



## An Innovative Model for Teaching Mathematics and Social Studies through Game-Based Learning in Primary Education

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### Abstract

*This article explores the possibilities for implementing game-based approaches in primary education (Year 3). It presents an innovative teaching model that integrates the development of mathematical, social science and digital competences. The main goal of the proposed model is to transform the learning process into an active, attractive, and developmental experience for students.*

*The publication presents an interdisciplinary game-based lesson entitled "Journey into the Past." It helps third-graders summarize their knowledge and skills in mathematics and social studies related to global topics: "Addition and Subtraction of Numbers up to 1000 without Regrouping," "Addition and Subtraction of Numbers up to 1000 with Regrouping," "Multiplication of Two-Digit and Three-Digit Numbers by One-Digit Number," "Division of Two-Digit and Three-Digit Numbers by a One-Digit Number" and "Bulgarian Society in the Middle Ages". The methodological development emphasizes the development of digital competencies through working with QR codes and 360-degree technologies, which transforms the lesson into a comprehensive educational experience.*

*The introduction of such interdisciplinary game-based lessons in primary education will help to increase student motivation and promote more lasting acquisition of knowledge and skills in various subjects.*

**Keywords:** Game-Based Learning, Mathematics, Social Studies, Innovative Model

### 1. Introduction

The rapid development of new technologies presents modern education with a range of opportunities and challenges linked to the demands of a radically different economic and social environment. There is a growing consensus that modern schools must prepare students for jobs that do not yet exist, to use technologies that have not yet been invented, and to solve problems we do not yet know exist. To address the challenges facing education, a number of international organisations are developing strategic frameworks and concepts, focusing on the development of soft skills, critical thinking and adaptability, and aiming to transform the student from a passive recipient of information into an active participant in the learning process and a creator of their own future. An example of such a document is the Organisation for Economic Co-operation and Development's framework – 'The Future of Education and Skills 2030/2040' [1], which is one of the most influential contemporary documents rethinking the role of schools in the dynamic 21st century. At the heart of this project lies the concept of the 'OECD Learning Compass 2030' [2]. The document clearly states that, in the face of an unpredictable future, schools can no longer offer students a fixed route (map), but must equip them with tools for self-navigation. This is why a 'compass' is needed, comprising: knowledge, skills, attitudes and values, to help students begin to apply their knowledge in practice so that they can succeed in life after school. To achieve these goals, the use of integrative learning resources linked to real-world practice and combining knowledge and skills from different subjects is becoming increasingly important.

Modern primary education requires that learning content be presented in an accessible, motivating and practical way that encourages curiosity, independent thinking and experiential learning. In this context, the cross-curricular links between social studies and mathematics offer rich opportunities for making sense of knowledge through solving practical and creative tasks related to time, space, numbers and social relationships.

This article presents an innovative model of teaching mathematics and social studies through game-based learning for Year 3. Many researchers share the view that combining a game-based framework with a didactic task offers a number of advantages, including: the development of teamwork skills, the building of positive motivation for learning, the filling of gaps in knowledge, the correction of errors, etc. [3].

The lesson presented in this publication is designed to consolidate the knowledge, skills and attitudes acquired from the following global topics: "Addition and Subtraction of Numbers up to 1000 without Regrouping," "Addition and Subtraction of Numbers up to 1000 with Regrouping," "Multiplication of Two-



*Digit and Three-Digit Numbers by a One-Digit Number," "Division of Two-Digit and Three-Digit Numbers by a One-Digit Number" [4] and "Bulgarian Society in the Middle Ages" [5]. The interdisciplinary lesson is structured as a themed adventure in which students must find a traveller lost in time. To achieve this goal, they sequentially solve tasks related to historical events, geographical locations, performing arithmetic operations, applying logical thinking and navigating various situations. The lesson includes both practical tasks, as well as links to interactive games and 360-degree images, which transform the traditional revision session into an engaging educational mission.*

## 2. Method

The aim of this article is to present an innovative teaching model for mathematics and social studies through game-based learning in primary education. The model was implemented with 96 students from four Year 3 classes in two primary schools in Plovdiv, Bulgaria, during the 2025–2026 academic year. The innovative model comprises six lessons combining the third-year curriculum for mathematics and social studies. Five of the lessons cover global topics from both subjects that were being studied at the time the lessons were delivered, whilst the sixth serves to summarise part of the curriculum at the end of the school year. The focus of this publication will be precisely on this summary lesson.

### 2.1. Structure of the Interdisciplinary Game-Based Lesson 'Journey Into The Past'

The theme of this innovative lesson revolves around a lost time traveller. By successfully completing the set tasks and educational games, Year 3 students will be able to find him and, subsequently, learn about the historical period in which he has found himself.

