learnersif any of the solutionsismoreefficient than the  others. |
|  |  |  |
| **w** |  |  |
| **Digital Concepts(± 1 hours)** | | | | | **Could be integrated with Life Skills and/or Language** |
| **D.1 Outline the concept of technology and purpose of informationtechnology (IT).** | | | | | **Link to D.2, D.3, D.4 and D.7** |
| **Possible discussion:**  **Technology**  Technology refers to the tools, techniques, andprocesses that areusedto create, develop, andimproveproducts, services, andprocesses. Technology isused to solveproblems,improveefficiency, and enhance productivity.  **Purpose of IT:**  Information technology(IT) is a specific branch of technologythat dealswith thestorage,processing, and transmission of digital data. The purpose ofinformation technologyis to provide tools and resources thatenable people to manage anduseinformation effectively | | | | | Technology isall aroundus.  Providepictures of examples of technology andinformation technology.  Discuss the concepts of technologyandIT as well as their  purpose |
| **D.2 Recognise that he or she is living as citizens ina digital world.** | | | | | **Link to D.1** |
| **Interact appropriately with others online.**  **Using appropriate examples/role play, etc. and discuss:**  What does itmean to interactonline?  Why is itimportant to treat other with kindness andrespect?  Emphasisesafe and good practices suchas not sharingpersonal information andlimiting screen time. | | | | | Extendandreinforcefrom previous terms.  Interactappropriatelywith otherswhen online |
| **D.3 Demonstrate an understanding of the concept of a computing device.** | | | | | **LinktoD.7** |
| **Possible discussion**  A computingdeviceis something you canuse to do thingslikeplay games,watch videos, or talk to peoplewho arefar away.  Some examples of computing devices arecomputers, tablets, and smartphones. Theyhave screens where you can see what you're doing, and youcanuse buttons or touchscreens to control them/ give theminstructions.  It alsohas something called a processor thathelps themdo all the things youwant themto do.So, when youusea computer or tablet, you're usinga computing  device. | | | | | Reinforceand extendfrom previous terms.  Showpictures or examples of different computing devices to support understanding |
| **D.4 Identify the common uses of ICT in the real world.** | | | | | **Link to D.3** |
| **Possible uses:**  ICTs refers to the tools andtechnologies thathelpus,process, share and communicateinformation.  Common usesincludecommunication, e.g. WhatsApp, entertainment such as video games, educationusingICTs tolearn,business, e.g.pay points, etc. | | | | | Use anddiscuss examples thatlearners arefamiliarwith. |



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| **Content (Grade 1 / Term 3)** | | | | **Notes/Examples** |
| **D.7 Present a basic understanding of the concept of input processing and output.** | | | | **Link to D.3** |
| **Possible discussion:**  Input,prooossing, and output are the threebasic components/processes of acomputer system.  **Input:**Refers to data or information thatis enteredintoa computer system.For example, we useinput devices such as a mouse,keyboard, microphone to enter thedata or information.Input can takemany formssuch as text, images, voice.  **Processing:**Processingrefers to themanipulation of the data or informationthathas been inputintothe computer system.Processingtransformsinput into output.  **Output:** Refers to theresults or information thatareproducedby a computer system afterprooossing theinput data. This can takemanyforms, including text,  images, video, and audio.Output is typically displayedon acomputer monitor or screen,printed on paper, or played through speakers. | | | | Provide examples or pictures of input and output devices to spark  discussions.  Itisimportant thatlearnersunderstand that thesethree components/processeswork together to enable the computing device to perform awiderange offunctions and tasks. |
| **D.8 Interpret a pattern to represent or communicate a message or image.** | | | | **Link to C.6 and C.7** |
| **Example: Interpret and present/communicatea message** | •• **0**  **b•**  **c•**  **d• Q**  •• **0**  *I•* '-)  **9•** " | **Emoji Code Breaker**  **Conip&ttt lht codt ldil\9 these symbols.**  **h•** ·-=) ••  I • **p• fQ**  ?  J. **0 q•**  **k• *G* r•**  I • •• "  **m** • **";l. t• i**  n• ***r-*** •• | ,\_  **v• c...)**  ...--,,.  **w•**  ,\_.  **x• c..**  **y•**  ,. ,.. | Learners canwrite theirname with theemojis or a short |
| Abasicpattern isinterpreted and acorrespondingmessage in symbolicformis | instruction to their friends. |
| presented. | Done in relation to C.6 andC.7 |
| Abasicpattern is decoded to a simpleword, image or 3-word sentence/phrase. |  |
| @ Emoji SecretCode Generator Worksheet - Primar Resource(twinkl.co.za) |  |
|  |
| **Assessment- Term 3** | | | |  |
| Continuous Assessment - Refer to Section **4** | | | |  |

* + 1. **Term 4**

Content (Grade 1 / Term 4) Pattern Recognition

* 1. Recognise and interpret patterns in symbolic sets of data or visualisations.
  2. Create or complete a pattern to represent a data set. Example:

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Proctic<>wr;ung the number nom and complete the poll.er•nl

[2J C...:."\;*J*'•"' .r-*J*--\·*,*' •.

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Notes/Examples

Could be integrated with Mathematics or Language Reinforce from previous terms.

Use numbers,colours,shapes,body percussion, etc

Could be done with C.6

Learnerscreatetheirownpattern, or theycopy thepatternand thencompletethepattern.

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DBE Grade1 Workbook2 (Maths)- p66

Algorithm Design and Coding

* 1. Apply computational thinking skills do developa set of logical instructions to solve aproblem. Example:

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Studythegivenmap (grid)andaccompanyingcode set ontheright. -•

* + - Whatword would SSB spellif he executes the code set? (Answer

Link to C.2, C.3, C.4 and C.5

Thisactivitycouldbe integratedwithLanguage.

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* + - Writedownthecode set thatarerequiredto haveSSB spell SALT. **A**

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* + - WhichotherwordscanSSB spell? ;......-. '. E **L**

**r**..**4"**..**'**

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- -1.,.\_.r,,\_. -

* 1. Present a simple coding solution using symbolic or written statements representing sequences of commands, single repetition,

and conditional constructs. Example

Learnerscode their namesandanadditionalwordsuchas 'hallo' to communicatea

message usingacodingcardandgiveto theirpeersto decipherusingthecard.

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.....\_ ,....., ,. ,,..\_,....-•r-

Thiscanbe integratedwithphonicsto e.g.builda three-letter wordto illustratetheuseof secretcode.

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| **a** | **b** | **C** | **d** | **e** | **f**  - | **9**  C!:) | **h**  @) | •I  = | •  **J**  o"t:. | **k** | I | **m**  *1s* |
|  | | = | |
| **n** | **0** | **p**  *p* | **q\_**  *-':It'* | **r** | **s**  *..:* | t  ab | **u** | **V**  0 | **w**  E> | **X**  @ | **y**  .,fiil | **z**  6. |
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**Content (Grade 1** / **Term 4)**

* 1. **Interpret and execute a given symbolic or written set of commands Example 1:**

The dogneeds to pickup thebone andreturnto thekennel. Thecode providedrepresents a sequential solution. Rewrite the oode provided to induderepetitioncommandwhere appropriate.

Codeprovided**b**: means turnaround(dog first needto turn around to face oppositedirection and startwalkingin the directionit is facing)

**Notes/Examples**

**Link to C.1,C.3,C.4,C.5 C.6 and C.7**

Learnersmustnowinterpret and execute thecode.The•robor mustfollowinstructions.

Learnersreinterpret the code to change the solutionfrom a sequential solution to one thatusesrepetitioncommands. **Note:**

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Where the*Turn Around*instructionisused, turning to face the directionintowhich the sprite/charactermust start walking,isnot implied. Once the dog hasturnedaround, the, turningleft and right andfacing the directionintowhichitmust oontinue, are impliedand thepath as well as theorientation of thefront of the character/spritemustbe oonsidered(the character/spritefaces the directionin whichit will movenext).

* 1. **Debug a given symbolic or written set of instructions.**

Providelearnerswitha grid andincorrect oode.

Learnersneedto determinewhere theproblemisand oorrect the oode

* 1. **Evaluate a given solution towards potential improvement. Example1 Example 2:**

codlno ma:themcllcs

tt is cosilypossible to s-upporl mothomoticol concophwith tho somo coding constructs.and imtructi thot tho loomors oro oxpos.ed to.

Providelearnerswith a gridwithmore than

In lh9 following ()>:omplG>thQ following "-'Gstion con bQposQd. Assvmiog SSB olwoYS stort ot O. On \-.klichpvrplo block \.viii h9 end vp oncG,

oneroute to anobject. • 11e hos e)lecvted the fit$! line {A.I of if,itrvctions? 11 + 3 +-2) = 6

Cl he hos e>ecvled the second line IBJ or instructions? ( •2 + 2 -1) = 3

* Leanersneed to identify all theroutes. !
  + - leanersneedtofindtheshortestroute. I 2

. . . . . . . . . . . . . . . .

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**Link to C.1, C.2 and C.3**

While executing,learnersmustmake sure theinstructionswork. Debugif necessary and execute the codeagainuntil it iscorrect. **Link to C.1,C.2,C.3 and C.4**

Givelearnersmorethanone solution thattheymust evaluate to findthemost effectiveroute/theroutewith theleast steps.

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**Robotics**

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# **B**' ffl

**Could be integrated with Creative Arts**

* 1. **Explain what a robot is in simple terms.**



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* 1. **Identify different types of robots.**

Showlearnerspictures of different type of robots, e.g.

**R.1, R.2, R.3 and R.4 can be done together**

**Reinforce from previous termsusing different examples and activities**

**Content (Grade 1** / **Term 4)**

* Robot vacuumcleaner (Type: household}
* Robot assemblingcars (Type: industrial)
  1. **Outline the different components of a robot**

Robots canhavea body, arms andhands, sensors, a power source, wheels or legs andattachments Provideexamplesof different types ofrobots and identify their components

* 1. **Present an understanding of how robots affect the world. Example**

Ask learnershow they thinkrobots canhelp orharmus.Discusspossibilities suchas robots doingworkin dangerousplaces where humanscannot go, robots usedin industryfor assemblingcars, etc.

R.5 Design a simple product (artefact) based on a set of design specifications.

Example

The learnerscould applypaper weaving skills to createa mat.This mat canthenbeusedin the design and */..\_::..*  ***.4***· *1* · *>* **1.\_1**

creation of another artefact.  **. v,,**  \_aIB!-"' ,,

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**Notes/Examples**

**Link to R.1 and R.2**

Reinforcefrom previous terms usingdifferent examples and activities

**Link to R.1, R.2 and R.4**

Robots are changingtheworld by helpinghumans do thingswith greater efficiency anddoing things thatwerenot possiblebefore

Link to **R.4**

Reinforceand extendfrom previous terms using different examples and activities.

R.6 Mimic the operations of a robot.

**Example:**Coding cupchallenge

The person represents arobot thatmust moveits arms to stack thecups <http://www.youtube.com/watch?v=7zHVi16uXnU>

**Poper cup coding wtth symbols**

- **avouTube**ZA

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**Link to C.4**

Reinforce and extendfrom previous terms using different examples and activities.

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1. **7 Create test and execute a set of robotic instructions.**

ReferringtoR.6, test theoperationsfor correctness

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.... **t-,.,1.**

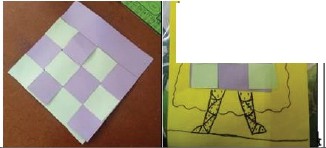
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**Link to C.4 and R.6**

**Digital Concepts** I **Could be integrated with Life Skills or Language**



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* 1. **Outline the concept of technology and purpose of informationtechnology (IT). Reinforce and extend using different examples and activities. Example:**Provideexamples of technology, e.g. computers, smartphones, TVs, videogames, 'robots' thatperform specific tasks anddiscuss e.g. thefollowing: InformationTechnology (IT} isa type of technology thatdealswith Technology is designedwith a purpose of solvingproblems thatmeet humanneeds andwants. It refers to tools,machines, or devicesthatmake our lives easier information, such as data,images, and sound. ITindudes things or better. Technology isall aroundus, andwe use ii every day to communicate,learn, andhavefun. like computers, software, and theinternet.

The purpose of ITis to helppeople access and use informationmoreeasily and efficiently.

* 1. Recognisethat he or she is living as citizens in a digital world. Reinforce and extend from previous Grades and terms

**Content (Grade 1 / Term 4) Example:**Possible questionsfor discussion:

**Limit screen time: Interact appropriately with others online:**

* + - Whatis meantby limiting screen time? • What it means tobe respectful and disrespectful online

**Notes/Examples**

Reinforcefromprevious grades and termsusing different examples and activities.

Learnersneedto understand:

* + - Why itisimportant to limit screen time.
    - When unkindness and disrespect turnintoonlinebullying
    - The concept of screen time, what itmeans andhow do they
    - Why we alsoneed family time, play time, time forschoolwork, exercise, etc • How to standup for others that are treated badly.

**D.3 Demonstrate an understanding of the concept of a computing device.**

**D.4 Identify the common uses of ICT in the real world.**

* 1. **Present a basic understanding of the concept of input processing and output**
  2. **Interpret a pattern to represent or communicate a message or image.**

balance their time with technologyandother activities.

* + - How to Interact appropriatelywith otherswhen online **Reinforce and extend from previous Grades and terms using different examples and activities.**

**Link to C.6 and C.7**

**Example:**If the vowels are represented with thefollowing3-dot colour codes, what are thewords **A ••** \_,

**I e.** '.\_.

on theright?

**E.** • • **B••••••N**

* 1. **Create a pattern to represent or communicate a message or image.**

**oe** *)•*

**u** ••••

**K•••T•••**

**Link to C.6 and C.7**

**Example** If the vowels arerepresented with thefollowing3 dot colour codes howshould each of thewords be **Ae•** \_,

'coded'. •

**E. •**

**BIKE**

**re•·**- **SURE**

**Assessment- Term 4**

Continuous Assessment - Refer to Section 4

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**Note:**

In terms of coding, typically, problems couldrequirelearners to

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read code and explainwhat it does

work through(trace)/ act out code (physically or simulated) to determinethe output or thecorrectness

provide missingcode instructions(code instructions are provided with some instructions or code elementsmissing) thatlearnersneedto complete translateverbal/writteninstructions(algorithm) to code.

add some functionality/instructions to anexistingprogram.

rewrite a set of codinginstructions to be moreefficient, e.g.using aloop constructfor code that isrepeated choose thecorrect solutionfrom 2-3 options

compare different solutions to evaluateefficiency

debug analgorithmor program (findthebug, describe thebug, andcorrect it)

developa solution/algorithm(code instructions) based on a givenproblem or foranopen-endedproblem throughplanning,implementing, testing, and debugging.

depending on the competency/(ies) the learnerneeds to demonstrate.

* 1. **GRADE 2**



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**Note:**

Teachers must include the following competencies and content in their Annual Teaching Plans (ATPs), distributed across the terms and sequenced, organised, grouped (and i synergised with other subjects in Grade 2, where applicable), and in a manner that will facilitate learning, ensure ample retrieval and deliberate practise with feedback to ground principles and concepts, maximizing the learners' learning outcomes and achievement, whilst also ensuring a gradual, steady learning curve, in a way that will make optimal use of available time and resources.

