

# FOSTERING ENGAGEMENT IN LEARNING MATHEMATICS: THE DIGITAL MATH ESCAPE ROOM “LEONARDO DA VINCI”

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Basing on the self-determination theory of Deci and Ryan (2002), it is the aim of this article to discuss a proposal of a math learning environment using the conception of digital gamification. „Gamification is the application of game features, mainly video game elements, into non-game context for the purpose of promoting motivation and engagement in learning.”(Alsawaier, 2018, p. 56) How does the gamification situation affect engagement of younger students towards math (lessons)? Does a problem solving situation embedded in a digital math escape room help to develop and/or support orientations like interest and intrinsic motivation? To give a first answer, the project “Digital math escape room Leonardo da Vinci” was created. Within a mathematical-historical context, students solve self-determined mathematical problems using their knowledge on mathematics. It is interesting to accompany students using their mathematical beliefs to find and to solve problems in such an open learning situation (Kloosterman, 1996). It is already shown that gamification and especially escape rooms have a positive effect on mathematical learning engagement. Due to the period of homeschooling, we assume that digital escape rooms may also influence students’ motivation. The research questions are:

- Does the digital escape room provide a meaningful context for students?
- In how far do students experience success playing the digital game?
- In how far do students experience individual autonomy playing the digital game?
- In how far do students experience social inclusion playing the digital game?

The theory of basic cognitive needs, as described by Deci and Ryan (2002), form the basis of analysing the digital math escape room. Experiences of competence, of autonomy and of relatedness are needs that determine the learner’s interest, motivation and handling during the digital escape room game. In August 2020, these needs are measured by accompanying the activities in this special learning environment of German students of grade 4 to 8 of different school types and by using post-questionnaires with closed as well as open questions. The survey will be provided in a digital form by the web application LimeSurvey. Qualitative data will be analysed with support of the software MAXQDA, whereas quantitative data with SPSS 25.

We aim to derive first indications regarding possible trends with respect to the discussed special conception of digital gamification.

## References

- Alsawaier, R. S. (2018). The effect of gamification on motivation and engagement. *The International Journal of Information and Learning Technology* 35(1), 56-79. <https://doi.org/10.1108/IJILT-02-2017-0009>
- Deci, E. L., & Ryan, R. M. (2002). Overview of self-determination theory: An organismic dialectical perspective. In E. L. Deci, & R. M. Ryan (Eds.), *Handbook of self-determination research* (pp. 3–33). University of Rochester Press.
- Kloosterman, P. (1996). Students’ beliefs about knowing and learning mathematics: Implications for motivation. In M. Carr (Ed.), *Motivation in mathematics* (pp. 131–156). Cresskill, NJ: Hampton.