# Beaconing scenarios

Introduction

This document presents one problem related to Math- that could be used in the pilot sessions of the Beaconing project. They are described according to the Beaconing Blueprints created by the University of Coventry. In the framework of this taxonomy, a play-lesson plan pathway can be schematized as follows.

A problem is first presented to the students, who then proceed to solve it. A problem is divided into smaller missions logically connected, and each mission can itself be divided into quests. Once the problem solved, the students will reflect about how they proceeded and what they learnt and practiced.

## Helping students from High School struggling with basic Math concepts

Summary of the problem

Today’s world requires knowledge based on solid basic skills such as mathematic literacy. An alarming picture of the current situation in math literacy at high school level is provided by the PISA and TIMSS international surveys.

Some basic mathematical notions learned in primary and secondary schools are still not fully mastered by some students by the time they arrive in high school. This situation will lead those students to be unable to follow properly the math curricula, especially in algebra, are they are not able to build on this pre-existing knowledge.

This activity will address the problem by providing activities designed to work on essential algebraic notions needed throughout the high school curricula.

Mission A: The 4 basic operations

With the prevalence of many automatic ways of computing simple operations such as pocket calculators, smartphones, computers and so forth, students very often forget how to realize simple operations by themselves and without help. They tend to commit simple mistakes that can often snowball and make all further computations wrong. Those mistakes could be easily avoidable by practicing the 4 basic operations in a step by step fashion.

The operations can be practiced by hand or by using an electronic device, either directly or in a fill-the-gap fashion.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Why? | What? | Where? | Who? | How? |
| Gain Knowledge | Addition | Classroom | The teacher | Their computer |
| Practice Knowledge | Subtraction | Lab | Their parents | Their tablet |
| Consolidate Knowledge | Multiplication | On their mobile | Their classmates | Their mobile |
|  | Division | Home | Their friends | By hand |

Mission B: Proportionality and cross-multiplication

In a contrast with some other subjects, proportionality is a field which can prove to be extremely useful in the students every day’s life when tackling simple tasks like quickly figuring out the importance of a discount on a price tag. Despite this usefulness, it is often a subject in which some students are lacking. Many practical problems can be used to illustrate proportionality, and the beaconing platform gives the teachers the flexibility to author several scenarios tackling subjects adapting directly to the students most direct interests.

The exercise could be solved by hand or by using an electronic device, presented as a text or as a table to fill or as a figure to draw. ICT can help the students by showing the immediate result of the data entered by the students in the problem’s framework.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Why? | What? | Where? | Who? | How? |
| Gain Knowledge | Cross multiplication | Classroom | The teacher | Their computer |
| Practice Knowledge | Proportionality | Lab | Their parents | Their tablet |
| Consolidate Knowledge | Percentages | On their mobile | Their classmates | Their mobile |
|  |  | Home | Their friends | By hand |

Mission C: Prime decomposition, integer factorization

Identifying numbers as prime or composite is a very basic and important algebra skill. Once a number has been identified as a composite, the students need to be able to decompose it at will into its prime factors.

There are many different way to represent decomposition into prime factors such as the prime factor tree, Venn diagram and so forth.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Why? | What? | Where? | Who? | How? |
| Gain Knowledge | Prime numbers | Classroom | The teacher | Their computer |
| Practice Knowledge | Factorization | Lab | Their parents | Their tablet |
| Consolidate Knowledge | Decomposition | On their mobile | Their classmates | Their mobile |
|  |  | Home | Their friends | By hand |

Mission D: Divisibility rules

Sometimes performing a full division is not necessary to solve a certain problem. A divisibility rule is a shorthand way of determining whether a given number is divisible by a fixed divisor without performing the division, by examining its digits.

Knowing those rules is a very handy tool in the math tool box of a high school student and can contribute to a faster and accurate resolution of many problems. The decomposition rules can be practiced by hand or by using an electronic device.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Why? | What? | Where? | Who? | How? |
| Gain Knowledge | Divisibility by 2 | Classroom | The teacher | Their computer |
| Practice Knowledge | Divisibility by 3 or 9 | Lab | Their parents | Their tablet |
| Consolidate Knowledge | Divisibility by 4 | On their mobile | Their classmates | Their mobile |
|  | Divisibility by 5 | Home | Their friends | By hand |
|  | Divisibility by 6 |  |  |  |
|  | Divisibility by 7 |  |  |  |
|  | Divisibility by 11 |  |  |  |
|  | Divisibility by 13 |  |  |  |

Debriefing and Reflection