* + 1. **Term 1**

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| **Content (Grade 2 / Term 1)** | | | | | | **Notes/Examples** |
| **Pattern Recognition(+ 2 hours)** | | | | | | **Could be integrated with Mathematics or Language** |
| **C.6 Recognise and interpret patterns in symbolic sets of data or visualisations** | | | | | | **Link to C.1** |
| ""'; ***r* Pot.terns:** "'  '  , •0.,,..•- •••••••••  ..,, :t; ..,, **:t;** ..., :i ..,, :l; ..,, :l+ ...,,  1.,,.,,.,,.,  .,, **Cir.llJ.. U.C..C,..o.t4-**  DBE Grode 2 wo,kbook I fMOIIUI - *.6.*  Patterns can consist ofnumbers, colours, shapes, objects,movements, etc. | | | | | | C.6 develops**pattern recognition** (part of computational thinking) thatis eventuallyusedto developcoding solutions as part of computational thinking to identifypatternsin the codingproblem and/or data by identifying similarities or differencesthatcan help to solve theproblem or refine the algorithm |
| **Algorithm Design and Coding** | | | | | |  |
| **C.1 Apply computational thinking skills do develop a set of logical instructions to solve a problem.** | | | | | | **Link to C.2 and C.3** |
| **Example:**Developinstructionsfor the dog to first pick up itsbone before going home. It must avoid the trees.  ... **l** | | | | | | One could extend theproblem by asking learnershow many differentroutesthe dog can follow, then discusswhich routes are the shortest (link to C.5).  **Note**  Evidence suggests thatpupils should be taught- initially at least- in small bite-sizedchunks.These steps in the learningprocess shouldbe well-thought out andgradual as well as allowplenty of opportunityforpractice(see, for  example,Rosenshine, 2012; Coe *et al.,* 2014; Sealy, 2019). |
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| Content (Grade 2 / Term 1) | | Notes/Examples |
| C.2 Present a simple coding solution using symbolic or written statements representing sequences of commands, single repetition, and  conditional constructs. | | **Link to C.1** |
| **Example:**  The orangebutterfly wants to visit theredflower. How shouldii fly if ii isnot allowed to touch theblocks with the stems of theflowers.  ,. I .-i-. °'"-**-**'I **- -f**  .\_ ....\_  **t** | | Learnerspresent and explain their solution. |
| **C.3 Interpret and execute a given symbolic or written set of commands** |  | **Link to C.2and C.1and C.7** |
| **Example: Interpret code and provide missing coding instructions** Sipho Suber Bunny(SSB) needto collect the carrot at theend of thepath. Study the grid on theright and the codeprovided below:  **,a-.::**  1  Providethemissing code instructions thatwill help SSB to collect the carrot  Similar activitiescouldalsoformpart of code evaluation(C.7)) | :---  t | **Note**  To ensure anacreptablelearningcurve/ progression, teacherscaninitiallyprovide code thatlearnerscan choose from, e.g.provide learnerswith thefollowing to code instructions to choosefrom to fill in themissing code, e.g.  if◊  As learnersprogress, theycouldbe expected tofill in missing  instructionswithout giving theminstructions to choose from. |
| Robotics | | I Could be integrated with Creative Arts or Language |
| R.1Explain what a robot is in simple terms.  R.2 Identify different types of robots. |  | Reinforce and extend from previous Grades using  different examples and activities |
| R.5 Design a simple product (artefact) based on a set of design specifications. I Link to R.6 | | |
| Example  Learners could designa salt clay/playdoughcircuit.  - theyneed to first completea designprocess as representedin Grade 1 Term3 andin R.7 below  Electricity forkids-Easy PlayDoL!Jh Cirruits - ScienceExperiment:; forKids(science-sparks.com)  ElectricPlayDough Project1:Make YourPlayDough LightUp& Buzz!I Scienre Project(scienrebuddies.org) | Salt clay/ Playdough Circuits  \_.\_ | Reinforce andextendfrom previous Grades usingdifferent examples andactivities.  Learnersfirst needto design their artefact.Refer to other R.5 examples that illustrates thedesignprocess. |



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| **Content (Grade 2 / Term 1)** | **Notes/Examples** |
| **R.6 Mimicthe operations of a robot.** | **Link to R.1, R.2 and R.5** |
| **Example**   * Place the cones orother objectsin the open spaoe to create an"obstade course" for therobot to navigate. * Dividelearnersintopairs anddesignate onemember to be the'robot' and theother to be the'programmer. * Give the programmer a set of instructions for the robot to follow, such as "move forward three steps, turn left, move forward two steps, turn right, move   forwardfour steps, turn around, etc.'   * Theprogrammer shouldreadtheinstructions aloud to therobot, whowill thenfollowtheinstructions to navigate the obstacle oourse. * Once therobot oompletes the oourse, switchroles so that each learnerhas a chance to be therobot and theprogrammer.   **Note:**  As anextensionactivity, one can add more complexinstructions orobstacles to thecourse, orhave thelearnerscreatetheir own instructionsfor therobot to follow.  One can alsoblindfoldthe'robot' to see howwell theprogrammer's instructions are designed. | This isanexample of anoutside•pairprogramming' activity.  Explain to thelearners thattheywillbe pretending to be robots andfollowing a set ofinstructions to complete a task, justlikeareal robot.  This activityhelpslearners to developthe sequencingand problem-solving skills andencourages oooperativelearning. |
| **Digital Concepts** | **Could be integrated withLife Skills or Language** |
| **D.1Outline the concept of technology and purpose of information technology (IT).** | **Reinforce and extend from Grade 1.** |
| **Possible discussion:**  **Technology**  Technologyrefers to the tools, techniques, andprocesses that areusedto create, develop, andimproveproducts, services, andprocesses. Technologyisused to solveproblems,improveefficiency, and enhanceproductivity.  **Purpose of IT:**  Information technology(IT)is a specific branch of technologythat dealswiththestorage,prooessing, and transmission of digital data. Thepurpose ofinformation technologyis to provide tools andresources thatenablepeople to manage and useinformationeffectively | Providepicturesof examples of technology andinformation technology.  Discuss theconcepts of technologyand ITas well as their purpose |
| **D.2 Recognisethat he or she is living as citizens in a digital world.** | **Link to D.1** |
| **Possible discussion**  **Be respectful:**Alwaysusekindwords andtreat others theway you wouldlike to be treated.Remember that there arereal peoplebehind the screen, andwhat you say and do canhave animpactonhow othersfeel.  **Be safe:**Never share yourpersonalinformation, like yourfullname, address, phonenumber, orpassword,withanyoneonline.Also,nevermeet someone you've  only talked to onIinewithout anaduIt present.  **Be** safe:Never shareyour personal information,like your fullname, address,phonenumber, or password, with anyone online. Also,nevermeet someone you've only talked to onIinewithout anaduIt present | Reinforce and extendfrom previous Grades usingdifferent examples and activities.  Extend to:  Interact appropriatelywith otherswhen online.  Learnersneedto notethatitisimportant to remember to be kind and respectful to others, just like we would beinperson. Empower learners to develop thinkingskills and strategies to support the development of self-awareness and self- regulation so theylearn to manage themselves as digital  citizens |
| **Assessment- Term 1** |  |
| Continuous Assessment - Refer to Section 4 |  |

* + 1. **Term 2**

**Content (Grade 2 / Term 2) Pattern Recognition**

* 1. **Recognise and interpret patterns in symbolic sets of data or visualisations**

**Example:**

Therearefour robot animalsin a shop:a bear, abird, arabbit and acat.

Onerobot animal secretlywalkedaroundthe shop at night.A trail offootprintswas left on thefloor.

Whichrobot animal left thefootprints?

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**Bear**

Bird

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Rabbit

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cat

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**Notes/Examples**

**Could be integrated with Mathematics or Language Reinforce from previousGrades and Terms** Graduallyincrease the complexityofpatterns.

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**AlgorithmDesignand Coding**

**C.1Applycomputationalthinking skills to developa set of logical instructions to solve a problem.**

**Link to C.2 and C.3**

1. **2 Present a simple coding solution using symbolicor written statements representing sequences of commands, single repetition, and conditional constructs.**

This activityusesC.1andC.2

**Example**



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:h; :erfly mustre eflower using aninstructionset witharestrictionof 6 **instrucrtions**anda grid of A turnleft arrow I isintroduced(andby implication alsothe turnright)

The Turn right couldbe introducedmoving thebutterfly oneblockleft.

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**Note**

For Grade2andGrade3, whenever the character/spriteis instructedto turnleft or right, the orientation of thefront of the character/sprite shouldbeconsidered.Thisimplies thatthe character/spriteface thedirectionin whichii will movenext).



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| **Content (Grade 2 / Term 2)** | | **Notes/Examples** |
| **C.3 Interpret and execute a given symbolic or written set of commands** | |  |
| SSB can jump over logs. When he jumps, he moves 2 spaces Sipho con only move one block of a time and jump Wrile  down the instructionsand how many timesSSB must jump or  (1iles) forward. move to get to the carrot.  **,:M**   /  '£;  **I 2** §§] ]  Sipho can only move one block at a time and jump Write  down the instructions and how many times SSB must jump or move to get to the carrot. | | Present the solutionwithdirectional coding cards andusing the |
| repetition structure. |
| **Robotics** | | **I Could be integrated with Creative Arts or Language** |
| **R.1Explain what a robot is in simple terms.**  **R.2 Identify different types of robots.** | | **Reinforceand extendfrom previousGradesand Termusing**  **different activities andexamples.** |
| **R.5 Designa simple product (artefact) based on a set of designspecifications. I Link to R.1and R.2** | | |
| **Example**  Usingaplastic spoon,rubberbands andicecreamslicks,build a spooncatapult. . . Seelinkfor designinstructions,  https:ljstlmotherhood.com/popsicle-spoons-catapuIt-chaIIenge/ | | Reinforcefrom previous grades and termsusing different activities. |
| **R.6 Mimicthe operations of a robot.** | **Link to C.1,C.2,C.3 and R.1, R.2 and R.5** | |
| **Example:**  Dividethelearnersinto groupsandprovidethemwith a sheet of paper to writedown their instructions.  Have thelearners discuss andplan out asimple sequence ofinstructions that arobot couldfollow, such as movingforward, turningleft, andpickingupanobject. Once thelearnershaveplanned out their sequence of instructions, havethemwrite down their instructions stepby step on thepaper.  After writingout theirinstructions,have thelearners test their instructionsby having agroupmember act out theinstructions. Thiswillhelp thelearnersidentify any errors or missing steps in theirinstructions.  Finally,have thelearnersreviseandrefine their instructionsuntil theycan successfullycompletetheir robot task | | Learners develop their own set of instructions to mimic the operations of arobot. |



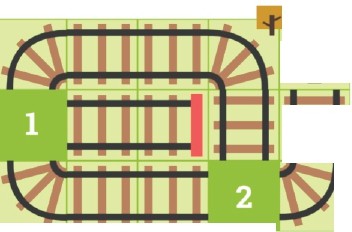
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| **Content (Grade 2 / Term 2)** | **Notes/Examples** |
| **Digital Concepts** |  |
| **D.1Outline the concept of technology and purpose of information technology (IT).** | **Reinforce and extend from previous Grades and Terms using**  **different examples and activities.** |
| **Possible discussion:**  What does technologyrefer to?  Whatis technologyusedfor?  Whatis thepurpose of IT?  Whatis ITusedfor? |
| **D.2 Recognise that he or she is living as citizens in a digital world.** | **Link to D.1** |
| **Possible discussion**  **Be honest:** Always tell thetruthwhenyou're online. It isimportant tobehonest about who youareandwhat you're doing.  **Be agood friend:**Just likein person,it isimportant tobe a good friendto otherswhen you areonline.Thismeansbeing therefor them, helping themwhen they needit, andstandingup for themwhen they arebeing treatedunfairly. | Reinforceand extendfrom previous terms. Interactappropriatelywith otherswhenonline. |
| **D.3 Demonstrate an understanding of the concept of a computing device.** | **Link to D.2** |
| **Possible Activity**  Explainwhat a computingdeviceis andwhatii does.Explain that acomputingdeviceis amachine that canprocess and storeinformation and canbeusedto do thingslikeplay games, watch videos, and communicatewith others.  Showthelearnerpictures of different oomputing devices and ask themtoidentifywhat they are.Talk about the differencesbetween thedevices, such assize, shape, andfeatures.  Give thelearner apieceofpaper and ask themto drawapictureof a computing device.Encouragethemto be creativeandincludedetailslikebuttons, screens, andkeyboards.  Once thedrawingiscomplete, ask thelearner to explainwhattheir computing device does andhowit works.Have themdescribewhattheymight usethe device  for, such as playing games, doinghomework, or talkingtofriends andfamily How to takecareof computing devices andusethemsafely. | Reinforceand extendfrompreviousGrades and Termsusing different examplesand activities. |
| **Assessment - Term 2** |  |
| ContinuousAssessment- Refer to Section4 |  |

* + 1. **Term 3**

**Content (Grade 2 / Term 3) Pattern Recognition**



**C.6 Recognise and interpret patterns in symbolic sets of data or visualisations.**

**Notes/Examples**

**Could be integrated with Mathematics or Language Link to** C.7

Gradually increase the complexityofpatterns.

**A B C**

...**YQ-t­**

Which one of thebracelets (A,B or C) isin thesame order andpattern as presented in straight linepattern below?

**C.7 Create or complete a pattern to represent a data set.**

**Example 1:**The trainmustget to the station;however, some trackpieces aremissing.

Study thepicture andindicatewhichtwo trackpieces from thepieces ontheleft (A, B, D,E orF) shouldbe placed in position1 andposition 2.

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**Link to C.6**

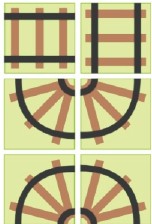
Learners canalso create their ownpatterns,based onthe problem, or the teacher can give themaninoompletepattern with

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•••

**A B**

l••



**C**

**D**

**E**

**F**

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some of the elementsmissing. Theymust thencomplete the pattern by adding themissingelements.

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**Algorithm Design and Coding**

* 1. **Apply computational thinking skills do develop a set of logical instructions to solve a problem.**

**Example: 1 2 3 4**

Studythefollowingplacement and answer the questions thatfollows. **I,** '. · · -,**1**

* + - Which rowhas only one dinosaur? **A**I ;.... I **t/**
    - What colour of dinosaur occur twicein thesame column?
    - Write down thecoordinatesof all the greendinosaurs **s1:**

**Reinforce and extend from previous Grades and terms**

Introducelearners to the concept of coordinates onagrid.

For C.1 to C.3 problem-basedquestions and scenarios canbe introduced, where scenarios are given, andthelearners are expected to answer questionsbased onthe scenario.

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| **Content (Grade 2 / Term 3)** | **Notes/Examples** |
| **C.2 Present a simple coding solution using symbolic or writtenstatements representing sequences of commands, single repetition and**  **conditional constructs.** | **Link to C.1** |
| **Example:Museumvisit**  Visitors visiting themuseumare only allowed to go throughall therooms exactly once. **1 s** +  This is calleda one-way tour.Therefore, thefollowingrestrictions apply:  **Restrictions 3**  Theymay not visit a room more thanonce.  They are alsonot allowedto use the same door for entering and exitingaroom. **6**  The visitorsmust start at the arrow thatenters themuseum andleaveby way of the door withthe **2**  arrow leavingthemuseum.  **Task 4 7**  Use directional codingcards and pack theinstructions according to therules. -►, I  Adapted from 2021-TS-Elementar}'.-Question-PaQ§r.Qdf(ol}'.mQiad.org.za) | Complexityisincreasedby addingrules orrestrictions |
| **C.3 Interpret and execute a given symbolic or written set of commands** | **Link to C.1, C.2, C.6 and C.7** |
| Example Sipho Super Bunny can only move one block at a time. Write  down the instructionsand how many times SSB must move and !urn right or lef1to get lo the carrot.I  SB con only perform 1he following commands. **t** Al  **c::>** Fa--ward *,:* 1-  **1.-- T1..n1 Ricpt** . \_i.\_,...t. -  ' /  ,. T1..n1Left  - • \_,.1•.,\_ **\_J**  -  **[l] [l] [l] [l]**  **(3**- **'** *(* -**2') i' 2)** I -I ') I I I  - | They now execute the code to test it.  Learners should alsobe able to replace the symbolswith characters torepresent the actions.  Forward  \.-TurnRight  *I"* Turnleft  **F**- **[BJ** -- **[I] f [I] f [BJ** -**F**  **1 3)** I **2)**  I **2)** I I ) i I )  - - - - - |
| **C.4 Debug a given symbolic or written set of instructions.** | **Link to C.1, C.2 and C.3** |
| **Example1** Study thefollowing3 gridswithsymbols and ans-wer the qu,esti,ons on theright.  Explainwhich grid(s) break therulefor thelimitation(s)  ' , providedbelow:   1. There *may* not be two arrow symbols in the same row.   ' (Answer C)   1. Flowersmay not appear in the same column(Answer is   A).   1. Theremay notbe any bow arrow in the grid (Answer A)   **A B C** | Learners followdifferentinstruction sets, of whichsome are incorrect, to find thecorrect solution, then theyneedto explain why the error in theincorrect ones. |

Content (Grade 2 / Term 3)

**Example 2:**

Study theproblem below, thenfindthecorrectset of instructions on theright.

Notes/Examples

Circle the fuzz with the correct code!

[!] **[iJ**

**[iJ [iJ**[!]

* **[ij [ij**
* **[!] [ij[ij**

**Robotics** I **Could be integrated with Creative Arts or Language**

* 1. **Explain what a robot is in simple terms.** R.1, R2, R.3,R.4 andR.5 canbe done together
  2. **Identifydifferent types of robots.** Firstlearners explainwhat arobotis andname different types of
  3. **Outline the different components of a robot** robots as well as thed ferent components of a robot andhow

. . . robots affect theworld.

**Body-**usuallymade up ofmetal orplastic and1s the outer covering thatholdsall the other components together. Th b . th . . at· **f** de • • th •

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**Arms and hands** - -many robotshave arms andhands that canmove andmanipulate obJects. These armsandhands areusuallymade up of101nts that allow bo

themto bend andmovein different directions.

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e o*f* the1• rrobot

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**Sensors** - robotshave sensors thatallow themto "see" and"hear" theworld around them. These sensors canincludecameras,microphones, and other devices *y* . I . h h . p *d d* h . ' . . th



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thatcan detect th. 1I-k 1-ht *d d* I componen1s I1w111 ave, w a1I 1can o an ow I1 w1111mpac1 e

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control system - is what allows therobot to "think" andmake decisions. It's usuallymade up of a computer or microcontroller that'sprogrammed with instructions wor forhow therobot should behave.

