



# CLASH OF WIZARDRY

THE MAGIC OF TRAINING MATHS IN A GAME

## HANDBOOK



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Knowledge (Cologne, Germany), IIS Leonardo da Vinci - Nitti (Potenza, Italy) and Acharnes Vocational Special Education School (Athens, Greece) sponsored by the Portuguese Erasmus+ Education and Training National Agency.

In the two years between 2017 and 2019 this multidisciplinary consortium consisting of a software development company and teachers from different backgrounds and know-how, developed a cutting-edge educational game for mobile devices: **Clash of Wizardry**.

By developing Clash of Wizardry, the E-MaGIC project aims to introduce an innovative teaching approach which can help teachers support students in effective maths learning, improving their school achievements and success, to promote inclusion and to inspire students to become interested in STEM subjects.

Clash of Wizardry is a magic duelling game where players compete using magic spells powered by maths. Through solving equations players can improve their mathematical skills and win the duel.

## 1. QUICKSTART.

Clash of Wizardry is a game where students can learn and practice mathematics by playing in a fun and engaging way.

In this handbook teachers can find helpful ideas on how to use the game in an educational context - whether inside or outside classrooms - to improve students' mathematical skills. This help includes guides, teaching materials, classroom strategies and more.

## 2. INTRODUCTION.

E-MaGIC (Education in Mathematics in Game-based Immersive Contexts) is a project that gathers teachers, programmers and researchers from GMTE - Direção Regional de Educação (Funchal, Portugal), Ingenious

## 3. LEARNING GAMES IN EDUCATION.

The right kind of education along with the social context can motivate students to become successful learners. Therefore it is vital to find the most effective learning method as opposed to simply using the

usual flat and passive approach.

In this perspective using the right method is fundamentally important. Several studies addressing this topic show that it is not possible to use “a unique method” due to the complexity of the teaching and learning process.

There are two theories of basic learning, Behaviourism and Cognitivism from which two other main currents were developed: Structuralism from the former and Constructivism from the latter, from which was disseminated the humanistic psychology developed at the end of the 20th century. In the 21st century these schools of thought evolved into the most modern methods of active learning currently used.

Therefore teaching can be transformed by a system of knowledge into an open system of skills. Likewise, education goes from an isolated system divided into classes, subjects, concepts, to an open system of research, communication and development. In this context, serious games find their natural place for the training of knowledge and skills acquired in different contexts and modalities.

However, the use of immersive games in education is under constant development because the overall goal of the game is to foster the active players' interest in order to modify their behaviour.

The implementation of playful mechanics is one of the most effective ways to engage students in classroom activities through a smartphone or tablet applica-

tion.

Another key advantage of serious gaming is that the player's behaviour can be measurable and allows you to collect data based on the actions performed within the game.

## 4. SERIOUS GAMES IN MATHEMATICS.

The potential of serious games has been acknowledged in recent years, especially in informal learning contexts.

Serious games in mathematics are becoming more and more popular, while educators become more aware of their potential. At the same time, students are more used to games in their everyday lives as technology becomes increasingly present all around us.

Results from the consortium's joint research and game trials performed by teachers and students from Portugal, Italy, and Greece show the necessity of adopting strategies to improve maths learning processes and teaching practice.

The use of mobile devices can enhance the learning outcomes of students who experience difficulties in maths. Serious games extend the traditional learning environment to a sort of 'virtual classroom' allowing these students to find stimuli and challenges that they find enjoyable. This stands in contrast to the more traditional method which

focuses on the static transmission of content by the teacher standing in front of the classroom. Serious games are instead pleasant, interesting, attractive to the students, and most importantly, effective.

According to Marti (1992), Amante (2007) and Martins (2003), the use of technology can promote more and better maths learning.

Serious games enhance the acquisition and retention of new knowledge more quickly, since by their nature they engage in immediate 'testing' of the knowledge by using it. This proves especially true for mathematical knowledge, as the games stimulate the whole process of teaching and learning, increasing the capacity of observation, motivation and interest in students.

Therefore, teachers are responsible for providing varied activities in an educational context, allowing students to enjoy alternative methods. That is to say the role of the teacher should change from the communicator to the observer, organizer, consultant, mediator, manager and facilitator of the learning process, thus supporting and stimulating the student learning process. However, when choosing a playful activity, the educator must have defined goals, whether with the intention to know their students, to stimulate the development of a certain topic or, to promote specific content learning.

## 5. CLASH OF WIZARDRY, THE GAME.

### 5.1. THE CONCEPT

The development of Clash of Wizardry followed academic research standards, starting with a theoretical foundation about educational games and their effect on the learning of students, research about the games preferences of students, the game concept development, field test trials with students and teachers who provided their feedback which is essential for further improvements to be introduced in its final version.