Following a motivating introduction to the lesson topic, the lesson is delivered in the following three stages:

#### **Stage One: Discovering the location in Medieval Bulgaria where the traveller has ended up**

The class is divided into teams of four third-year students. Each team receives a worksheet (Fig. 1.), containing six questions – three on mathematics and three on social studies. At the end of the worksheet there is a URL address which the students in the team must complete by entering, in sequence, the letters preceding the correct answers to the six questions. In this way, if the students make a mistake on any of the questions, the link will not be active. It will only open if they answer all six questions correctly across both subjects. The correctly completed web address will take them to the place where the traveller has gone missing. The link is generated via the *bit.ly* platform, which allows for free link shortening and the creation of QR codes.

The images used in the first task on the worksheet are taken from the 'Man and Society' textbook for Year 3, authored by R. Penin and G. Yakimov [6].

1. Which of the images is related to Medieval Bulgaria?



a)



b)



c)

2. What are the missing words in the text?

*The Proto-Bulgarians believed in the god \_\_\_\_\_. They were led by \_\_\_\_\_ and lived in \_\_\_\_\_.*

*In \_\_\_\_\_ the Bulgarians, led by Asparuh, defeated Byzantium and created \_\_\_\_\_ Bulgaria.*

a) Perun, Prince, dugouts, 681, Volga

b) Lada, king, palaces, 678, Old Great

c) Tangra, khan, yurts, 681, Danube



3. Examine the plan of the city of Preslav and determine in which direction the palace church is located in relation to the Royal Palace.



- a) East
- b) West
- c) North
- d) South

4. A medieval craftsman has 1 kilogram of gold. From it he needs to make 276 gold coins, each weighing 3 grams. How many grams of gold will he have left after making the coins?

- a) 182 grams
- b) 172 grams
- c) 272 grams

5. During the week, 45 groups of 8 students visited the archaeological museum to see the Preslav Treasure, and on Saturday and Sunday – 25 groups of 6 students. How many students in total saw the treasure?

- a) 510 students
- b) 410 students
- c) 500 students

6. The gift shop at the Archaeological Museum received 144 round magnets and 128 rectangular magnets. The round magnets were packed in boxes of 6, and the rectangular ones in boxes of 8. How many boxes were the magnets packed into in total?

- a) 30 boxes
- b) 40 boxes
- c) 50 boxes

Link: [www.□□□□□.bit.ly](http://www.□□□□□.bit.ly)

Fig. 1. Worksheet with a space to fill in a URL address.

### Stage Two: A Journey into the Middle Ages

When they open the URL, they have found, the students will be taken to a 360-degree image of medieval Tarnovo (the capital of the Second Bulgarian Kingdom) (Fig. 2.). The panoramic image is hosted on the Study360.eu platform, which allows the use of 360-degree images for educational purposes and the creation of special info points with additional information at various locations within the image.

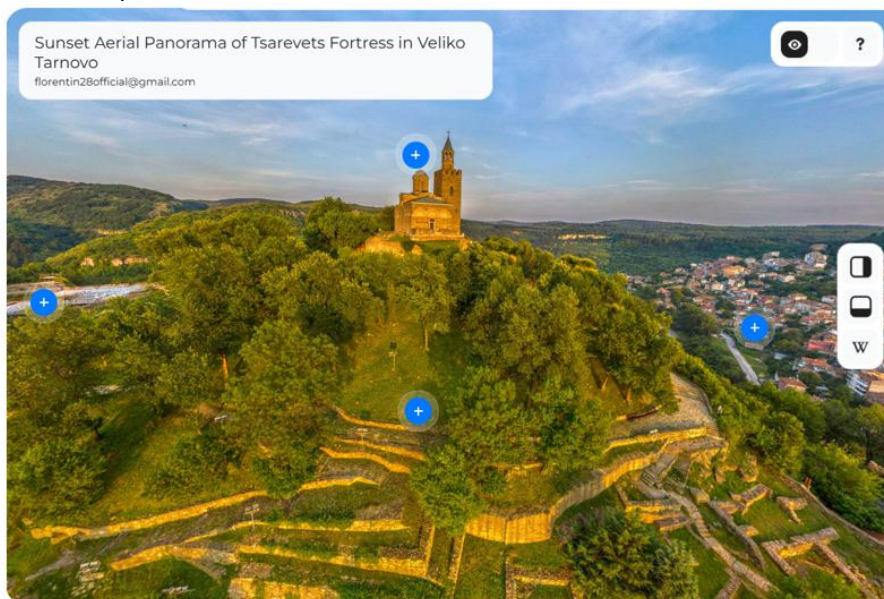
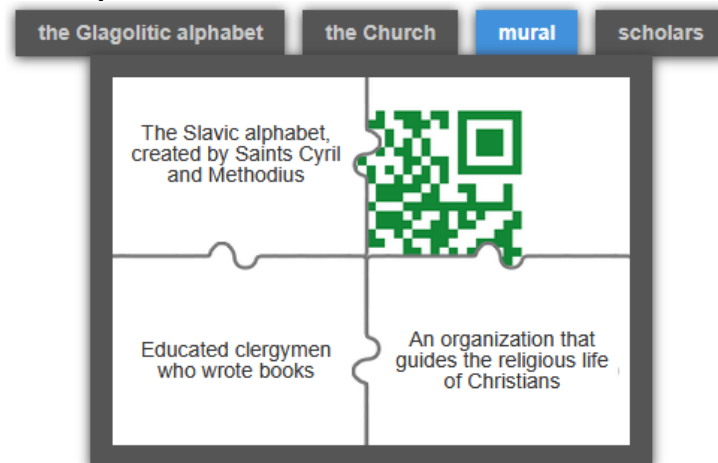