**Power source** - robotsneeda sourceofpower to operate. This couldbe abattery or a plug thatconnects therobot to anelectrical outlet.

Wheels or legs - some robots havewheels or legs that allowthemto move around.These wheels or legs areusually controlledby the control system.

**Tools or attachments** - depending on thetask therobot isdesigned to do, it *may* havevarious tools orattachments, suchas avacuumcleaner attachment, a paintbrush, ora \_gripperforpickingup objects.

* 1. **Present an understanding of how robots affect the world.**
  2. **Design a simple product (artefact) based on a set of design specifications.**

**Example:**Linking to **Language,**learnerscanpresent their robots andtell the class about theirrobots:

* + - What type ofrobot it is
    - What components ithas
    - What it can do
    - How it canimpact theworld



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| **Content (Grade 2** / **Term 3)** | **Notes/Examples** |
| **R.6 Mimic the operations of a robot.** | **Link to C.3 and R.7** |
| **Example:**  learnerpretends thatheor sheisarobot that hasbeenprogrammed to pick up and sort objectsby colour andfollowthefollowing steps:   1. Pretend to turn on thepower (e.g.Battery) 2. Use their sensors to "see" theobjects thatneed to be sorted.We might havea camera or other deviceto detect colours. 3. Usingtheir arms and hands,pick up one object at atime andexamineit to see what colourii is. If it'sblue, wewould place it in the"blue" pile.Ifit'sred, we wouldplace itin the"red" pile, and so on 4. Repeat thisprocess until all the objectshavebeen sortedinto their respectivepiles. 5. Once finishedsorting, sensorsused tocheckandmake surethat all theobjectshavebeen sortedcorrectly.If thereareany errors,pick up themisplaced objects andmove themto the oorrectpile. 6. Turn off thepower to oonserveenergyfor thenext task | learnersfollowing a set of •programmecf instructions to oomplete  a task, using differentparts and systems to accomplishit.  Reinforcethe decisionstructure(IF...THEN), e.g.  As question: What is the colour of the objectpicked up?   * IF objectpicked upisred, put with redpile. * IF objectpicked upisblue,put with blue pile. |
| **R.7 Create, test and execute a set of robotic instructions.** | **Link to R.6 and C.4** |
| **Example**  Use the activityfrom R.6 above andlet learnersnow createcode using oodingcardsto createinstructionsfor therobot topick up objects. | Extend example in R.6 |
| **Digital Concepts** | **Could be integrated with Life Skills or Language** |
| **D.1 Outline the concept of technology and purpose of informationtechnology (IT).** | **Reinforce and extend from previous Grades and Terms using**  **different examples and activities.** |
| **D.2 Recognisethat he or she is living as citizens in a digital world.** |
| Beinga digital citizenmeansbeing a good andresponsiblepersonwhenwe use theinternet and technology.  Whenwe're digital citizens, we followrules and guidelines tomake the onlineworlda safe andapositive place for everyone such as to treat otherswith kindness and respect, thinkbefore we post. | Reinforceand extendfrom previous Grades and Termsusing different examples and activities.  Interactappropriatelywith otherswhen online |
| **D.3 Demonstrate an understanding of the concept of a computing device.** | **Reinforce and extend from previous Grades and Terms using**  **different examples and activities.** |
| **D.4 Identify the common uses of ICT inthe real world.** |
| **D.5 Differentiate between the components of an ICT system.** | **Link to D.3 and D.4d** |
| **Possible discussion**  An ICT system isa system thatusesoomputers, programs (instructions), andnetworks(communicationbetweencomputing devices) to process and store information.  It has distinctparts thatwork together tohelpus use computers to do different tasks:   * The firstpart is thecomputer itself. * The second part is theinstructions(software) that tell the computerwhat to do. * The thirdpart is the data.Data is theinformation thatwe put intothe computer to work with. This canbe thingslikepictures, music, or text. * An ICT system alsohasnetworks.Networksareliketheroads thathelp oomputers talk to each other. They connect computers together so thatwe can   communicate, shareinformation andwork onprojects together. | Use pictures to discuss the different components of an ICT system.  Use examples that are age appropriateand that learnerswilI understand, e.g., a mobilephone system |
| **D.7 Present a basic understanding of the concept of input processing and output.** | **Link to D.3 and D.5 and D.8** |
| **Example** - IPO  Dividelearnersinto groups of 3. One learner acts as 'input', another learner acts as 'processing' andthe thirdlearner acts as 'output' Providedifferent colours of play dough anda cookie cutter foreach group.  'Input' collects thedough(input) andpasses it to 'Processor.''Processor' mixes the dough anduse the oookiecutter to cut'oookies' from themixeddough. Then  'output' oollects the'cookies' from 'processor' and showthemto the dass as theprocessed product. |  |
| **D.8 Interpret a pattern to represent or communicate a message or image.** | **Link to C.6 and C.7 and D.7** |

**Content (Grade 2 / Term 3)**



**Example- Coding and Decoding**

Emoji Code Breaking

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**Notes/Examples**

Anactivity suchas theexamplecan alsobe usedtoillustrate Input, Processing andOutput:

* **Input:** Prepare a simple cipher code (secret code) where symbols/numbers replaceletters of the alphabet.Write a short message in thecode as the"input" for the computer.
* **Processing:**Provide thelearner with a decoder chart to figureout thesymbols, translate themessage, and do the calculation. This represents the computerprocessing the encrypted/coded data.
* **Output** Once themessage is decoded, the childcanreadit outloudas the computer's'output.'

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https://content.twinkl.co.uk/resource/35/a6/t2-m-17313-ks2- emoji-code-breaking-activity-sheets-english ver **1**.pd **Assessment- Term 3**

Continuous Assessment - Refer to Section 4

* + 1. **Term 4**

**Content (Grade 2/ Term 4)** I **Notes/Examples**



**Pattern Recognition** I **Could be integrated with Mathematics or Language**

**C.6 Recognise and interpret patterns** in **symbolic sets of data or visualisations.** ReinforcefrompreviousGrades and termsusing different types

**C.7 Create or complete a pattern to represent a data set.** ofpatters, e.g.numbers, colours and/or shapes, objects,poems,

Examples: **k'4'l:;**Chiii..,i.,..::-oo1.;.. p.u:;:;..,,. , physical activities, etc.

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JSEGrade 2 Workbook 1 {Maths) - P,51

**Algorithm Design and Coding**

* 1. **Apply computational thinking skills do develop a set of logical instructions to solve a problem.**

**Example:**

In this examplecode shouldbe writtenwhichincludes directionalindicatorsfor eachstepand singlemovement instructions where thearrowindicates themovement in a single direction(forward1). The solutionis for the orange dinosaur to meet up with hisfellowsamecolour dinosaur.

Note: Theremaybesome alternates as well. Thesealternate solutions should alsobeacceptedand discussed.

The complexitycanbe increasedby instructing thelearners to write two sets of code foreach colour dinosaur to visithis/her friend, but thepathsmay not cross. •

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**Link to C.2 and C.3**

Graduallyincrease complexityby extending the grid, e.g. adding obstades andlimitations

Evidence suggests thatpupils shouldbetaught - initially

at least - in smallbite-sizedchunks. These stepsin thelearning process shouldbe well-thought outand gradual as well as allow plenty of opportunityfor practice(see, for example, Rosenshine, 2012; Coe *et al.,* 2014; Sealy, 2019).

* 1. **Present a simple coding solution using symbolic or written statements representing sequences of commands, single repetition, and conditional constructs.**

**Examples**

**Link to C.1**

The concept of a conditional/decisionconstruct shouldbe

Introducethe concept of a conditional codingconstruct(IF...THEN) using everyday decisions,

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beforeintroducingit as part of acoding solution.

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**Note:**

Ensure a graduallearningcurve.

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DBE Grade2 Workbook1 (L eskills)- p41

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| **'-I** | sequence |

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| **Content (Grade 2/ Term 4)** | **Notes/Examples** |
| **C.3 Interpret and execute a given symbolic or written set of commands** | **Link to C.1 and C.2** |
| **Example 1:**  Study thefollowing diagramandinstructions thatfollows and answer the questions thatfollows.  I 2  ••••••••••••••••••••• **Note:**  Theinstruction,pickup,picks up all the  carrots at thatpositiononthenumber  '/�/'/�/,��/,;�/'/� line. A Jump skips oneposition to the  right.  **A**, ,§) §)  **Note:**  -I The exampleintroduces thelearners  to theconcept of tracingcode in an  **B** •, elementaryway.   1. Examine thecode forinstruction set A:   After the code has executed onwhich purple number on thenumberlinewill SSB endup?(Answer 6) Alter the code has executedhowmanypurple carrotswill SSBhave collected?(Answer 3)  Alter the code has executed howmany orangecarrotswill SSBhave collected?(Answer 1)   1. Examine thecode forinstruction set 8:   After the code has executed onwhich purple number on thenumberlinewill SSB endup? Alter the code has executed howmanypurple carrotswill SSBhave collected?  ti Aller the code has executed howmany orangecarrotswill SSBhave collected?  **Example 2:Making decisions**  Studythepicturebelow: **Note:**  Example 2 combines sequence,  ' / decision andrepetition structures.  **Note**  The following symbolisused to represent an IF...THEN  coding construct then  / / | Introduce the decisionconstruct (IF...THEN...)  Coding requireslearners to master thebasic codingconstructs:   * Sequence * Repetition/Iteration(loops) * Decision     Decision Iteration  Step 1 Step 4? Repeat  Step 2 or Step 6  Step 3 Step 5? |
| A **sequence** isa set ofinstructions orcommands that are executedone after the other, in order. It'slikefollowing arecipe stepby step.  **Decision** constructislikemaking choices.It allows the computer  to execute a different instructionor set ofinstructionsbased on the outcome of the decision:whether theconditionresultin true offalse,  **Repetition,** orloops, allows the computer torepeat a set of instructionsmultiple times. It'slike doingsomething over and over withouthaving to write the same instruction(s) multiple times **Note:**  Keep to an acceptablelearningcurve -graduallyincrease complexity, e.g.   * One decisionas part of abasic problem * Then two decisions as part of abasic problem * Then onlybegin to combine a decision structurewith a repetition structure.   Literaturesuggests thatthebiggest problem ofnovice  programmers does not seem to be theunderstanding of basic coding concepts [nisolation] butratherlearning to apply them [andcombine them]. Therefore, at thislevel, beware of giving learnersprogramming tasks thatcombine too many concepts  (Robins, 2019). |



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| **Content (Grade 2/ Term 4)** | **Notes/Examples** |
| SSB does not likepurple carrots.When it lands on theredtile,itmust decidewhich direction to go to avoid thepurple carrots and to collect only theorange carrots. Thealgorithmbelow represents theinstructionsSSBmust follow(includingthe directionitmustturnwhen itlands ontheredtile) to avoidthepurple carrots and get to the orangecarrots  If SSB lands on the red tile, turn  r=¢1**rl1**Ii=>[I] le=> right (from the directionitis ,.  facing)  3) ( I (3 | Typically, problems couldrequirelearners to provide missing code instructions(code instructions areprovided with some instructions or code elements or requirelearners to develop the solution algorithmfor themselves. |
| C.4 Debug a given symbolic or written set of instructions. | Debugging relates C.1, C.2 and C.3 |
| **Example:**There are 2 errors in the solutionprovided. Identifyand correct the errors.  -- *11* **oo**3) **o**2**o o**2 **o** I **oo**2  - ***X\_ X***  -- *I'* [!] **[I],..\_... [l] 111**  3 2 2 I I ,  ..; ..; | Itis important for learners to be ableto debug a solution. Debuggingcodeispart of thecodingprocess. |
| C.5 Evaluate a given solutiontowards potential improvement. | **Link to C.1, C.2, C.3 and C.4** |
| **Example:**Threelearnersplay a game using a grid anda diewith coloureddots anda pile of directional coding cards. The objective of the game is to see which learner can get to the treasurebox first.  Go to front of  yellow bJ.o.ck  **Materials required:**  -·- Grid, die, treasure,  Pile of directional coding cards.  Directional cardsindude several of the  Go to the front following:  of blue block Forward, Turn Right, Turn left, Turn Around  Go to front of  greenl>J.oJ:.I; (facingopposite direction,Backwards)  How to play   * learnersthrowa diewith colours on each side. * If colour throwed,is yellow, learner startsin front of yellowblock on thegrid. | leanersdevelop their own solutionsbased on the cards they draw.  learnersneed to continuallypresent their coding solutionsby  interpreting the coding cards andevaluate the cardsin terms of theroute theycanbuildwith the codinginstructions theyhave and weather the cards theyhavewill leadthemto thetreasure. |



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| **Content (Grade 2/ Term 4)** | **Notes/Examples** |
| * If oolour throwed, isblue, learner starts in front ofblue block onthe grid. * If oolour throwed, isgreen,learner starts in front of greenblock on the grid. * Now each play gets a turn to throwthe dieagain. * If the dieindicates thelearner'scolour(theblock where theneedto start), they draw one directional cardfromthepile * Each timethey oollect adirectional cardfromthepile, theycheck to see if theycanreach thetreasure, else theyneedto wait for their nextthrow. * If alearner lands on theblack block thelearner must go back to the colouredblock where they started.   Thefirstlearner thatgathers theright cards to get to thetreasure,wins. |  |
| **Robotics** | **Could be integrated with Creative Arts or Language** |
| **R.1 Explain what a robot is insimple terms.** | R.1 and R.2 could be done together |
| **R.2 Identify different types of robots.** | Learnersneed to understand thatarobot isamachinebuilt by humans andprogrammed to performtasks,which ahumancan also do, e.g.arobot vacuum cleaner. Arobot canthus substitute aperson, performing a task that theperson coulddo.Robots can only do what they areprogrammed to do(follow a set of  instructions). |
| Provideexamples ofrobots andnon-robots and discuss these. Provideexamples of different types ofrobots and discuss these. |
| **R.3 Outline the different components of a robot** | **Link to R.1and R.2** |
| **Body** - usuallymade up ofmetal orplastic andis the outer covering thatholds all the other components together.  **Arms and hands** - -manyrobotshave arms andhands that canmove andmanipulate objects.These armsandhands areusuallymade up of joints that allow themto bend andmovein different directions.  **Sensors** - robotshave sensors thatallow themto 'see' and'hear' theworld around them. These sensorscanincludecameras,microphones, and other devices that can detect thingslikelight, sound, andmovement.  **Control system** - is what allows therobot to 'think' andmake decisions. It'susuallymade up of a computer or microcontroller that'sprogrammed with instructions  forhowtherobot should behave.  **Power source** - robotsneeda sourceofpower to operate. This oouldbe abattery or a plug that connects therobot to anelectrical outlet.  **Wheels** or legs - some robotshavewheels orlegs that allowthemto move around. Thesewheels or legs areusually oontrolledby the oontrol system.  **Tools or attachments** - depending on thetask therobot is designedto do, it may have various tools orattachments, such as a vacuum deaner attachment, a paintbrush, ora gripperforpicking up objects. | Components suchas:body, arms andhands, sensors, control system, power source,wheels orlegs, tools or attachments. |
| **R.4 Present an understanding of how robots affect the world.** | **Link to R.1, R.2 and R.3** |
| **Possible discussion:**  Helping with **Work:**Robots canhelpuswith different kinds of work.For example,in factories, robots can assemble thingslike cars or toys very quickly and accurately.  **Making Life Easier:**Some robots are designed to helpus with everyday tasks.For instance, there arevacuumrobots that can clean our floorsby themselves.  It is alsoimportant to remember thatwhile robots can do many amazing things, they are created by humans andneedto beprogrammed and controlledby us. They are designedtohelpus andmake our livesbetter, but itis still humanswho decide how they areusedandmake sure theyare safe. | Reinforceand extendfrom previous Grades and termsusing different examplesand activities. |
| R.5 Design a simple product (artefact) based on a set of design specifications. | **Link to R.6** |
| **Example: Design a board game** | Thelearners design theboard game inR.5, thenmimic the  operations of arobot(thisboard game) in R.6 |

**Content (Grade 2/ Term 4)**



**Materials required:**

3 wooden blocks to create 3 different dices(Dice1 has the values A to **F,**Dice2 has the values **1** to 6 and Dice 3has

thecodes: ***F, F, TR, TL, Bon*** and ®

1. The **F**represents Forward. \

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1. TR represents Turn right.