### 5.2. HOW THE GAME WORKS

Clash of Wizardry is a fast-paced game of magic duels in which wizards try to win fame in the arena by casting spells quickly and mastering the most powerful spells. Spells are triggered by equalizing magic energies (energy clouds), which essentially means solving mathematical equations. The game rewards you with success if you are fast and choose the harder equations. However, it never forces a difficulty level on you, giving you you free choice in the spell selection.

### 5.3. GETTING STARTED

In Clash of Wizardry you play a wizard who is mastering magic spells in a dueling arena. You can just focus on single duels against test opponents or other players, but you can also join a group and compete in a league-style contest. The method of winning the game is selecting the right spells that deal maximum damage and are fast enough for you to cast. After all, duels are won by damaging your

opponents more and faster than they can damage you.

#### 5.4. CHOOSING AN AVATAR

When you first start the game you are asked to create an avatar of your wizard. Choose whether you want to be female or male and choose your looks. This is rather straightforward and has no impact on the strengths of your wizard in the game. You can change the appearance of your avatar later under the settings menu. You are also asked to pick a name. Please be aware that you cannot change the name afterwards.

#### 5.5. YOUR FIRST PRACTICE MATCH

It's time to start your first match! We recommend choosing "training" to start with. This will pair you with a simulated training opponent, a perfect setting for getting used to the environment of the dueling arena. You have the choice between easy, medium and hard opponents and we recommend that you first try to beat the easy opponent. If you are a master mathematician, by all means, go for the hard opponent immediately.

#### 5.6. FINDING ANOTHER PLAYER OPPONENT

Of course, the main intention of the game is to have duels between players, so when you are used to the game environment you can choose a match with other players instead. So instead of "training" you would choose "matchmaking" from the start screen. The game will then try to find another opponent for you that is also ready to play. Once an opponent is found you will be taken to a game screen which reveals a little information about

your opponent. Take a close look at your opponent's favored spell, it might be an indication what kind of magic you will be facing. This should have an impact on your spell selection, that is, in your game strategy.

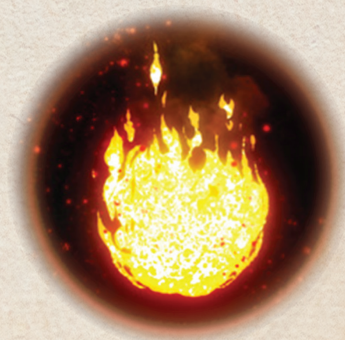
If you don't see another opponent it means that no other opponent can be found at the moment. In this case you will have to try again later.

#### 5.7. RANKING POINTS

To match you against players that are on a similar skill level as you, the game measures your skill level with ranking points. After you have won or lost a match you will gain or lose a specific amount of ranking points. The amount of ranking points you acquire is based on your opponent's ranking score. For instance, if you won against an opponent with a much higher ranking score you will be highly rewarded with many points.

#### 5.8. CHOOSING SPELLS

You can choose your spells before getting matched against your next opponent and during a match. As choosing spells in the middle of a match is time consuming and can give your opponent a big advantage we always



recommend preparing yourself as well as possible in advance before searching for an opponent.

You can choose up to five spells for a duel. Your current spells are shown at the bottom of the screen. You can remove spells from your selection by tapping on them. In order to add new spells to your current spells you choose one of the eight schools of magic (the symbols at the top) and then tap on the spell level you want. Each school has two spells and each spell has three difficulty levels. Higher level spells do more damage but are also harder to cast.

In general you should avoid changing your spells in the middle of combat because the game does not pause for you. However, sometimes it can be a strong advantage to change your strategy when you see that your opponent currently has good counter-spells. Keep in mind that spells of some elements are weaker if your opponent casts a spell of certain other elements before you can finish casting your spell.

### 5.9. HOW TO CAST SPELLS

You can cast spells by channeling their energy. After you have selected a spell you can see two magic energy circles in the middle of your screen. To successfully cast your selected spells you have to achieve a balance between the power of both clouds. This is similar to solving equations but hides the actual maths.

You select numbers and operators by tapping them. After choosing the spell you want to cast you must make the number in

the magic energy circle on the right equal to the number in the magic energy circle on the left. To do this you first select (by tapping) the circle on the right, then select the operator in the center, then choose whichever of the numbers floating in the air of the battlefield, resulting in balancing the two magic circles. For example, if you select the circle on the right, then the “add” operator, then one of the floating numbers, the current value of the circle will be those two numbers added together. The size of the magic energy circles represent their value relative to each other.

This might sound daunting at first but casting a spell is actually very easy. It can be summarized in 3 steps:

- (1) Tap the energy circle you want to make changes to
- (2) Tap the operator you want to use to modify the energy circle value
- (3) Tap the number that completes the operation and equalizes the energy clouds.

### 5.10. COUNTERING YOUR OPPONENT'S SPELLS

You can cast a spell of a school countering the school of the spell your opponent is currently casting. By doing that his spell becomes much weaker. If you choose your spells wisely depending on what spells your opponent has chosen you might be able to counter several of his spell, granting you a great advantage. For example you could consider casting a weak water splash that is easy to cast to weaken your opponent's mighty fireball. Here is a list showing what schools counter each other:





Fire - Water  
Darkness - Light  
Energy - Death  
Poison - Life

Don't worry, you do not have to remember this. After you have selected one of the schools you can see what its counterpart is.