Fig. 2. 360-degree image of medieval Tarnovo.



The Middle Ages is the period in which the lost traveller finds himself. Six info points are located on the image of this old Bulgarian capital. Five of them contain information related to the overarching theme 'Bulgarian Society in the Middle Ages', which the Year 3 students need to recall, whilst the sixth info point contains a hidden link to the educational platform *LearningApps.org*.

**Stage Three: In the footsteps of the lost traveller**



**Fig. 3.** Educational game on *LearningApps*.

The link that the Year 3 students discover in the 360-degree image takes them to an online educational game created using the 'Groups in a Puzzle' template on the *LearningApps.org* platform (**Fig. 3.**). In it, Year 3 students must match concepts and their definitions related to the information they recalled whilst exploring the 360-degree panoramic image. Correct completion of the game will reveal a QR code to the Year 3 students, which will take them to a talking avatar of the traveller (**Fig. 4.**). The image of the traveller itself was generated using *ChatGPT*, and the video in which he addresses the students was created using the free AI video generator *heygen.com*.



**Fig. 4.** Talking avatar.

Here are the words with which the traveller will greet the Year 3 students:

"Hurrah! You've found me! Thank you, brave time travellers! Whilst I was lost through the centuries, I found myself in the glorious days of the Bulgarian Middle Ages and learnt many important things!

I realised that Medieval Bulgaria was a powerful country, with an amazing culture, ruled by wise rulers. They protected the people, built impressive fortresses and monasteries, and made Bulgaria one of the leading countries in south-eastern Europe.

I also met various people from medieval society. I met boyars – the rich and important aides to the tsar; craftsmen – masters who made vessels, clothes and weapons; merchants – travelling to distant lands; and peasants – the largest part of the population, providing for the whole of society. All these groups played an important role.

I visited the beautiful capitals of Pliska, Preslav and Tarnovo, where I saw fortresses, palaces and churches. I also learnt that Saints Cyril and Methodius gave the Slavs an alphabet, and that their disciples found refuge in Bulgaria and continued the work of the Slavic apostles.

Remember: when a people are brave, hard-working, united and when they preserve their traditions, they remain strong, no matter the difficulties! And now it's time to head back... to your classroom!"



## **2.2. Development of Key Competences in the Interdisciplinary Game-Based Lesson "Journey Into The Past"**

The varied system of educational activities in the "Journey into the Past" lesson supports the development of mathematical, civic and digital competences in Year 3 students.

According to the "Council Recommendation on key competences for lifelong learning", digital competence is defined as "the confident, critical and responsible use of and engagement with digital technologies for learning, at work and for participation in society" [7]. In the lesson presented, third-year students are given the opportunity to work with a variety of digital technologies – typing using a keyboard and opening a URL address, opening and navigating a 360-degree image, using information from info points within the image; navigating the *LearningApps.org* platform and participating in an online educational game, using a QR code scanning app to access a talking avatar generated using AI.

In the same document, mathematical competence is defined as 'the ability to develop and apply mathematical thinking and perspective in order to solve various problems in everyday situations' [7]. The maths tasks included in the worksheet used at the start of the lesson support the development of third-year students' mathematical competences by placing them in practical problem situations that can be solved using the tools and language of mathematics.