\ \

1. TLrepresents Turn left.
2. Bonrepresents abonus throwand
3. ® represents skip acard/turn.

* A reusedcardboardfrom a cereal box with a 6 x

**Notes/Examples**

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6 grid andtheindicatorsA to **F**and **1** to 6 for therows andcolumnsrespectively

* A set of codingcards made from theremainder of theboard with the codes TR, TLand

**F** appearing twicethenumber of times. (The codingcards are cut out)

* 3 small stones torepresent obstacles.
* A one Rand coin to represent a prize (it may be substituted with a sweet or any other indicator)
* Two player blocks representing anicon/charmfor eachplayer (in this example two uni-fix countingblocks, oneredandblue areused)
* Small coding\_cards made from theremainder of thecarton of the cereal box.

**R.6 Mimicthe operationsof a robot.**

**Example: Referring to the board game designed in R.5 How the game works.**

1. The threeobstacles(i.e., stonesin our example) areplaced randomly on the gridby throwing the two dicewith theletter and thedigit together, e.g. the

letter dieindicatestherow, say,D and thenumber dieindicatesthe column, say for 4. The obstaclewill thenbe placed onblock 0.4.This actionis repeateduntil all threestones areplaced on theboard; *Astone may not be placed on the same position twice.*

1. Now,place theprize using the same process as in **1.**Above

*T*

**Link to R.5 and R.7**

Using theboard game designedinR.5,learnerswill nowmimic how arobot responds toinstructions.

Coding constructs that arereinforcedwith this activity: Repetition:

Throw letter dieandnumber dietoidentify theblock where the

first obstacleneeds to be placed.

**REPEAT** thisprocess **UNTIL** all threeobstacles areplaced

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**(REPEAT 3 times)**

**Note:**

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Inthisactivity there are several instanceswhere repetitionis used.This must be pointed out to learners and emphasised.

There are also several instanceswhere decisions arerequired. Point out to learners and emphasise.



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1. Now, the startingposition foreachplayer isdeterminedby throwing the singlerow-and-column die.



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| **Content (Grade 2/ Term 4)** | | | | | | | | **Notes/Examples** |
|  | Player RED throwsD andisplacedonD  on theleft of the grid | | | Player BLUE throws6 andisplaced on  thenumber 6 on top of the grid | | | (A rulemay be added thatif theplayer is within six moves of theprize theplayericon shouldbemoved to the opposite outside edge.In the case for blue,it wouldhave been at thebottom outsideof column6) (The rulewas not appliedin this case) |  |
|  | ' I:.:,\_  p I•-,.-· ' r  ,,  - *I i*r -  *[* . I *'-.,\_,).* -  *t I* 'I I  -·  ***D***  , ,  • |  | *I l* ' ; *! --* | |  |
|  | *A f*  ,., t .  ' *I* .  *I* -*.*·*-j-* -  *[ '1 \;;,.,.!J*  C  *F* '  - . - |
| **Movingtheplayers**   * Usingthe ***move*** dice, eachplayer throws 6 times and collects theapplicablecorrespondingcodingcard. If the ® is thrown, then aturnismissed. * Usingthe codingcardsat their disposal, theplayersmustthenpack out the code to have theiriconmove to theprize. * If theplayer does not have the correct cards,heor she may throwthedice again to get anadditional coding card.Thisis alternatelyrepeateduntil one   of theplayerspacks out the correct solutiontohave theiriconreach theprize.   * Each opponentplayer must verify that theplayerindeedhasa correct solution or not. * Thewinneris the onewhoreaches theprizefirst | | | | | | | |
| R.7 Create, test and execute a set of robotic instructions. | | | | | | | | Link to R.6 |
| Using theboard game designed in **R.5,** and played in **R.6:**  Once a learner has collectedthesix coding cards, thelearner needs to pack out instructions(create a set ofinstructions) tomove to theprize. In doing so, the learnerneedsto tesUevaluate to see if thecardshe/shehas, will be able tomove his/her charmto theprize, IFnot, THENthelearnerneed to throwagain and  repeatthepacking andtesting/evaluationprocess UNTILhe/she | | | | | | | | Thelastfew steps of the game in R.6 areapplicableto creating, testing andexecuting theinstructions. |
| **Digital Concepts** | | | | | | | | **Could be integrated with Life Skills or Language** |
| **D.1 Outline the concept of technology and purpose of information technology (IT).** | | | | | | | | Reinforceand extendfrom previousGrades and Termsusing  different examples and activities. |
| **D.2 Recognisethat he or she is living as citizens in a digital world.** | | | | | | | | **Link to D.1and D.2** |
| Interact appropriately with otherswhen online.  Discusswithlearnerswhy andhow theymustinteractappropriatelywhen online. | | | | | | | | Reinforceand extendfrom previous Grades and Termsusing different examples and activities.  Empower learnerswiththinking skills andstrategies to support  the development of self-awareness and se -regulation so they learn to managethemselves as digital citizens |
| **D.3 Demonstrate an understanding of the concept of a computing device.** | | | | | | | | **Link to D.1, D.2 D.4, D.6 and D.7** |
| **Example: Asan extension from D.3activity in Term 2:**  Thelearner creates a'poster' withpicturesof different computing devicesandlabels that describetheirfeaturesandfunctions. This canbe a greatway to reinforce the concept of acomputing deviceandhelpthelearnerunderstand the different types of devices that are available.  Learners can alsoexplain:   * What thedevicescanbeusedfor | | | | | | | | Reinforceand extendfrom previous Terms using different  examplesand activities |

**Content (Grade 2/ Term 4) Notes/Examples**

* + Whatimpact theyhavein ourlives(0..6)
  + How to takecareof computing devices andusethemsafely
  + How to behavewhen using the devices(0.2)
  + How these devicesreceiveinput andhow they give output
  1. **Identify the common uses of ICT** in **the real world. Link to D.1, D.3 and D.5**

**Examples:** Identify and discusscommonusesin areasof communication,

**Communication:**socialmedia, e-mail,messaging apps education,business, andentertainment

**Education:**Digital learningmaterial **Business:**Point-of-sales **Entertainment:**streaming videos and music

* 1. **Differentiate between the components of an ICT system. Reinforce and extend**
  2. **Explain how the adaptation of technology impacted the world we work and live in. Link to D.4 and D.5**

Reinforcefrom previous grades andterms. Reinforceand extendfrom previous Grades and Terms using

**Impact:**(different sectors), e.g. different examples and activities.

* + - Communication:Made theway we oommunicatemuch faster and easier (Instant messaging, e-mail, etc.)
    - Education: Changedtheway welearn(onlineresources)
  1. **Present a basic understanding of the concept of input, processing and output. Link to D.8 and Cs**

Example activity: Secret Code Decoder: Reinforceand extendusing different examplesand activities

Dividelearnersinto small group of threelearners and provideeach group a simple cipher code chart where symbols replace letters of the alphabet. One learner Initially, thewords *translate to* and *translate back* couldbeused act as input, secondlearner acts as processing and thirdlearner acts as output. tointroducelearners to theconcepts encoding and decodingin

* + - Input: First learner prepares input using the cipher code and writes e a short message in the code (encrypted message) and passes it to the second programming.

learner as the 'input' for the computer to beprocessed. Learners are then gradually exposed to thewords *encode* and

* + - **Processing:**Second learner uses the cipher code chart to figure out the symbols and translate the message. This represents the computer processing *decode*

theencrypted data. The translatedmessage is thenpassed it to the thirdlearner

* + - **Output:** Thirdlearner reads the translated/decryptedmessage out loud as the computer's 'output.'
  1. **Interpret a pattern to represent or communicate a message or image. Link to D.9, C.6 and C.7**

**Example:**Encoding ,- - , • , , ,. , - , , ,, , An activity such the examplecan alsobeused to illustrate Input, Learners use the braille chart to write their names in braille. • • • • •• :, • ... **j** Processing andOutput (0.7):

A.l>COEFGHI: , , (

DBE Grade 2 Workbook 2 (Life skills)\_ p52

•, •• • • • •• •• •••• •••••• .' • **Input:**Prepare a simplecipher oode secret oode) where

••• • • • • • • • symbols/numbers replaceletters of the alphabet. Write a

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figureout the symbols and transl.atethemessage. This

eq •,,.c.,,, ..-.. ,,.,\_•...., ; represents the computer processing the encrypted/coded

message. (This thenIinks to D.9)

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.J j I I I 1 L J */* • ***;u: ut*** Once themessage is decoded, the childcan readit



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IIIIIIIII!I\ outloud as the oomputer's 'output.'

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| **Content (Grade 2/ Term 4)** | | **Notes/Examples** |
| **D.9 Create a pattern to represent or communicate a message or image.** |  | **Link to D.8**  Thisactivitycanbe extended where learnerscode their ownmessagesuchas asmiley to e.g. communicatehow they felt when the woke upinthe morning |
| **Example 1- Use a grid with blocks to code'message'**  Dividelearnersintopairs.Provideeachpair with anempty grid as shown on theright(without therobot) and a set of instructions(containingcoordinates(row, column) to specificblocks thatmust be ooloureda specificcolour. and a colour that the. Theinstructionsnavigatelearners to code arobot or acomputing device.  Onelearner act as thenavigator (reading theinstructions) and theother learner as the driver(following theinstructions) Once done,pairs showtheir 'patternmessage; to otherpairs to 'read' and explainwhatthemessage iscommunicating. |
| **Assessment- Term 4** |
| Continuous Assessment - Refer to Section 4 | |  |

**Note:**

In terms of coding, typically,problems oouldrequirelearners to

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readcode and explainwhatitdoes or

work through(trace)/ act out oode (physically or simulated)to determinethe output or thecorrectness or

providemissingcode instructions(code instructions areprovidedwith some instructions or oode elementsmissing) thatlearnersneedto complete or translateverbal/writteninstructions(algorithm) to code.

add some functionality/instructions to anexistingprogram.

rewrite a set of codinginstructions to bemoreefficient, e.g.using aloop constructfor code thatisrepeatedor choose thecorrectsolutionfrom 2-3 options or

compare different solutions to evaluateefficiency or

debug analgorithmor program(find thebug, describe thebugand correctit)

developa solution/algorithm(code instructions) basedon a givenproblemor foranopen-endedproblemthroughplanning,implementing, testingand debugging.

depending onthe competency/(ies) thelearnerneedsto demonstrate.

* 1. **GRADE 3**

**Note:**

Teachers must include the following competencies and content in their Annual Teaching Plans (ATPs), distributed across the terms and sequenced, organised, grouped and synergised with other subjects in Grade 3, where applicable), and in a manner that will facilitate learning, ensure ample retrieval and deliberate practise, with feedback to ground principles and concepts, maximizing learner's learning outcomes and achievement, whilst also ensuring a gradual, steady learning curve, in a way that will make optimal use of available time and resources.

* + 1. **Term 1**

**Content (Grade 3 / Term 1) Pattern Recognition**



**C.6 Recognise and interpret patterns in symbolic sets of data or visualisations.**

**Example:**A rainbow parrot hasfour chicks

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2019-TS-Elementary-Question-Paper.pdf (olympiad.org.za)

* Each youngparrot has a d ferent colour for each ofits 4 body parts.The colours are red, blue, green, andyellow.
* None of theparrotshavethe same colour body parts as any of their brothers.
* Based on thefirst3 chicks, whatwill the colour of the4th chick's tail be?

**Algorithm Design and Coding**

**C.1Applycomputational thinking skills to develop a set of logicalinstructionsto solve a problem.**

**Example:**

Read theinstructionsin theblocks and developa set of commandsfor the dog to pick up hisbone and then go home.

**Notes/Examples**

**Could be integrated with Mathematics or Language**

Learners need to identify thecolour pattern and determinewhat colour thefourth chick's tail shouldbe.

**Link to C.6**

Problemscan become increasinglymore complexby making the grid bigger, addingconstraints andobstacles and addingmore actions.

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**Note:**

***Turn Left* or *Turn Right*** means turn to face the directionintowhich you want to walk(not movingforwardbut stay in the same block if you turn, facing the directionintowhich you will continue))

***Forward*** means move oneblock forward.

Forthe shortest solution, you need thefollowingcommands: 10 Forward commands

4 Turn Right commands

1 Turn Left command 1 Pick-up command

One can extend theproblem by askinglearners to indicatewhich instructions shouldbe added tofollow an alternativeroute.

**Note**

For Grade 2 andGrade 3, whenever the character/spriteisinstructed to turnleft or right, the orientation of thefront of the character/sprite shouldbe considered. This implies that the character/spriteface the directionin whichit willmove next(thisrequirementisnot applicable to Grade Rand Grade **1)**



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| **Content (Grade 3 / Term 1)** | **Notes/Examples** |
| **C.2 Present a simple coding solution using symbolic or written statements representing sequences of commands single repetition**  **and conditional constructs.** | **Link to C.1** |
| **Example1:Drawing** (Penbased coding - incorporating•pen-based' drawingand coding activities)  SiphoSuper Bunny(SSB) likes to draw. It first needs to move to thestartingpoint on the grid, thenput thepencil down to drawa square.After drawing the square,itneeds tolift thepencil to stop drawing.  • • • • • •• •  • • ♦ • • **.-eR.**  eto ►  • • • •  Penddo""'  • • • • •  Peod<-9  . • •  *.f:* - ·  • • • •  • • • • • • •  **fy]EB§J**IEIE **E1a fillfill**  Asa variation, the teacher could provide the code which learners need to interpret and evaluate for accuracy.  **Example2- Drawing and symmetry**  In this example, the orangeline(left - in front of the arrow) isprovidedand thelearnersmust develop the code for SSB to drawthe symmetrical shape/mirror image(blueline--0ntherightright).  • • • • •   * • . • M:>veto ►   Penddown  • • ♦  Pend<-9   * • • • ♦   *.f:* • ♦  • • • •  ���♦ �• �• [I•D�• �• �• � | New commands arebeingintroduced:   * Move to a startingpoint ona grid. * Put down thepencil (to beable to start drawing) * L t thepencil up(to stop drawing)   Theinstructions couldbe usedin variousways, e.g., as theexample ontheleft.  It canthenuserepetitionconstructs(indicators) to shorten the  number of instructions as indicatedbelow:  **ti=;; :,c\_o 141**  **2**  Learners couldalsouse*Turn Right* or*Turn Left* commandsas an alternative solution:  lY} **§][I]§] [I]§] [I]§]**    Learners shouldbe exposed to various alternative solutions to stimulate thinkingprooesses and to compare different solutionsin terms of aspects suchas efficiency(shortestroutes,lessinstructions, etc.)  Activities couldbe adaptedto graduallyincreasethedifficultyand complexitylevels. |



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|  | **Content (Grade 3 / Term 1)** | **Notes/Examples** |
| **C.3 Interpret and execute a given symbolicor written set of commands** | **Link to C.1, C.2** |
| **Example 1- Interpret and followinstructions**  SSB can onlymove oneblack at a time, jump, turnleft and turnright.  Studythe gridbelow andwrite down theinstructions andhowmanylimes SSB mustmove forward to reach the green tilewith the carrot at theend.  **w**  **1...r**-**.**    **§J [l]** [!]§)[!] **§J[l)I** | Learnersmustnowexecutethe code to assess whether ii iscorrect or not.  In the second example, the complexityisbeingincreased(from Grade2) by addinganadditional instruction(pickup)  Evidencesuggests thatpupils shouldbe taught - initially  at least- in smallbite-sizedchunks. These stepsin thelearning process shouldbewell-thought out andgradual as well as allow plentyof opportunityforpractice(see, forexample, Rosenshine, 2012;Coe *et al.,* 2014; Sealy, 2019). |
|  | -2 I 2 I **(2**  **Example 2- Interpret and executecode**  Siphocanonlymove oneblock at a lime, jump, turnleft, turnright, andpickupa carrot in ablockitresidesin. Forward Study the gridbelow andwrite down theinstructions andhowmanylimes SSBmustmove or jump, turnleft or turnright to get ***i.*** TurnRlgit to thegreen tile  ,. Turnleft  J  **C**- - -**R)I**\_ . Ptck4>  **I** §] (!]  I) I **2 I**  [!]§] --  **I** -**2** | **Note:**  In addition, referringto example 2, thelearnerscan alsobeexpected to present their solutionin analgorithmicformusing two- or three-  Equivalent algorithm  Start  Forward Pick up Forward  J  Pick up *X* 2  Forward Tu-n Left Pick up Forward Tu-nRght J  Pickup  ForwardX2  Pickup  Stop  wordphrases.For example: |



