

## Designing maths games

### CORE PURPOSE:

In this scenario, students are introduced to the skills of computer programming and develop their maths skills through the creation of interactive games using simple, intuitive online programming software such as Scratch.

### NARRATIVE OVERVIEW:

My maths teacher colleague Rene and I are struggling with some students in our classes who find maths particularly difficult, are not engaged with the subject and who do not have a secure understanding of some basic maths concepts. We have tried a number of methods to try to re-engage them without much success. We have realised that if students' understanding is to improve, we need to revisit these concepts in a different way from how they were first experienced.

We decide to use game and app creation to enthuse students and develop a programme of work based around simple, intuitive, 'drag and drop', online programming software, such as Scratch or Alice or app building software. These software programmes support the development of computational ideas and creativity alongside maths skills such as understanding degrees of turn, systematic reasoning and creating logical sequences. We involve the school's IT department to ensure we have the technology and training to use and teach the programming package.

First, students revisit the concepts of maths they need via some online maths games and smartphone apps. We then support them to create criteria for a good maths game and evaluate the games they use. We explain to the students that they will learn computer programming in order to be able to build their own interactive online maths games/apps aimed at helping younger children learn some of the concepts they are revising. The students are supported to develop the skills needed to effectively use the software via sessions which include direct instruction, open-ended experimental time and sharing learning amongst peers. We also invite people working in the field of game or app development to provide guidance for students, answer questions and introduce students to the possibilities of computer programming as a career.

Once the students are confident at using the software, we support them to design simple maths games, making explicit the maths skills they are using. By considering how they could teach younger children, students deepen their understanding of the maths concepts they need to revisit. The completed games are saved in a repository they can be accessed and used in the future. Students peer assess them against the co-developed criteria and younger students are invited to play and give feedback on them. We also include a competitive element, so organise a school-wide gaming day where students play the games and vote for their favourite.

### TREND/S

What motivates students? There is an increasing understanding across education systems in Europe - and globally - of how technology and a focus on emotional well-being can be effective to motivate young people, and help them engage with important subjects like MST

Increasing frustration of young people with typical classroom activities

### POSSIBLE APPROACHES TO TEACHING AND ASSESSMENT

- Instructional design
- Direct instruction
- Game-based learning
- Peer assessment – criteria for a 'good' game decided near start

### ENVIRONMENT

- Classroom
- Computer room
- Online software environments

### PEOPLE & ROLES

*Teachers* – provide some direct instruction on the programming software but also allow the students to experiment with it, paying close attention to the operations students learn and encouraging them to share tips with each other. Teachers also make explicit the skills the students are using as they learn programming. The teachers continue to support the students on the underlying maths concepts they struggle with throughout the process, again giving them direct instruction where necessary. The outcome (game) is assessed for understanding of both programming and the maths concept the game is based on.

*Experts* – people working in the fields of game creation or app development – to provide guidance on developing criteria or games and introduce students to the idea of working in the field

*Students* – actively share skills learnt and keep a log of new programming instructions they have developed by take screen shots. Peer assess others' work and give feedback.

### ACTIVITIES

- Developing maths skills through playing and designing games
- Learning basic computer programming
- Recording and sharing skills learnt
- Teacher training and support for use of game/app programmes

### RESOURCES (INCL TECHNOLOGIES)

- Internet enabled computers
- Videoconferencing (with experts)
- Online repository for games