

# EMPOWERING TEACHERS TO ENGAGE STUDENTS IN MATHEMATICAL LEARNING THROUGH DIGITAL COMPETENCE SCENARIOS

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*Twenty-first century students are exposed to technology from a young age and build up digital competencies throughout their school years. However, research has shown that students do not have opportunities to put into action their digital competencies when learning mathematics. This poster presents an example activity that integrates mathematical learning in a broader scenario within the CRISS platform that enables the guided acquisition and certification of digital competencies.*

*Keywords: digital competencies, mathematical competencies, teaching scenarios*

## INTRODUCTION

In the digital era, students' acquisition of digital competencies is viewed as a necessity. In 2013, the European Commission stated that all students need to acquire digital competence before completing their compulsory education and therefore be better prepared to join the labour force. In the same year, the European Commission's DigComp framework on digital competencies for citizens was published (Ferrari, 2013). This is structured around a number of main areas, namely Information, Communication, Content criterion, Safety and Problem Solving. A *digital competency* is described as "the set of knowledge, skills, attitudes [...] required when using ICT and digital media to perform tasks; solve problems; communicate; manage information; collaborate; create and share content; and build knowledge effectively, efficiently, appropriately, critically, creatively, autonomously, flexibly, ethically, reflectively for work, leisure, participation, learning, socialising, consuming, and empowerment" (Ferrari, 2012, p. 43). However, its application and adaptation to schools is not that straightforward. Thinking about mathematics classrooms in particular, these general digital competence areas cannot be directly linked to the mathematical context and in fact not all of them are of equal importance with regards to certain mathematical competencies (Geraniou & Jankvist, 2018).

Teachers are expected to support students' acquiring mathematical knowledge and mathematical competencies, but at the same time they are challenged to employ technology to promote digital competencies. To make things even more complicated, teachers are often not convinced that digital technologies can have a better impact on students' mathematics learning compared to non-digital resources and are hesitant in using them in their practice due to their perceptions, attitudes, professional development experiences and technical or pedagogical support networks (e.g. Clark-Wilson, Robutti & Sinclair, 2014).

The EU-funded H2020 project CRISS [1] came together to address some of the issues raised above, particularly the need to document and certify digital competences in primary and secondary schools. The CRISS platform provides opportunities for students to acquire digital competencies through broad scenarios and associated activities that encourage creativity and collaboration within a particular subject or even across the curriculum. Teachers are able to configure these scenarios and through learning analytics monitor their students' progress and support them in their journey to certification using the CRISS digital competence framework that is based on DigComp (cf. Guardia, Maina & Julia, 2017).

## A SCENARIO IN THE CRISS PLATFORM

As an example activity of a scenario that integrates mathematical and digital competencies, we focus on a particular instantiation of the well-known Monty Hall probability problem, which is about examining the best strategy for winning a prize based on probabilities. Students are encouraged to search for a simulation presenting the game show, compare and contrast the chances to win for each option and design a gameshow for peers. They are asked to reflect on the problem first on their own (personal inquiry), then search for a simulation on the internet in pairs (e.g. Scratch or Geogebra) and use it to solve the probability problem collaboratively. Their final task is to recreate this problem using a programming environment such as Scratch or GeoGebra and design their own simulation. The teacher chooses the most interesting simulation and asks the pair of students who created it to 'host' a game show for their peers. Through this process, the scenario addresses the following digital competencies from the CRISS framework: (a) Collaborating through digital technologies, (b) Planning, searching and critically selecting data, information and digital content, (c) Developing digital content, and (d) Programming and configuring digital tools, applications and devices and some mathematical competencies from the Danish KOM project (Niss and Højgaard, 2011): (a) reasoning competency by following a line of inquiry, (b) problem tackling competency, (c) modelling competency, (d) symbol and formalism competency and (e) modelling competency.

The CRISS scenarios are currently being piloted at schools. In this presentation, we will share the project's early findings and showcase how the two frameworks, i.e. CRISS and KOM, can be used to analyse the interplay of digital and mathematical competencies. We therefore envisage addressing how teachers integrate digital competencies in their practice and in students' mathematical learning.

## NOTES

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