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| **Content (Grade 3 / Term 1)** | **Notes/Examples** |
| **Robotics (± 2 hours)** | **Could be integrated withCreative Arts or Language** |
| **R.1Explain what a robot is in simpleterms.** | **Link to R.2** |
| **R.2 Identify different types of robots.** | **Can be done with R.1** |
| Highlight thefollowing about arobot, using anexample:   * Special kind ofmachine * Followinstructions to do thingsby itself (arecoded) * Have different parts that canhelpthemdo different things such as   0 armsandhandstopickupsomething.  0 sensors to sense(see *I* hear)whatis around them.  0 legs orwheelsfor movingaround.   * **Made** by peopletohelp themdo different things such as vacuumthehouse, assemblingcars. * Do things thatpeoplecannot **do** such as v.Qrkingin dangerousplaces | Reinforceand extendfrom previousGrades |
| **R.5 Designa simple product (artefact) based on a set of designspecifications.** | **Reinforce and extend** |
| **R.6 Mimicthe operations of a robot.** | **Reinforce and extend** |
| **Digital Concepts(± 1 hours)** | **Could be integrated with Life Skills or Language** |
| **D.1Outline the concept of technology and purpose of informationtechnology (IT).** | **Link to D.2 and D.3** |
| Usinganappropriateexample, explain that technologyisdesignedwith apurposeof solvingproblems thatmeet humanneeds andwants. It refers to tools, machines, ordevices thatmake our lives easier or better.  **Examples** of technologyincludecomputers, smartphones,*TVs,* videogames andeven'robots' thatperformspecific tasks.  Information Technology(IT)is a typeof technology thatdealswithinformation, such as data, images, and sound.ITincludes thingslikecomputers, software, and theinternet.  The**purpose** of ITis to helppeople access anduseinformationmore easily and efficiently.  Technologyis all aroundus, andwe useit every day to communicate, learn, andhavefun. | Learnersneedto distinguishbetween technology andinformation technologyandprovide some examples andthepurpose of each. |
| **D.2 Recognisethat he or she is living as citizens in a digital world.** |  |
| Learnersneedto understandthat a digital footprint islikea trail of your activitythatyouleavebehindwhen do something online, e.g., use WhatsApp and that, evenif youdelete a WhatsAppmessage,itis very possible thatsomewherethereremains arecordofit.  **Possible discussion points**  Justlikehow oneleavesfootprintsin the sandwhen youwalk on sand, youalsoleavebehind traces of your online activity suchas thewebsites you visit, the videos youwatch, thepictures youpost, andthe things yousay or searchfor online.  This digital trail canbe seenby otherpeople,like your friends orfamily, and evenby people youdon't know. It'simportant to remember that anything you do  or say onlinecanbe tracedback to you, soit'simportant tobe careful about what youshareonline and to always thinkbefore youpost | ReinforcefrompreviousGrades and Terms   * DigitalFootprint   Empower learnerswiththinking skills and strategies to supportthe development of self-awarenessandself-regulation so theylearn to managethemselves as digital citizens |
| **D.3 Demonstrate an understanding of the concept of a computing device.** | **Reinforce and extend from previous Terms and Grades** |
| **Assessment- Term 1** |  |
| Continuous Assessment - Refer to Section 4 |  |

* + 1. **Term 2**



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| **Content (Grade 3 / Term 2)** | **Notes/Examples** |
| **Pattern Recognition** | **Could be integrated with Mathematics or Language** |
| **C.6 Recognise and interpret patterns in symbolic sets of data or visualisations.** | **Link to C.1** |
| **Example 1:**  Example **1:**  Different shapesbut all have the same number of angles and sides(thepattern)  **Example 2:**  Whatcomes next? Why?  • *•A* •- • | Learnersmust interpret andexplainthepatterns. Distinguishbetweenrepeatingandgrowingpatterns |
| **Algorithm Design and Coding** | **Link to C.6** |
| **C.1 Apply computational thinking skills do develop a set of logical instructionsto solve a problem.** | **Link to C.2 and C.3** |
| **Example:**   1. Explain to thelearner thattheywillbe using a grid to practice sequencingand directional commands, justlikea computerprogrammer. 2. Show thelearner theset of directional cards and explainwhat each cardmeans(e.g. up, down, turnleft, turnright, forward) 3. Show thelearner theset ofnumber cards and explainthat theywill be using thesecards tomove a character on thegrid. 4. Placethe character (a small sticker or marker) at thebottom-left corner of thegrid. 5. Ask thelearner to choose anumber card(e.g., 3) anda directional card(e.g.,up) andplace themin a sequence(e.g., 3,up) 6. Ask thelearner to followthe sequenceandmove thecharacter on the grid accordingly(e.g.,move up three squares) 7. Repeat steps 5-6 several times with different sequences of numbers and directional commands, encouraging thelearner to think carefully about the order of the commands | Inthisactivity,learners eventually design their own'game' in C.2  This activityhelpslearnersreinforcetheir sequencingand directional skills, as well basic programming oonceptsin afun and engagingway. |
| **C.2 Present a simple coding solution using symbolic or written statements representing sequences of commands, single repetition,**  **and conditional constructs.** | **Link to C.1 and C.3** |
| Usingthe examplein C.1, once thelearner iscomfortablewith moving the character on the grid, challengethem to create their own sequences of commands  using thenumber and directional cards | **Extend activity from C.1** |
| **C.3 Interpret and execute a given symbolic or written set of commands.** | **Link to R.6** |
| **Example 1:Decision with pair programming**  SSB does not likepurple carrots at all. When SBBlands onaredblock, it must decidewhich of theinstructions ontheright to follow to **Ftrw<rd**  avoid collectingpurple carrots. Tlr11Rq,1  Dividelearnersintopairs andprovide eachpair with the grid andtheinstructions (oompleted oode) below.  ,,.. TlITILef;  One learner act as thenavigator and theother act as the driver. Thenavigator reads theinstructionsprovided and the driver *ad* as the 0::1  rabbit andfollow theinstructions as communicatedby the driver. JUTf)  When done, driver explains the code to navigator and thenavigator ver ies that the explanationis correct. | The complexityisbeing increasedby adding two decision structures(as one oomparedtoGrade 2) to theproblem, combinedwith several repetition structures. |



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| **Content {Grade 3** / **Term 2)** | **Notes/Examples** |
| ' /    / *I'* **1-11 100 00** r=> l,!J  ¾ 2 2 (3'  /  **Example 2 Interpretinstructions provided and fillin missing instructions.**  SSB must collect the carrot.Studythe grid and thecode instructionsbelow. Interpret theinstructionsprovided andfillin themissinginstructions to enableSSB to collectthecarrot.  *I'*  **Forward x3**  *Ii.'* **Down x2**  **(missing instruction(s))**  u.. **Up x (missing number)**  **Left x2**  ---  L: -- Now code the completedinstructions(algorithm) using arrows andnumbers |  |
| **Robotics** | I **Could be integrated with Creative Arts or Language** |
| **R.1 Explain what a robot is** in **simple terms.** | I **R.1 and R.2 can be done together** |
| **R.2 Identify different types of robots. Reinforce from previous Graders and Terms using**  **Example different examples**  Learners shouldnowhavea good idea thata robotis suchas body, arms andhands, sensors, control system, power source,wheels orlegs, tools or attachments | |
| **R.5 Design a simple product (artefact) based on a set of design specifications. Link to R.1 and R.2** | |
| **Example:** Learners shouldbe able to design an artefact that  Provideanexample of arobot artefact thatlearnersneedto design. See R.5Grade1, Term3 • •1ookslike' arobot.  Learners get inspirationformtheir understandingofrobots andthenideate about theirrobot: • can•moveIikearobot'.   * Who their robotis. • have•partsIike arobor. * Whattype ofrobot ii is followinstructionslikea robot * Whatcomponentsii has * Whattheirrobot cando * How theirrobot couldhelppeople | |



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| **Content (Grade 3 / Term 2)** | **Notes/Examples** |
| **R.6 Mimicthe operations of a robot.** | **Link to R.5 and C.3** |
| Use examplesofrobots(pets,robots, cars) and directional codingcards andletlearnerscreateinstructionsfor theserobots and act it out.  ' -...:, ,-'".".   * -.;:   ·  ' 0:l | Reinforceand extendfrom previousGrades and Termsusing different activities |
| **Digital Concepts(± 1 hours)** | **Could be integrated with Life Skills or Language** |
| **D.1 Outline the concept of technology and purpose of information technology (IT).** | **Reinforce from previous Grades and Terms** |
| **D.2 Recognise that he or she is living as citizens in a digital world.** | **Link to D.1** |
| **Example: Positive Footprint**  Providelearnerswithan'empty' footprint.  Let themwrite downin thefootprintwhat theywouldlike otherpeople to link to their namein future, thinking about aspects such as:  Theirprofile, Achievements, Pictures they shared,how theybehavedonline | ReinforcefrompreviousGrades and Terms   * DigitalFootprint |
| **D.3 Demonstrate an understanding of the concept of a computing device.** Learnersneedtounderstand thatcomputing devices areall  **Possible Discussions** aroundus and that theseareall linkedto facilitate, e.g.,  Whatis a computing device? communication  How we canuse computing devices, e.g., computing deviceshelpus to communicateandlearn How do weneedto behavewhenweusecomputing devices | |
| **Assessment- Term 2** | |
| Continuous Assessment - Refer to Section 4 | |

* + 1. **Term 3**



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| **Content (Grade 3 / Term 3)** | | **Notes/Examples** | |
| **Pattern Recognition** | | **Could be integrated with Mathematics or Language** | |
| **C.6 Recognise and interpret patterns in symbolic sets of data or visualisations.** | | **C.6 and C.7 can be done together** | |
| **Example1** Interpret thepattern, then translatepatternusingsmileys to patternusingthumbs.  ©©©©©© | | Interpret apatternandthen translate thepattern(create the same patternusing different symbols/material) | |
| **C.7 Create or complete a pattern to represent a data set.** Extendpatterns to includegrowingpatterns andidentifyingthe  **Example 1 Example 2** underlyingrule.  Growingpatterns: Decreasing growingpatterns and theirunderlyingrule((-□in the examplebelow)  □□□□□□□□□□- □□□□□□□□□- learnerscan alsoplay games withrepeatingas well as growing  patterns, such as a domino game in which theyneed to match  and their underlyingrule (+□in theabove example) patternswiththe same unit or rule.  **Example 2** Determine thepattern(rule), thencomplete thepattern. learnersmustfirst determine theunderlying ruleand thencompletethepattern accordingly. | | | |
| **Algorithm Designand Coding** |  | | |
| **C.1Applycomputationalthinking skills do developa set of logicalinstructionsto solve a problem. C.1, C.2, C.3 and C.4 can be done together** | | | |
| **C.2 Present a simple coding solution using symbolicor written statements representing sequences of commands single repetitionand**  **conditional constructs.** | | | Inthe example ontheleft,learnersmustsolve theproblemusing   * C.1- applycomputational thinkingto developasolution (algorithm) |
| C.3 **Interpret and execute a given symbolicor written set of commands** | | |
| **Example:**Movingoneblockat atime, the dog mustfirstpickup thebone and then go toitskennel. • C.2- present asolutionusing arrows  Use the arrowsprovided, avoidingthe trees, pack out theroute to thebone andthen going to thekennel. • C.3- act out (implement) thesolutionandtest if it works  ***i.t-* t l** ... • C.4- find the error and correct it (debug) if it does not  **t** work  ...... ....... As thereismorethanoneroute to thebone andback, one can  **t** also extend theproblemby askinglearners to indicatehowmany  **ft** \* **l** routesthe dogcanfollow, andwhichrouteis theshortest.  **t** ...... | | | |



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| **Content (Grade 3 / Term 3)** | **Notes/Examples** |
| **C.4 Debug a given symbolic or written set of instructions.** |  |
| **Example1**  Study thefollowingpicture steps anddescription to fold abasicpaper plane. (https:/[/www.hgtv.com/design/make-and-celebrate/handmade/how-to-make-a-paper-airplane)](http://www.hgtv.com/design/make-and-celebrate/handmade/how-to-make-a-paper-airplane))    Steps   1. Unfoldthepaper andfold eachof the top oornersinto the centreline. 2. Fold thepaperin half vertically. 3. Fold theplanein half toward you. 4. Fold thewings down,matching the top edges up withthebottomedge of thebody. 5. Fold the top edges intothe centreline. 6. Add double stick tape to theinsideof thebody. Thefinishedplane shouldlooklikethis. Fold your ownpaperplanelooking at thepicture steps and thewritten steps.   **How should the written steps be renumbered to match the steps as per the pictures? Example 2:**  SSB onlylikearrangecarrots. Whichpathshouldhefollow to eat only the orangecarrots.Thereisanerrorin the solution ontheright, Find the error and correct.  ' /  / ;  **t II [I[]I] [.tile:>**  / **2 2, 2 )( (3** |

**Content (Grade 3 / Term 3) I Notes/Examples**



**Robotics I Could be integrated with Creative Arts or Language**

**R.1Explain what a robot is in simple terms.** Reinforceand extendfrom previousGrades and Termsusing

**R.2 Identify different types of robots.** different examples and activities.

**R.3 Outline the different components of a robot**

**R.4 Present an understanding of how robots affect the world.**

**Assisting People:**Robots canbeprogrammedto assist peoplewhomay needhelp. Some robots canhelppeoplewith disabilitiesby fetching things, opening doors, etc.

**Exploring New Places:**Robots arealsoused to exploreplaces thatarehardfor humans to reach.E.g. theycan go deep into the oceans to study sea creatures.

**Learningand Education:**Robots canbe great toolsforlearning. Some schoolsuserobots to teach students about science, technology, engineering, andmath

**R.5 Designa simple product (artefact) based on a set of designspecifications. Link to R.1, R.2, R.3 and R.4 and includes R.5, R.6, R.7**

**Example 1**

Design arobot hand!

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Refer to designprocessin Grade1 Term3 to first design the hand.



[https:Uwww.youtu be.com/watch?v=elc095iTlgs](http://www.youtube.com/watch?v=elc095iTlgs)



1. **6 Mimicthe operationsof a robot. Link to R.5**

Inrelation to therobotichand artefact the students can design their own simple signlanguage to communicatemessages pulling thestrings of thehandlifting certainfingers. Anoperation to turn thehand aroundcan alsobe included to either have thefingerspointing down orup. This extends therangeof the symbols that canbe presented.

**Marble maze:** The learnersdesigna simplemaze on paper. Through whicha marblecan runwhen tilting. Plan the design.

Reinforcefrom previous Terms andGrades

**Marble maze**

Blockspapermay be usedfor this activity.

Start planningthe design. Rethink if needed

Finalise the design

Indicatestarting point(green) and end point(red)

Test the design (onpaperwithan overlay) indicating the path themarble will follow

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This examplecovers several coding androbotics skillsincluding elements of thedesign thinkingprocess.

The debuggingprocessis alsoappliedin variousformsfirstly

throughthe checking of themaze and secondly through the



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*I* checking of the algorithmto move themarblefrompoint A to 8.

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, Variousfinemotor skills arealso developedusing this activity/



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| **Content (Grade 3** / **Term 3)** | | | | **Notes/Examples** |
| **Implement thedesign**(buildthe artefact)  Create the solution to move themarblefrom the start to the endfollowingthe desiredpath.  **Material** I **Maze Test against overlay**  Use cardboard or paper and arecycledbox ICut straws(singleand doublelength strawsthat Use overlay to see if mazeis correct.  canbe donein advance) andpack straws onto cardboardtorepresent themaze.  Checklayout against design.  If correct, glue  straws to cardboard  Desi-gn codingcards(canbe donein advance)- couldbe substitutedwithwritteninstructions:  1  **t** *Tift ng i-* ***d*** *d,.,* , ***1*** .. *ill* 11 1- Tilt up   * • ***----...1***  *---. left*-*ftJ* ***-t*** ·•· - Tilt Right Tilt left, Tilt up, Tilt down   != / **le1**  **Code the solution(Design the algorithm)**   * + Thelearnersmustnowdevelopthe algorithm(solution) to have amarblemove fromtheindicatedstartingpoint (green) to the endpoint red).   + Compare the algorithmto the original paper-based(overlay) solutionto that of the codingcards.   + Test the solutionby followingthe code (cardinstructions) and tilt thebox according to theinstructions.   + Debugif required. | | | | Learners could then exchangemazes and solve eachother's maze problems, firstusingcodingcards and thenphysically executingthe code.  The solving of thephysical game requires a certain degree of hand-eyecoordination. |
|  |  | Tilt right  **r** Till up  *.....,,,,,.in* ,en **Note:**  -' -*rmup* **alidown** Thisprocessmay require  --- further debugging.  \_, Ti/I right  , Tilt up •  *i* ***Jiltlefl,*** | | **Could be integrated with Life Skills or Language** |
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| Digital Concepts | | |  |
| **D.1 Outline the concept of technology and purpose of informationtechnology** (IT). | | | | Reinforceand extendfrom previousGrades and Termsusing  different examples and activities. |
| **D.2 Recognisethat he or she is livingas citizens in a digital world.** | | | | **Link to D.3, D.4** |

**Content (Grade 3 / Term 3)**



**Example**Digital Citizenship discussions:

Preparecardswithdifferent actions or choices childrenmake online, like"sharing afunny video," "commentingonsomeone'spost," or"playing a game with strangers", etc.

Dividelearnersinto small groups andhave each group drawa card.

Each group discusseshow their actions canleavea "digital footprint or couldhurt someone'sfeelings, etc.

Talk about thepositive andnegativeconsequencesof different actions they take online andhighlight the values thatmustbeinstilledand the characterwe should express.