One of the aspects of civic competence emphasised in the Recommendation of the Council of the European Union is "awareness of current events and a critical understanding of the major events in national, European and world history" [7]. The concepts, facts and information on key events included in the various stages of the interdisciplinary lesson, studied under the topic '*Bulgarian Society in the Middle Ages*', directly correspond to the values of European society, including a good knowledge of national history.

## **2.3. Challenges and Opportunities for Development in the Implementation of the Innovative Teaching Model**

Possible challenges to the integration of the author's teaching model include the need for a stable internet connection, which is not always available in some schools, as well as the high level of skills required of the teacher to create such types of teaching materials.

The model also has potential for development in several directions. The technical aspect could be enhanced by integrating an AI-powered chatbot, with which students could converse in real time on various historical issues. The interdisciplinary nature could be deepened by integrating further subjects such as Bulgarian language and literature (through the analysis of various texts) or art (by redrawing parts of the 360-degree panoramic photographs; drawing objects from a particular era).

## **3. Survey**

Following the conclusion of the implementation of the innovative model of game-based learning, a survey was conducted with the students from the four Year 3 classes included in the study. The aim was to ascertain the Year 3 students' views regarding their mastery of the curriculum content through game-based lessons.

Survey:

1. Select the statement that applies to you.
  - Game-based lessons made it easier for me to understand the maths material.
  - Game-based lessons made it harder for me to understand the maths material.
  - It was neither easier nor harder for me to understand the maths material.
2. Select the statement that applies to you.
  - The game-based lessons made it easier for me to understand the social studies material.
  - With the game-based lessons, I found it harder to understand the social studies material.
  - It was neither easier nor harder for me to understand the social studies material.
3. Select the statement that applies to you.
  - I found it easy to work with the photos and games on the phone/tablet.
  - I found it difficult to work with the photos and games on the phone/tablet.
  - It was neither easy nor difficult for me to work with the photos and games on the phone/tablet.
4. Select the statement that applies to you.
  - I found the game-based lessons very interesting.
  - I found the game-based lessons somewhat interesting.



- I didn't find the game-based lessons interesting.
5. Select the statement that applies to you.
- I would like there to be more game-based lessons.
  - I would like there to be fewer game-based lessons.

With regard to the acquisition of maths learning material during game-based lessons, 90.63% of Year 3 students stated that it was easier for them, 1.04% of those surveyed (one student) stated that it was more difficult for them, whilst 8.33% saw no difference compared to traditional lessons.

As for the assimilation of social studies material, 92.71% of the third-year students surveyed noted that it was easier for them to understand the material, whilst 2.08% encountered more difficulties. Of all those surveyed, 5.21% reported no difference in the ease with which they absorbed the teaching material compared to traditional lessons.

The result is not surprising when students are asked about the ease of working with digital technologies. Of the third-year students surveyed, 97.92% stated that they had not encountered any difficulties when working with the various online platforms, whilst only 2.08% stated that they had experienced some difficulties.

One of the major shortcomings highlighted when discussing traditional methods of teaching and the organisation of the learning process is the lack of emotional engagement and variety to spark students' interest. When asked for their opinion on the author's interdisciplinary lessons, 96.87% of those surveyed stated that they found them interesting, whilst the remaining 3.13% said they found them somewhat interesting. It is positive that none of the third-year students surveyed reported that their interest had not been sparked during the game-based lessons.

The responses to the final question in the survey were decisive for the overall opinion of the Year 3 students regarding the integrative game-based lessons – 98.96% of those who took part in the survey would like to have more such lessons, whilst only 1.04% (one student) would prefer there to be fewer.

#### 4. Conclusion

The presented author's innovative model for interdisciplinary learning through a game-based approach successfully integrates the curriculum content for mathematics and social studies for Year 3, by transforming the traditional lesson into an engaging 'journey through time'.

The results of the questionnaire survey conducted among the four experimental classes confirm the high effectiveness of this approach – over 90% of the third-year students report that the game-based format has facilitated their understanding of the teaching material in both mathematics and social studies. Almost all respondents (96.87%) expressed a strong interest in the lessons, and working with modern technologies (QR codes, 360-degree images and AI avatars) is readily embraced by the students, which contributes to the development of their digital competence in line with contemporary trends in education. The implementation of such integrative learning resources not only aids in the more lasting acquisition of the competences set out as expected outcomes in the curricula, but also develops soft skills such as critical thinking, teamwork and adaptability, which are necessary for tackling the challenges of the 21st century.

#### ACKNOWLEDGEMENTS

This study is financed by the European Union-NextGenerationEU, through the National Recovery and Resilience Plan of the Republic of Bulgaria, project № BG-RRP-2.004-0001-C01.

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