COMPUTING@BALCARRAS

SUBJECT	YEAR	TERM
COMPUTER SCIENCE	7	1

TOPIC

PROBLEM-SOLVING

CONTENT (INTENT)

PRIOR LEARNING (TOPIC) No previous learning is necessary with this unit. Pupils may have had some experience of computational thinking concepts through the KS2 national curriculum. However, this unit has been designed that it is accessible to all students no matter their previous learning.

The unit is subdivided into four learning hours spread across four lessons. The aim of the unit is to help improve the computational thinking and problem-solving skills that are at the core of many other aspects of computer science. The unit avoids dealing with these concepts explicitly, as a theoretical understanding of computational thinking techniques is not necessary at this level. Instead, concepts like decomposition, abstraction and algorithmic thinking are introduced in an applied way through a variety of small problems or challenges. At the end of this unit students will partake in Oxford University's Bebras challenge, which acts as a formal assessment of their problem-solving ability.

FUTURE LEARNING (TOPIC): Bebras Challenge and Python Programming

IMPLEMENTATION

KNOWLEDGE

At the end of this Unit all pupils should be able to:

- Use algorithmic thinking to interpret or create the steps involved in solving a problem.
- Produce well-reasoned solutions to a range of problems.
- Decompose complex problems into smaller manageable parts.

Most pupils will be able to:

- Use abstraction to remove unnecessary detail from more complex problems.
- Produce explanations of their thought processes throughout solving a problem.

Some pupils will be able to:

- Use well developed logical reasoning to solve complex problems.

SKILLS

Learning Skills:
This unit aims to improve problem solving skills, but also requires students to use metacognition whilst considering their own thought processes.

Life Skills:
Effective problem solving brings with it a range of transferable life skills, including *resilience*, *resourcefulness* and *reflectiveness*.

IT Skills:
This unit has been designed not to rely upon any specific piece of software. However, some of the solutions to problems are presented using software such as PowerPoint.

Literacy Skills:
Effective problem solving requires careful interpretation of what the problem itself requires. This provides good practice of interpreting texts.

IMPACT

Depending upon the problem, pupils will either create a solution using a suitable piece of software, such as Microsoft Word or PowerPoint or answer a set of questions. These will be given a 9-1 grade or mark respectively along with feedback on how to improve. In either case work will be set and marked through the VLE. The score achieved in the Bebras challenge acts as the end of topic assessment.

New Computing at Schools (CAS) Attainment Targets (partially covered in this Unit)

- design, use and evaluate computational abstractions that model the state and behaviour of real-world problems and physical systems

HOW CAN PARENTS HELP AT HOME?

All the problems set in this unit are designed to be accessible to everyone, regardless of previous experience. Parents can help engage students in these by attempting the challenges themselves and seeing if they can produce a better solution. As the challenges are set on the VLE, parents should be able to access these via the parent portal.

The Bebras Challenge is a national competition, and this may be the first time many pupils have taken part in something of this scale. We will spend time in lessons preparing pupils for this, but there are a lot of resources available that can help parents support in this preparation too. The main Bebras page listed below is a good starting point for this.

HELPFUL READING/FURTHER DISCUSSION

Reading:

- Completing any problem that requires logical or mathematical reasoning will help improve a pupils problem solving techniques. Something as simple as a sudoku in a newspaper is a good and easily accessible example.

Websites:

- Practice for Bebras Challenge: https://www.bebras.uk/
- Website to help theory: https://www.bbc.co.uk/bitesize/topics/z7tp34j

VOCABULARY

Abstraction, decomposition, logic, algorithm.

CAREERS

- Applications developer
- Big data engineer
- Cyber security analyst
- Data scientist
- Database administrator
- Forensic computer analyst
- Game designer
- Games developer
- Information systems manager
- IT consultant
- Network engineer
- Software engineer
- Systems analyst
- UX designer
- Web designer
- Web developer

EXTRA SKILLS

- Communication
- Teamwork
- Leadership
- Problem-solving
- Time management
- Organisation
- Report Writing
- Software Skills

PROGRESSION

- Online tutorials
- GCHQ competitions
- OUCC
- Coding clubs
- GCSE Computer Science
- A-level Computer Science
- University/Apprenticeship
- Work experience