1. **3 Demonstratean understandingof the concept of a computingdevice.**

Learnersneedto understandthat a computing deviceis amachine that canprocess and store data andinformation, and canbeusedto do thingslikeplay games,watch videos, and oommunicatewith others

**D.4 Identifythe common uses of ICT in the real world.**

Communication technologyplays acrucialrolein an ICT system

ICTisanumbrella termthat indudesany communication device, encompassingradio, television, cellphones, computer andnetworkhardware, satellite systems, and so on, as well as the various services and applianceswiththemsuchas videoconferencing and distancelearning

Communication technologyenablesmoderncomputingand allowspeople andorganizations to interactin the digitalworld

**D.5 Differentiate between the components of an ICT system.**

**Possible discussion**

An ICT system isa system thatusesoomputers, programs(instructions), andnetworks to process and storeinformation. It has distinctparts thatwork together to helpususecomputers to do different tasks:

* Thefirst partis the oomputer itse .
* The secondpartis theinstructions(software) that tell the computer what to do.
* The thirdpartis the data. Data is theinformation that we putintothe computer to workwith.This canbethingslikepictures, music, or text.
* An ICT system alsohasnetworks.Networks areliketheroads thathelp oomputers talk to each other. They connect computers together so thatwe can shareinformation andwork onprojects together.

**D.7 Present a basic understanding of the concept of input processing and output.**

Learnersneedto understandthat a computing devicereceivesinput, processes theinput, andprovideoutput

**D.8 Interpret a pattern to represent or communicate a message or image.**

**Example:**Wat does thefollowingcommunicate?

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**Notes/Examples**

Reinforceand extendusingdifferent examples and activities As digital citizens, weneedinstilpositive values thatbuild character to guide ourbehaviour whenwe interact in the digital world.

Learnersneed to start to understand theimpact of their actionsin the digital world and developessential skillsforbeingresponsible andrespectful digital citizens.

**LinktoD.7**

**Link to D.5**

Reinforceand extendfrom previousGrades and termsusing different examples and activities.

**Link to D.1, D.3, D.4, D.5 and D.7**

Reinforceand extendusingdifferent age-appropriateexamples and activities.

Use pictures to discuss thed ferent components of anICT system.

**Link to D.3 and D.8**

Reinforceand extendfrom previousGrades and termsusing different examples and activities.

**Link to D.3 and D.7**

One oould oommunicateinput, processing and output using symbols, e.g.,input (keyboard), processing(CPU/chip) and output, e.g., computer screen.

**Assessment- Term 3**



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ContinuousAssessment - Refer to Section 4

* + 1. **Term 4**



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| **Content (Grade 3 / Term 4)** | **Notes/Examples** |
| **Pattern Recognition** | **Could be integrated with Mathematics or Language** |
| **C.6 Recognise and interpret patterns in symbolic sets of data or visualisations.** | **Also link to C.7 and C.1** |
| **Example**  Study at the following text: **AABAACAADAABAABA**  Find the following pattern within the above text:I **AABA**  Pattern found in three instances at positions **AABA AABA**  and 12: **AABAACAADAABAABA**  **O 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15**  **AABA**  Onecould start withaskinglearners to firstfind theBA patter (position 2, **11** and14) | Findhiddenpatterns/ patternswithin data  Patternrecognition eventuallyleads to analysingpatternsin data. Byidentifyingpatterns,we canpredict whatwill come nextand whatwill happen again and againin the sameway.  A patternmaybenumerical, visual orbehavioural.  InComputer Scienoo/codingwe analysepatternsin data and makepredictions and generalisationsbasedon thepattern analysis. |
| **C.7 Create or complete a pattern to represent a data set.** | **Link to C.6 and C.1 and C.2** |
| **Example**  (i)  **e.;.;** •  (iil **tttt, TTTT, ttt, TTT, tt, TT** \_  (iii)... '\ '  (iv) 4, 8, 12, 16, 20, , | Providelearnerswithpatterns theyneedto oomplete. Learners alsoneedto create their ownpatterns.  Inprogramming,for example, aprogramthat canrecognize patternsin handwritingcanbeusedto digitizehandwritten documents, whileaprogramthat canreoognizepatternsin speechcanbeusedto transcribespokenwordsinto text.Pattern recognitionis also afundamental aspect of artificial intelligence andplays akeyrolein many applications of machinelearning, |
| **Algorithm Design and Coding** |  |
| **C.1Apply computationalthinking skills do develop a set of logical instructions to solve a problem.** | **Link to C.2** |
| **Example**  Four beavers start swimmingfromdifferentplaces. They only swimforwards and always follow the arrows. Selectall thebeaverswhowill reach the strawberry.  TS-2018-Solutions-Guide.pdf(olympiad.org.za) ***4***  ***2. 3*** | Useabstractiontohighlight the vitalinformationfor solving the problemandignoreunimportantinformation.  Decompose by followinstructions(algorithm) for beaver **1,** then for beaver 2, thenforbeaver 3andlastlyforbeaver 4 (one at a time) to seewhichbeaverswill reach the strawberry |



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| Content (Grade 3 / Term 4) | | | **Notes/Examples** |
| **C.2 Present a simple coding solution using symbolic or written statements representing sequences of commands single repetitionand**  **conditionalconstructs.** | | | **Reinforce and extend from previous grades and terns** |
| **Example**  Usingthefollowing as anexamplequestionmay beposed suchas  Can Zebra visit elephant without crossingany pinkbutterflies? CanGiraffe visit Zebra by crossingevery singlepinkbutterfly?  Whichroute shouldElephant follow to cross as many as possible different colours of butterflies? (Elephant  may only cross a singlecolourbutterfly once). | ***11:***-,***'*** |  | Providelearnerswith aproblemandlet themdevelopthe instructions to solve theproblem, thenpresent and execute the set ofinstructions.  Additional complexitywhich requires the application of analysis and simpleproblem-solving skills couldbe added to problems. |
| **C.3 Interpret and execute a given symbolic or written set of commands** |  |  |
| **Example**  The following exampleisfrom theDBERainbowGrade 1 (EnglishHL - Book 1,page 115). With simple adaptationsii can easilybe changed to aproblem-solving question thatrequire some coding and decisionmaking.The colouredsquaresindicateconditional stops.  ShowScm   * c,,)howt,,9etto   school,to **the Sorn** loScl-oo(Rcute 0  shopondto  the tOX1rank. -- [ID§] [ID§)[ID§1  [- t:  ,• ,........ Som toSchoolmcute2 - fltemotel'  §)[ID [ID® §)§)[I) [ID§J[ID  Somto ToxlRori,  §][ID (m@§) ®§1[ID  'A ..r!.-. ....  • | | | Learners developdifferent routes for Sam to go to school or to go to thebank. |

**Content (Grade 3 / Term 4)**

**C.4 Debug a givensymbolic or writtenset of instructions.**

**C.5 Evaluate a given solution towards potentialimprovement.**

**Example:Museum visit (extendedfrom Grade2)**

Visitors visiting themuseumare only allowed to go throughall therooms exactly once. Thisiscalleda one-way tour.Therefore, thefollowingrestrictions apply:

**Restrictions**

Theymay not visit aroommorethan once.

They arealsonot allowedto usethe same door forentering and exitingaroom.

The visitorsmust start at the arrow that enters themuseumandleavebyway of the doorwith the arrowleavingthemuseum.

**Task**

**Notes/Examples**

Debug your algorithm, if necessary

learnerscancomparealgorithmsin pairs to decidewhose algorithmismoreeffective or howitcanbeimproved, e.g., find pattern/ combine single steps intoaloop.

Complexityisincreasedbyaddingrulesorrestrictions

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Evaluate thefollowingfloor plans to seewhichmuseumlayoutwillmeet therequirements(restrictions)

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**3 i 3** - -

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**6 6**

**2 2**

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**4** I 7 ..

**4** 7

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Adapted from 2021-TS-Elementary-Question-PaQer. f(olymQiad.org.za)



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**Robotics(+ 2 hours)**

* 1. **Explain what a robot is in simpleterms.**

**R.2 Identifydifferent types of robots.**

**R.3 Outline the different components of a robot**

Components such as body, arms andhands, sensors, oontrol system,power source,wheels orlegs, tools or attachments(reinforcefrom Grade2 andprevious terms) robots-activity-sheets.Qdf(ieee.org)

**R.4 Present an understandingof how robots affect the world.**

**R.5 Designa simple product (artefact) based on a set of designspecifications.**

**R.6 Mimicthe operationsof a robot.**

**Could be integrated with Creative Arts or Language**

learnersshouldnowbeable to

* Describearobot.
* Identify types ofrobots.
* list the variousparts that arobot couldhave.
* State what arobot cando (and cannot do).
* Describehowrobotsmove.
* Explainhowrobotsimpacttheworld aroundus.

learnersshouldnotbe able to design an artefact that

* •lookslike' arobot
* can•moveIike arobot'.
* have'parts Iike arobor or
* followinstructionslikea robot

learnersshouldbe ableto act out a set of instructions(provided

ordeveloped) thatmimics various actions/tasks arobot oould perform.



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| **Content (Grade 3** / **Term 4)** | **Notes/Examples** |
| **R.**7 **Create test and execute a set of robotic instructions.** | **Links to R.1, R.2, R.3, R.4, R.5, R.6** |
| **Example**  Alearner/group oflearners areprovidedwith a gridwith obstacles andlimitations as well as anoutcome(e.g.,robot mustpickup 5 coins, avoid,x andy andmay not touchz andmynot step on the same block twioo.Learner/group then develop theinstructions to solve theproblem/meet theoutcome.  Onelearner act asarobot and executes(act out) theinstructions developedto seeifit works.  If thereis amistake, thenext learner/group oflearnersmust debug andcorrect, thentest again...repeatuntil it is correct | Learners shouldcreate their own set ofinstructionsfor arobot to act upon, executeit byactingii out/ testingii and debuggingii if necessary. |
| **Digital Concepts** | **Could be integrated with Life Skills or Language** |
| D.1 Outline the concept of technology and purpose of information technology (IT). | **Reinforce and extend** |
| Technologyis designedwith apurpose of solvingproblemsthatmeet humanneeds andwants. It refers to tools,machines, or devicesthatmake our lives easier or better.  **Examples** of technologyincludecomputers, smartphones, TVs, videogames andeven'robots' thatperformspecific tasks.  Information Technology(IT)is atype of technologythat dealswithinformation, suchas data, images, and sound. ITindudesthingslike computers, software, and theinternet.  The**purpose** of ITis to helppeople access anduseinformationmoreeasily and efficiently.  Technologyis all aroundus, andweuseit every day to communicate, learn, andhavefun. | Reinforcefrom previous grades and terms.  Learnersneed to distinguishbetween technology in general and information technologyandprovide some examples andthe purposeof each. |
| D.2 Recognise that he or she is living as citizens in a digital world. | **Link to D.1** |
| Reinforcefrom previous grades andterms.  We aresurroundedby technology, andwe useit in many aspects of our dailylives.Providelearnerswithexamples.  As citizensin a digitalworld,wehave oortainresponsibilities and expectationsregarding aspects such as online safety,privacy,respect, digital footprint.  It'simportant to remember thatanythingyoudo or say onlinecanbetraoodbackto you, so it'simportant to becareful how youbehave online, aboutwhatyou share online and to always thinkbefore youpost. | Learnersneed to understand thefollowing concepts andprovide examples:   * Online safety * Privacy * Respectfor others * DiQital Footorint |
| **D.3 Demonstrate an understanding of the concept of a computingdevice.** | **Link to D.1and D.2** |
| A computingdevioois amachine thathelpsus proooss andstoreinformation.It canbeanything thatusesa computer chip to work, like a desktopcomputer, a laptop, a tablet, a smartphone or aSmart TV.  Computing deviooshelpuslearn, communicate, create, andhavefun.  How to takecareof computing devices andhowto usethemsafely. | Reinforceand extendfrom previous gradesand terms. Learnersneed to understand thatcomputing devices areall aroundusand thatacomputing deviceacooptsinput,prooosses  theinput, andprovides output. Use appropriateexamples. |
| **D.4 Identify the common uses of ICT** in **the real world.** | **Link to D.1, D.2 and D.3** |
| Commonusesincludecommunication, education, entertainment, business.  Discussuseswithintheseareasknownto learners | Learnersneed to identifyuses of ICTin real lifeknownto them,  e.g.,point of sales systemat the shop |
| **D.5 Differentiate between the components of an ICT system.** | **Links to D.4** |
| Reinforce and extendfromprevious grades and terms.  **Example:**the salespoint in the shophas ascanner thatreads thebarcodeon theitemandadda thepriceof eachitemto give you the total amount payable. Another part, thecardmachinereads yourbankingdetails andmake apayment.(use examplesthat learnersunderstand)  Partsinclude:   * Hardware(input and output devioos), e.g.till, barcodereader and the cardreader * Software(code) - programs that enable the systemto work * Data thatisprocessedand stored, e.g.readbarcodeonitemsto get prices andcalculateamount due * The Internet (network) that communicateswith thebank tomake apayment*I* communicationbetweentill andbarcodereader or the cardreader * People thatoperate the devicesandusers that communicatewithothersusingICTsystems | Learnersneed to understand that an ICT systemis made up of variousparts or components thatwork together to helpus proooss andshareinformation  Provideappropriateexamples(e.g. point-of-sales system) that learnerscanunderstand |



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| **A** | **B** | **C** | **D** | **E** | **F** | **G** | H | I | **J** | **K** | **L** | **M** |
| 14 | 26 | 11 | 20 | 4 | 19 | 12 | 2,, | 1 | 25 | 6 | 23 | 5 |

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| **N** | **0** | **p** | **Q** | **R** | **s** | **T** | u | **V** | **w** | **X** | **y** | **z** |
| 13 | 7 | 15 | 2 | 17 | 21 | 10 | 22 | 8 | 16 | 3 | 18 | 9 |

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| **Content (Grade 3** / **Term 4)** | **Notes/Examples** |
| **D.6 Explain how the adaption of technology impactedthe world we work and live in.** |  |
| Reinforce and extendfrom previous grades and terms.  **Impact:**(different sectors)   * **Communication:**Made theway we oommunicatemuch faster and easier (Instant messaging, e-mail, etc.) * **Education:**Changedtheway welearn(onlineresources) * **Entertainment:**Stream movies, etc. * **Work:**Peopleworkremotely, collaboratewithpeople around theworld, etc. | learnersneedtounderstand thattechnologyhastransformed the way we work, oommunicate, andlive.  Provide appropriateexamples |
| **D.7 Present a basic understanding of the concept of input processing and output.** | **Reinforce and extend** |
| Reinforce and extend fromprevious grades and terms.  **Example:**Using thepoint of sales ICT system - thebarcode reader inputs theitemcodes, thenprocess theitempricesand thenprovidesoutput in theformof theamount payable.The person that operates thepay point isalsopart of the ICT system; so is the oode (softwareinstructions) thatcalculates theprices. | learnersneedtounderstand, using an examplefamiliar to them, the ooncepts of input thatresultsin output throughprocessing. |
| **D.8 Interpret a pattern to represent or communicate a message or image.** | **Link to D7 and D.9** |
| **Example 1.**  **Yellow and Black stripes:**depending on how it ispresented it oouldbe interpreted as   * **Bee:**thepatter of yellow and black stripes couldrepresent a bee * **Warning:**the yellowand black strips are commonlyused as a warning sign such as on oonstruclion sites or traffic oones * **Sport team's shirts:**A sport team couldhave shirtswith yellowandblack stripes.   **Example 2 Secret Code**  **Riddle Code Breaker**  Use the code to find the answers to the riddles )   1. What CQA you ootch but riot throw?   G l11l1l21l2ol   1. What beglrts with T, finlshes with T, and ha.s T in it? 1. A Cold   G 1101·1,.1,s11 l10I 2. A teapot  htt12s:LLcontent.twinkl.co.ukLresou*rceL*92L*4aL*za-h1-495-riddle-code-breaker ver 2.12d | Reviseand extend using different, appropriateexamples  An activity suchas Example 2 can alsobeused to illustrate Input, Processing and Output:   * **Input:**Prepare a simple cipher oode (secret oode) where symbols/numbers replaceletters of the alphabet. Write a   short message in thecode as the"input" for the oomputer.   * **Processing:**Provide thelearner with a decoder chart to figureout the symbols and translatethemessage. This represents the computerprocessing the encrypted/coded   data.   * Output Once themessage is decoded, the childcan read it outloudas the oomputer's'output.' |
| D.9 Create a pattern to represent or communicate a message or image. | **Link to D.8** |



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| **Content (Grade 3 / Term 4)** | **Notes/Examples** |
| * Secretmessage oodingbraceletusingbinarycodingwiththe alphabet torepresent message, e.g., the   r(/ ?} r,...RY C1 learner'sname  fl'\.P. HA8, **Note:**eachletterisrepresentedby a sequence of 8 zeros and ones(ASCIIoode)  *H,-:::::. -, I*  (Threecolours ofbeads required: one colour to represent Os and one oolour to represent1sandanother  colour to represent a symbol suchas aheart, star, etc.thatwill separate the startingand endingpoints of  -F thelettersin the secret code.)  G **Example 2** ,   * \_\_**ui.**,,.,\_,.., **,\_** ..   **BINARY BEADING RAIISOW UNICORII COI.ORIIG GRIP**  COIJNGACTIVITY FORKIDS  **ti**  . .,,  **,-c.rtimit,**  https://www.woojr.oom/mystery-picture,:irid-coloring-pages-fantasy-fairy-tales/  .. ;;- ..... ,... \_, ..... ,... ...i  -. *!!*.*-*..***r-***...***-***........,.1,...  ,;  **r, ,.** | ASCIIcode isa set of digital oodes (binarynumbers) representing letters, numerals, and other symbols, widelyusedas a standard formatin the transfer of text between computers) |
| **Assessment- Term 4** |  |
| Continuous Assessment - Refer to Section 4 |  |
| **Note:**  In terms of ooding, typically, problemscouldrequirelearners to   * readcode and explainwhatit does or * work through(trace)*I ad* out oode (physically orsimulated) to determine the output or the correctness or * providemissingcodeinstructions(oode instructions areprovidedwith some instructions or code elementsmissing) thatlearnersneed to oompleteor * translate verbal/writteninstructions(algorithm) to oode. * add some functionality/instructions to anexistingprogram. * rewritea set of codinginstructions to be more efficient, e.g.using aloop constructfor code thatisrepeatedor * choose the correct solutionfrom 2-3options or * compare different solutions to evaluateefficiencyor * debug analgorithmor program(findthebug, describethebugand oorrectit) * developa solution/algorithm(code instructions) based on a givenproblemor for anopen-endedproblemthroughplanning,implementing, testing and debugging. depending on the competency/(ies) the learner needs to demonstrate. | |

The following example illustrates how a pen-and-paper activity could lead to implement the algorithm in a coding environment.

In Grade 3, the learner could do the pen-and-paper activity only. Implementing the pen-and-paper algorithm in a coding environment will follow in subsequent grades. The purpose of the example is to illustrate how the unplugged activities done in Foundation Phase, lead to activities that could be done using programming environments. Example of Algorithm Design (preciseness and detail of instructions) using pattern recognition and evaluation of solution:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Hereis an algorithm-follow exactly(do notlook at another's drawings and do not ask forhelp  Step 1: Drawa3 cm line.  Step 2:Draw another 3 cm line. Step 3:Draw another 3 cm line that oonnectswith thelinein step 2.  Step 4:Draw another 3 cm line that  oonnects to thefirstline | After drawing, oompareyour drawingwith the drawing of the others.  It was supposed to be a square.  Now, letus lookhow to developa better algorithmto drawa square:  Are they different?  Why are they different?  What was missing from theinstructions? It was supposed to be a square. | **Solution 1:**  Write down amore precise, detailed set of instructions:   1. Turn right. 2. Draw a 3 cm line. 3. Turn right. 4. Draw a 3 cm line. 5. Turn right. 6. Draw a 3 cm line. 7. Turn right. 8. Draw a 3 cm line. | **Now,** lookforpatterns:  2. Draw a 3 cm line. }**El**  1. Turn right.  4. Draw a 3 cm line. }El  3. Turn right.   1. Turn right. }� 2. Draw a 3 cm line. 3. Turn right. }[;] 4. Draw a 3 cm line.I | **Solution 2:**  Repeat **4** times | | |
|  | Turn right. Draw a 3 cm line | } |
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Example of two algorithms for drawing a square, the one on the left with linear steps and the one on the right with a loop after identifying repetitive pattern.

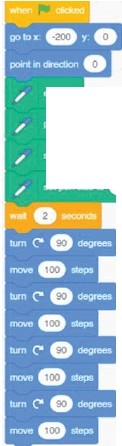
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**Code, Implement, Compare and Evaluate solutions (this could be done in the next phases):**

Implement and test both solutions. Both solutions work, however, evaluation shows that the solution on the right is more effective (using a loop) than the one on the right. The example below shows how the above algorithms can be implemented using programming software:

**ABABABAB**



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**Note:**

Learners need to understand that *turn right*

means 90 degrees in Scratch.

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**Note:**

Competencies covered in the above solution: C.1, C.2, C.3, C,4. C.5 and C.6

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* **B**

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###### SECTION 4

**ASSESSMENT**

* 1. **INTRODUCTION**

Assessment is a continuous planned process of identifying, gathering and interpreting information about the performance of learners, using various forms of assessment. It involves four steps:

* generating and collecting evidence of achievement.
* evaluating this evidence.
* recording the findings and
* using this information

to understand and thereby assist the learner's development to improve the process of learning and teaching.

In Foundation Phase, all assessment is school-based assessment (SBA) and involves activities that are undertaken throughout the year. Assessment in Coding and Robotics should encourage:

* Computational thinking practices, i.e., integrating the power of human thinking with the capabilities of digital technologies and computer programming.
* Design thinking and design process.
* Problem solving strategies.

In the Foundation Phase, the main techniques of formal and informal assessment are observation by the teacher, oral discussions, practical demonstrations and written recording. Grade R assessment should be mainly oral and practical.

* 1. **ASSESSMENT**

Assessment is the process of continuously collecting information on a learner's achievement. It is a daily monitoring of learners' progress.

The forms of assessment used should be age and developmental level appropriate. All assessments must cater for a range of cognitive levels and abilities of learners. The design of these tasks should cover the content of the subject in a variety of ways. A variety of forms of assessment (observation, oral, practical and written) should be used to give each learner the opportunity to demonstrate what he or she can do.

However, cognisance should also be taken of what is being assessed. Certain competencies are best assessed with particular forms of assessment. Different kinds of assessments are appropriate to the competencies necessary for different topics at different age groups. It is useful to use an observation checklist to assess learners measuring in the early grades. Rubrics, for example, can be used to evaluate learner's coding and robotics as well as problem solving skills.

Assessment can use the following strategies:

* 1. **PROBLEM-BASED LEARNING**

Assessment in Coding and Robotics can be done assessing the learner in action, for example, watching the learner solving the problem without stopping the moment. This can be done using the following strategies: As some Coding and Robotics competencies can be integrated with other subjects in Foundation Phase, for example, pattern recognition, it is possible to assess these competencies during the integration process.

* + 1. **Individual Problem-based Learning (coding)**

Problem solving is the process of designing, evaluating, and implementing a strategy to answer question, complete a task or achieve a desired goal.

CODING AND ROBOTICS



121

* + - 1. *Types of problems*

In terms of coding, typically, problems could require learners to

* + - * + provide missing code instructions (code instructions are provided with some instructions or code elements missing / to be completed or
        + choose the correct solution from 2-3 options or
        + work through (trace)/ act out code to determine if it is correct and correct if required or
        + rewrite a set of coding instructions to be more efficient or
        + compare different solutions to evaluate efficiency or
        + translate verbal/written instructions to code (e.g. packing arrows)
        + develop the solution/algorithm (code instructions) themselves using computational thinking and following problem-solving process.

The above will depend on the competency the learner needs to demonstrate. Coding problems need to gradually increase in terms of complexity.

* + - 1. *Assessing problem-based learning (coding)*

The learner is assigned a problem he/she must solve and in doing so

* + - * + needs to understand the problem.
        + analyses the problem (what is given and what is needed / what is important and what can be ignored - abstraction).
        + identifies the main steps (abstraction/ high level solution).
        + identifies the detailed steps (decomposition/ breaking down the main steps).
        + Identifies patterns to determine the need for using coding structures such as repetition.
        + implements and tests the solution (algorithm).
        + debugs the solution if required.

**Refer to Annexure A** for rubric example to assess problem solving.

* + 1. **Cooperative Learning**

Instead of encouraging learners to compete for grades or achievement, cooperative learning asks them to work together and participate in group learning activities (small groups, e.g. 4 learners), under the guidance of a teacher.

***Assessing cooperative learning in Foundation Phase Coding and Robotics***

Example rubric to assess cooperative learning activity: *Defining* a *robot and its different parts.*

**Refer to Section 2.6.2.1** for example cooperative learning activity.

**Refer** to **Annexure A** for rubric example to assess cooperative learning.

* + 1. **Pair Programming**

***Assessing pair programming in Foundation Phase Coding and Robotics***

Example rubric to assess cooperative learning activity:

*Identifying, completing and creating patterns.*

**Refer to Section 2.6.2.2** for example pair programming learning activity.

**Refer** to **Annexure A** for rubric example to assess pair programming.

* 1. **RECORDING AND REPORTING**

Recording is a process in which the teacher documents the level of a learner's performance in a specific assessment task. It indicates learner progress towards the achievement of the knowledge as prescribed in the

CURRICULUM AND ASSESSMENT POLICY STATEMENT



122

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Curriculum and Assessment Policy Statements. Records of learner performance should provide evidence of the learner's conceptual progression within a grade and her / his readiness to progress or being promoted to the next grade. Records of learner performance should also be used to verify the progress made by teachers and learners in the teaching and learning process.

Reporting is a process of communicating learner performance to learners, parents, schools, and other stakeholders. Learner performance can be reported in several ways. These include report cards, parents' meetings, school visitation days, parent-teacher conferences, phone calls, letters, class or school newsletters, etc. Teachers in all grades report in percentages against the subject. The various achievement levels and their corresponding percentage bands are as shown in the Table below.

|  |  |  |  |
| --- | --- | --- | --- |
| **RATING CODE** | **DESCRIPTION OF COMPEI ENCE** | **PERCENTAGE** | |
| 7 | Outstanding achievement | 80 -100 | |
| 6 | Meritorious achievement | 70- | 79 |
| 5 | Substantial achievement | 60-69 | |
| 4 | Adequate achievement | 50- | 59 |
| 3 | Moderate achievement | 40-49 | |
| 2 | Elementary achievement | 30-39 | |
| 1 | Not achieved | 0 - 29 | |

* 1. **GENERAL**

This document should be read in conjunction with:

* National policy pertaining to the programme and promotion requirements of national Curriculum statement Grades R-12; and
* The policy document, National Protocol for Assessment Grades R-12

CODING AND ROBOTICS



123

ANNEXURE A - TERMINOLOGY

The following tables provide clarity on terminology used in the CAPS

* 1. CODING

*Table A.5 Coding* - *Clarification of concepts and terms*

|  |  |
| --- | --- |
| **Term/Conceot** | **Exolanation** |
| **Algorithm** | An algorithm is a set of logical instructions/commands that a human or computer can execute to solve a specificproblem or accomplish a particular task.  It is a computationalprocess that uses a finite number of steps (logicalinstructions or commands), carried out in a soecificseauence to solve a oroblem. |
| **Coding** | **Coding** is the process of writinginstructions that a computer can understand and execute These instructionsare written in a programming language, which isa set of rules that define how the instructions  should be written.  The purpose of coding is to create software programs that can perform specifictasks, such as running a website, playing a videogame, or analysing data. |
| **Computation** | In computing, **computation** refers to any type of arithmeticor non-arithmeticcalculation that is well-defined.  It can involve mathematical equations, computer algorithms, and other types of calculations. |
| **Computational Thinking** | It refers to aproblem-solvingapproach that involves breaking down complex problems intosmaller,more  manageable parts and using algorithms and logical reasoning to solve them.  It involves skills such as abstraction, decomposition,pattern recognition, and algorithmic thinking. It is a way of thinking that is used in computer science,but it can also be applied to other fields.  In education, computational thinking is used to teach learners how to thinklogically and solve problems  svstematicallv. |
| Conditional (choice/  **decision) statement** | A control structure that selects one alternative from two or more possibleexecution sequences to be executed |
| **Control statement** | A control structure that is used to modify the order in which instructionsare executed such as a loop or  conditional statement |
| **Event** | A signal or notification that something has happened. |
| **Expression** | Refers to acombinationof one or more values, operators that can be evaluated to produce a result. |
| **Input** | In computing, input refers to the data that is entered intoa computer system, such as text,images, or  sound, |
| **IPO table** | lnput-Processing-Outout table describes the inouts processinaand outputs of a oroaram. |
| **Loop statement** | A control structure that allows a sequence of instructions to be continually repeated until a certain condition  is reached |
| **Operator** | **Operators** are symbolsor keywords that represent computations or actions performed on operands. Operators include:  Arithmeticoperators(+,-, x, /, modulo), comparison operators(=,>,<,:5, 2::, ¢),  Boolean operators OR, AND, NOT, string operators formanipulatingstrings/text (length, concatenate, indexing)  Operators providethe building blocks for creating expressions and performingoperations |
| **Output** | In computing, output refers to the result of the processed data that is presented to the user in a usable  format. Thiscan be in the form of text, sound, image, or video. |
| **Processing** | In computing, processing refers to the operations performed by the computer to manipulate or analyse the  input data. |
| **Proaram** | A **oroaram** is a sequence of instructions that a computer can execute to oerform a specific task. |
| **Trace table** | In programming, a trace table isa technique used to test an algorithmandpredict step by step how the computer will run the algorithm.  Statements are executed step by step, and the values of variables change as an assignment statement is executed.  A trace table simulates the flow of execution by showing the values of variables at each step of the  algorithm.  Trace tables are typically used by novice programmers to understand how an algorithm works and to  identifyerrors in the algorithm2 |
| **Variable** | In programming, a variable isa named storage location that holds a value or data.  Variables are essential for storing and manipulating data incomputer programs. The values in variablescan  chanae during the execution of a oroaram. |

**CURRICULUM AND ASSESSMENT POLICY STATEMENT**



**124**

I

* 1. ROBOTICS

*Table A.6 Robotics* - *Clarification of concepts and terms*

|  |  |
| --- | --- |
| **Term/Concept** | **Explanation** |
| **Actuator** | Refers to adevice that converts energy intophysical motion, such as rotation or translation. Actuators are  often called the muscles of robots, as they enable robots to perform various tasks and interact withthe environment |
| **Controller** | Refers to adevice that commands, directs, and regulates the behaviourof a robotic system. It takes input  signals from the robot's sensors, processes them based on programmed instructions, and then sends output signals to the robot's actuators to oerform the desiredactions. |
| **Microcontroller** | Refer to a type of small computer that can control the functions and behaviour of a robotic system.  It generally consists of a processor,memory, input/output ports and other peripherals that can be programmed to perform specific tasks.  It can receivedata from sensors,process it according to the programmed instructionsand send commands  to actuators. |
| **Robot** | A **robot** isa machine that can perform a series of actions automatically, either by being programmed by a  computer or by beinqquided by an external control device. |
| **Sensor** | Refers to adevice that can measure or detect some physical property of the environment or the robot itself and convert it into an electrical sianal.Examoles include liaht sensor, touch sensor,sound sensor, etc. |

* 1. DIGITAL CONCEPTS

*Table A.*7 *Digital Concepts* - *Clarification of concepts and terms*

|  |  |
| --- | --- |
| **Term/Concept** | **Explanation** |
| **Cipher** | A cipher, also known as an encryptionalgorithm, isa set of well-defined rules used to transform information  intoa scrambled form, called ciphertext.  It is used to encrypt messaaes so that they can only be read by someone who knows how to decrypt them. |
| **Computing device** | A general-purpose machinethat can execute instructions for any data processing purpose.  A computina device can receiveinout, do somethina with the input andprovide a result or cutout. |
| **Data** | Raw,unprocessed facts and fiaures. |
| **Decode** | Reconstructing the original **(encoded)** information. It involves takingan encoded representationand convertina it back into its oriainal form |
| **Decrypt** | The reverse process of encryption,taking ciphertext and using the appropriate key to convert it back into its  oriainal,readable olaintext form. |
| **Digital Citizen** | Aperson who uses the Internet and other digital technology to communicatewithother and engage in society. |
| **Digital Citizenship** | The ability to participate in online society.  It includes concepts like respecting others' privacy, avoidingcyberbullying,netiquette, digitalhealth and welfare, abilityto assess the credibilityand reliability of online information, intellectual property,impact and responsibilityof onlineactions and deeds. |
| **Digital Footprint** | The trail of traceable digital activities, actions, contributions, and communicationsone leaves behind when  usina the Internet or diaital devices. |
| **Encode** | Convertinainformationinto a soecificformat (transforminadata or messaaes into another format) |
| **Encrypt** | The process of transforming readable data (plaintext) into an unreadable, scrambled form (ciphertext) using acryptoaraohic alaorithm (cipher) and a secret key. |
| **Hardware** | The physical building blocks of a computing device or the tangible parts you can see and touch. It includes:   * **Central Processing Unit** (CPU):the component responsible for executing instructions. * **Random Access Memory** (RAM): Component for temporary storage of programs and data the computing deviceis currently working with. * **Storage devices:** E.g. hard drives, solid-state drives (SSDs), for permanent data storage. * **Input devices** such as keyboard,mouse, screen, microphone mouse,used to interact with the computer. * **Output devices** such as screen, speakers, printer, etc., used to display and output information. |
| **Information** | Data that has been orocessed and oraanised to convey meanina. |
| **Information and Communications**  Technoloav (ICT) | ICT is the use of computingand telecommunication technologies, systems,and tools to facilitate the way informationis created, collected, processed, transmitted, accessed and stored |
| **Information**  Technoloav (IT) | IT refers to the use of computer systems to manage,process, protect, and exchange data and information. |
| **Input** | In computing, input refers to the data that is entered intoa computer system, such as text, images, or sound. |

CODING AND ROBOTICS



125

|  |  |
| --- | --- |
| **Output** | In computing, output refers to the result of the processed data that is presented to the user ina usable format.  Thiscan be in the form of text, sound,imaae, or video. |
| **Personal information** | In computing, **personal information or personal data** is any information that can identifya person, from one's name and address to one'sdevice identifier and account number. |
| **Processing** | In computing, processing refers to the operations performed by the computer to manipulate or analyse the  input data.  This includesexecuting software applications,performing calculations, sortingand filteringdata, and runnina orograms. |
| **Software** | The intangibleprograms and applications(instructions) that give life to the physical components. Examples  include:   * **Operating System** (OS) that manages the hardware resources and provides a platform for running other programs. (e.g., Windows, macOS,Linux) * **Application software:** Specific programs designed for performing tasks like word processing, imageediting, games, etc. * **Programming languages** used to create new software by writing instructions the computer can   understand. |
| **Technology** | Encompasses any tool, technique, orprocess used to solve problems and manipulateour environment.  Technology is designed with a purpose of solving problems that meet human needs and wants. It refers to tools,machines, or devices that make our lives easier or better. |

CURRICULUM AND ASSESSMENT POLICY STATEMENT



**126**

I

ANNEXURE B- EXAMPLE RUBRICS

* 1. PROBLEM-SOLVING (CODING}

Example checklist to assess individual problem-based coding activity:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *Theprocess of creating alogical set of instructions to solveaproblem* or*that arobotcanmimic, whichrequireadeep understanding of*  ***computational thinkingand the problem-solvingprocess*** | | | | |
| **Learner can** | **Beginning**  **(1)** | **Developing**  **(2)** | **Accomplished**  **(3)** | **Exemplary**  **(4)** |
| @ | ***r***  • •  \.. ,\_ ***,I*** |  | *I;).-l:;J.*  *r*\*'*-1lJ,*•*.*  ...\_,***J:;J.*** |
| **Explain the problem in his/her own words** | Learner cannot explainthe probleminhis/her own words. | Leamer attemptsto explain theprobleminhis/her own words but continuously seeks assistancefromthe  teacher. | Leamer can explaina problem inhis/her own words but leans onpeers for support.Some points  are vaaue. | Learner can skilfully explain a problem inhis/her own words and can self-correct. |
| **Identify what is givenand what is needed** | Learner cannot identify what isgivenand what is needed | Leamer hesitantly attempts toidentifywhat isgivenand what is needed, but still seeks continuous assistancefromthe  teacher. | Learnerhesitantly attempts toidentify what isgivenand what isneeded.Some points are vague. | Learner confidently identifieswhat is given and what is needed |
| **Provide themain steps to solve the problem** | Learner cannot providethe mainsteps to solve the problem | Leamer attemptstoprovide themainsteps tosolve the problem but will continuouslyrefer to the teacherfor confirmation | Learnerhesitantly attempts toprovide themain steps to solvetheproblem,but he/shemight misssome  steps or give a vague explanationof some of the | Learner confidently provides themain steps to solve the problem |
|  |  |  | steos. |  |
| **Break themain steps into smaller, easierto solve, detailedsteps/parts** | Learner cannot identify detailed, easier to solve steps | Learner attemptstoidentify detailed, easier to solve steps, but continuously seeks assistancefromthe teacher | Learner attemptstoidentify detailed, easier to solve steps, but some stepsmay be vague or incomplete.  May leanonpeers for | Learner can identify detailed, easier to solve steps. He/she can self- correct |
|  |  |  | suooort |  |
| **Implement and test the solution** | Learner cannot implement and test the solution | Leamer attemptsto implement and test the solutionbut cannot follow  throuah | Learnerhesitantly attempts toimplement and test the  solution. May leanon peers for suooort. | Learner can confidently implement and test the solution |
| **Debug the solutionif required(fullmarks if learner indicatedit correct and teacher confirmed correctness)** | Learner cannot identify whether the solution requiresdebugging ornot. | Leamer attemptstoidentify whether a solutionneeds debugging but isnot sure or will try todebug because theyarenot completely surethat the solutionis correct. | Learnerwill be able to identifywhether the solution is correct ornot but will not be able to debug. | Learner can confidently identifywhether the solution iscorrect or needs debuggingand cando the debugging. |

As the rubric above uses a 4-level scale, the learner's problem-solving mark (out of 7 - for reporting purposes) from the above rubric can be summarised as follows:

|  |  |  |
| --- | --- | --- |
| **Problem-solving(coding) summary (generic example)** | | Mark achieved  *(from* rubric above) |
| Did thelearner understandtheproblem? | | 2 |
| Did thelearner analysetheproblem(what isaivenand what isneeded ? | | 3 |
| Did thelearner identifythemainsteps(abstraction/ highlevel solution | ? | 2 |
| Did thelearner identifythe detailed steos (decomoosition/ breakinadownthemain steos)? | | 1 |
| Did thelearner implement and test thesolution? | | 3 |
| Did thelearner debuQ the solution**if**required? | | 2 |
| **TOTAL** | | **13/24** |
| % | | **54%** |
| **RATING CODE(for renortinal:Adeauate achievement (50-59%)** | | **4** |

**CODING AND ROBOTICS**



**127**

* 1. COOPERATIVELEARNING

Example rubric to assess cooperative learning activity: *Defining* a *robot and its different parts (See section 2.6.1).*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Learner name** | **#Definition of robot** | **#Flashcards utilised well.** | **#Drawing illustrates robot** | **\*Learner** fulfilled  **role well** |
| 1. |  |  |  |  |  |
| 2. |  |  |  |  |  |
| 3. |  |  |  |  |  |
| 4. |  |  |  |  |  |

#Replace with suitable criteria depending on the task/problem

\*Will remain the same irrespective of task/problem

**Note:**

Althoughall learners in the group get the same markfor the first three criteria, each learner gets an individualmarkfor the "Learner fulfilled role well"- this is based on how well each learner contributed based on their set role.

The teacher can give mark these while learners are completing the activity and hence it should not requiremuch extra time.

Each of the aspects listed in the table above, could be assessed using the following example:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Aspect assessed** | **Beginning(1)**  @ | **Developing (2)**  ***r***  • •  \. ,\_ | **Accomplished (3)** | **Exemplary (4)**  *i:).-l;J.*  *r*:i:r*-*· *lJ 1* •  ;;;. |
| **Definition of concept, e.g.robot** | Key informationismissing  (e.g. noparts included) and the definition isunclear and difficult to follow | Some key informationis  included, and the definition is generally clear and easy tofollowbut may be incomplete or somewhat  disoraanised. | Most of the key information  is included(e.g. most of the parts) and it ismostly well- organised and easy tofollow | Thelearner demonstrates  full understandingin that the definitionis well-organised, complete, and easy to follow. |
| **Flashcard utilised well** | Flashcards are not used effectively | Some attempt is made to use the flashcardto explain the concept,but it lacks detail and key information | Flashcards are used appropriately to explainthe concept andincludesmost of the keyinformation | Flashcardsused effectively/innovatively to support acomplete explanation of the concept  and all key information |
| **Drawingillustrates concept, e.g. robot** | Drawing attempts toconvey the concept, but the drawing isincompleteand/or difficult  to interoret | Drawingincludessome relevant details that may not all be accurate and conveys  the concept but lackdetail | Drawing includes most of the relevant andaccurate details that appropriately  convev the conceot | drawingincludesrich, and accurate details that effectivelyconvey the  concept. |
| **Leamer fulfilled role well** | Learner does not understandhis/herroleand makes no contributionor unrelatedcontributions | Sharesideas or tries to fulfil her/hisrole,but does not work withgroup andmost of the contributions are unrelated | Tries tounderstandhis/her role andmostly makes relevant contributions.Can work on her/hispart and takepartinthe group | Generatesideas and builds uponother's ideas to develop a larger plan.  Works independentlytodo his/her partandis invested inthe other group members (e.g. helps when needed,  cares about the group oroduct) |

**CURRICULUM AND ASSESSMENT POLICY STATEMENT**



**128**

I

* 1. PAIR PROGRAMMING /COMPLETING A TASKIN PAIRS

Example rubric to assess pair programming activity: *Identifying, completing and creating patterns.*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Learner name** | #Identify **Pattern** | **#Complete Pattern.** | **#Create Pattern** | **\*Learner** fulfilled  **role well** |
| 1. |  |  |  |  |  |
| 2. |  |  |  |  |  |

#Replace with suitable criteria depending on the task/problem

\*Will remain the same irrespective of task/problem

**Note:**

Althoughbothlearnersget thesame markfor the first three criteria,each learner gets an individualmarkfor the "Learner fulfilled role well"- this isbased on how well each learner contributedbased on their set role.

The teacher can givemost of these marks whilelearnersarecompletingthe activity and hence it shouldnot requiremuchextra time.

Each of the aspects listed in the table above, is assessed using the following key:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Aspect assessed** | **Beginning(1)**  @ | **Developing (2)**  ***r***• •**'I**  \. '-,.. | **Accomplished (3)**  © | **Exemplary (4)**  *ZJ.- lj*  r*:\**-.1***1J.***  ... |
| **Identify Pattern** | * Needsassistanceto identify the patternand cannot describe the pattern interms of the correct patternrule(s) | * Abletoidentifythe pattern but needs assistance to describe thepatternin terms of   the correct pattern rule(s) | * Abletoidentifythe pattern and describethe pattern interms of the correct patternrules with minor shortcomings | * Abletoidentify andfully describethepattern in terms of the correct pattern rules |
| **Complete Pattern** | * Needsassistanceto completea patterndue tonot understandingthe   oattern rule(s) | * Ableto completethe pattern but needed help withpatternrule(s) | * Ableto completethe pattern according to the   rule{s)identifiedusing 2 attempts | * Ableto completethe pattern according to the pattern rule(s) identified   onfirst attempt |
| **Create Pattern** | * Needed assistance to create the pattern and does not understand   oattern rule(s) | * Createrepeating patterns but neededhelp withpatternrule | * Ableto create own pattern according to a pattern ruleusing 2   attempts | * Cancreateown pattern according to their own rule(s) onfirst attempt |
| **Leamer fulfilled role well** | * Learner does not understandhis/her role andmakesno contribution or unrelated contributions | * Sharesideas or triesto fulfil her/his role, but does not work well with peer and most of the contributionsare   unrelated | * Triestounderstand his/her role and mostly makes relevant contributions.Can work onher/hispartto   contribute to the solution | * Generatesideas and buildsuponpeer's ideas to develop a larger plan./ solve theproblem. |

* 1. **COMMUNICATION/ DISCUSSION (DIGITAL CONCEPTS)**

Example, **explaining a** concept, **e.g.,** what a robot is

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***An effective communicator shares information and ideas* for*a given purpose, task, and audience.*** | | | | |
| **Competencies** | **Beginning (1)**  @ | **Developing(2)**  ***r***• •**'I**  \. '- ,.. | **Accomplished (3)**  © | **Exemplary (4)**  *ZJ.- lj*  r*:\**-. ***1J.***  1  ... |
| **Explaining the concept** | * Learner's explanationis unclear ordifficult tofollow | * Learner's explanationis generally clearand easy to follow,but may be incompleteor somewhat   disoroanised | * Learner's explanationis well-organisedand easy to follow | * Learner's explanationis well-organized, engaging, anddemonstratescreativity andoriginality |
| **Key information included** | * Learner includes somekey informationbut may be missing some important details. | * Learner includeskey informationand some details to supporttheir   explanation. | * Learner includes all key informationand allrelevant details to support their   explanation | * Learner explainsthe concept indepth, demonstratinga deep understanding |

**CODING AND ROBOTICS**



**129**

* 1. DESIGN THINKING

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Aprocess that emphasizescreativity, experimentation, and iterationto arriveat the best solutionthat meets user needs.*** | | | | |
| **Competencies** | **Beginning(1)**  @ | **Developing (2)**  ***r***• •......  \. '- | **Accomplished(3)**  © | **Exemplary (4)**  I;;!.-  *:\** ***1J.***  *r-.)*  ... |
| **Inspiration: Learner applies creativethinkingto create *a* product or complete *a* task** | * Demonstrates limited creativethinkingand understandingof the problemor task | * Applies creative thinking to understand the problemor task and identifies some opportunities for innovation | * Applies creative thinking effectivelytogain a deeperunderstandingof the problem or task and identifies significant opportunitiesfor innovation. | * Demonstrates exceptional creative thinkingand in-depth understandingof the problemor task, uncoveringunique insightsand opportunities for   innovation |
| **Ideation:**  **Learner can create**  **own ideas to create a product or completingatask.** | * Unsure about what is expected so anyidea is scattered or unfocused andideas do not clearly connect to the problem or task. | * Generally,mimicsideas fromothers(rather than creatingnew ideas) that arerelated to the problemor task. | * Createsnew ideas that include enoughdetail and that are directly related to theproblem or task. | * Createsmany clear ideas by consideringlots   ofpossibilitiesthat focuseson key informationand fully  addresses theproblem or task |
| **Implementation: Learner can use best ideas to createa product or complete a task.** | * Creates aproduct or pertormance,butthe product haslimited functionalityor detail and does not clearly address   the problem or the oroduct isnot useful. | * Creates aproduct or pertormancewithsome functionalitythat is somehowrelated tothe challenge orproblem. | * Uses ideas tocreate a product or pertormance withgood functionality that isdirectly related to the problem or task. | * Createsclear ideas to create aproduct or pertormancewith precisionandfull functionalityand that fully addresses the   oroblemor task. |
| **Testing** & **Improving** | * Providesminimal or no feedbackand does not reflect on the quality to consider improvements oriterations | * Collects some feedback andreflects somewhat on the quality for consideringminor improvements or iterations | * Collects thorough feedback, reflects accurately on the quality toinformimprovements, anditerateson the solution | * Collects extensive feedback, conducts rigorous testing, and iterates on the design or solutionbased on feedback,leadingto transformative   imorovements. |

**Note:** All rubrics serve as examples only and may be adapted

CURRICULUM AND ASSESSMENT POLICY STATEMENT



130

I

ANNEXURE C - POSSIBLE ADDITIONAL RESOURCES

For the foundation phase, it is possible to fulfil the curriculum in its entirety unplugged (without coding software or robotics tools). However, should the school want to use coding software or educational robotics tools, they need to consider the possible impact it may have on the cognitive load (Refer to Section 2.9, Figure 2.7).

The following educational resources could be considered to support unplugged activities:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| (f)  0 | @  ® | ®  @ | @  @ | @ |

|  |  |  |  |
| --- | --- | --- | --- |
| **Robot Mouse** | | **BEE Bot** | |
| Image | Sample instructions | Image | Sample instructions |

|  |  |  |  |
| --- | --- | --- | --- |
| **Scratch Junior** | | **Scratch** | |
| Image    https://[www.scratchjr.org/](http://www.scratchjr.org/) | Sample instructions | Image    https:Uscratch.mit.edu/ | Sample instructions  5  **next roslume** |



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**--10&1"S-**

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Sample

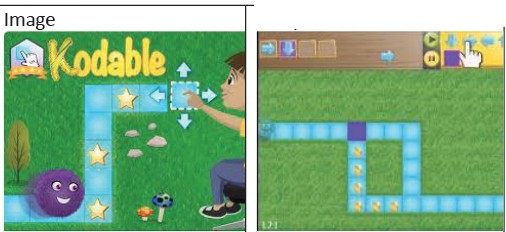
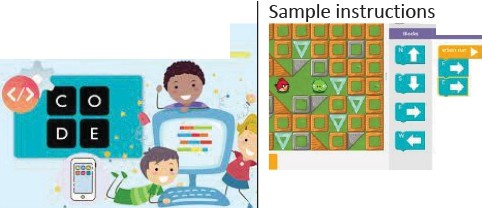
instructions

Sample instructions

Tanks

**Boats**

Image



**Kodable**

Image

**CS Fun With Code.org**

Sample instructions

https:Ucode.org/

https:U[www.kodable.com/](http://www.kodable.com/)

**Code.org**

**CODING AND ROBOTICS**



**131**

https://[www.tangiblgames.com](http://www.tangiblgames.com/)

CURRICULUM AND ASSESSMENT POLICY STATEMENT



132

I