#### 5.11. END GAME SCREEN

An opponent's life points are shown in the upper right corner in a green circle which turns red as your opponent takes damage. Your own life points are displayed in a similar way in the lower left corner. Once a wizard's life points drop to 0 the game ends and you are taken to the end game screen.

This screen gives you an overview of some game statistics. It lets you know who won the game and shows you the number of spells you have cast successfully, the life points you have left, and the duration of the match.

#### 5.12. GAME ROOMS

Are you a player who just wants to run internal tournaments with your friends, family or maybe even some random people that can join you? Or are you a teacher who wants to use the game in your class and let your students play against each other? Then game rooms are the right choice for you. When creating a game room you can decide if it is a public or a private room. While everyone can see and search public game rooms you can also create a private room and send the room's invitation code to others to let them join it. Private rooms cannot be

found via the search. They are completely hidden from others unless they join them using a code.

After you have joined a room you can go to its overview and tap the "Internal Matchmaking" button to find an opponent who is also in the room's internal matchmaking. When you play an internal match your room related score will change afterwards.

The creator of a game room will be provided some functionalities that helps to administer it. Those are:

- Reset the game room's internal ranking
- Kick players out of the game room
- Change the game room's name
- Delete the game room

You can access some of the administration functionalities in the room overview after selecting your room and some others by tapping the the cogwheel icon in the top right corner.

If you are the creator of a game room you can only leave it by deleting it.



## 6. THE EDUCATIONAL FEATURES OF THE GAME'S FUNCTIONALITIES.

In addition to the general tendency towards low achievement in maths, our students also stress out when they simply think about this subject. Many young people and even adults think you have to have a natural talent or inclination to be proficient in maths.

We continue to have these problems despite scientifically validated maths curricula being applied by more and more qualified teachers. The reason for this is that the students are not sufficiently motivated to learn maths, in part because of how their lifestyles have changed. Ever present technology creates constant stimuli and instant gratification. This constant connectivity provides a sense that they don't need to learn things when they can simply type into their phones and find something out. Previous methods of maths instruction are simply not interesting enough to them.

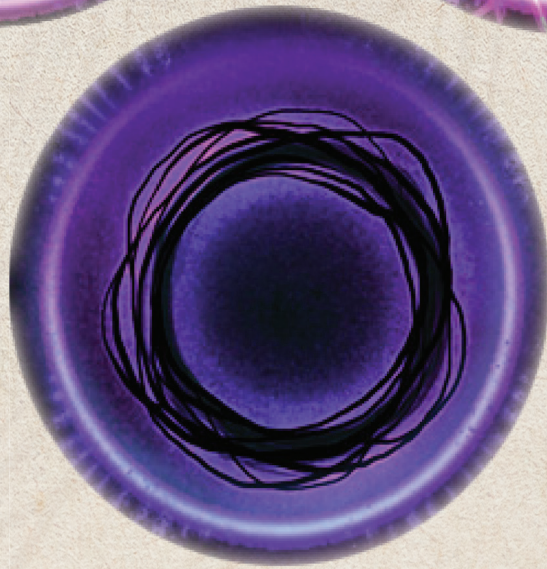
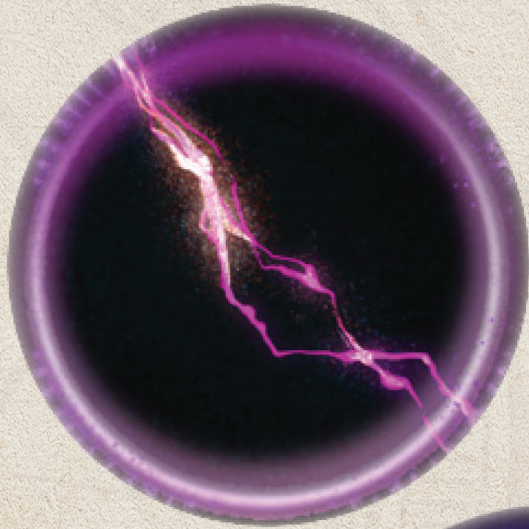
To change this negative trend and to meet the actual needs of our students, we as teachers, are forced to think about new methodologies and teaching practices that make sense to our students without neglecting the scientific value and content quality. We need to promote their motivation to learn and study maths, as well as to follow scientific careers in STEM, so needed by our modern social development.

Taking advantage of the pedagogical

trend of gamification, the game Clash of Wizardry was born. Part of the beauty of it is that it runs on platforms that are familiar to students: smartphones and tablets.

In Clash of Wizardry the fun element is intrinsically connected to the learning element because in this world of magic where the focus is to win duels (fun element) all ingame actions can only be triggered by applying maths (learning element). Thus, our students are not forced to learn new skills, however they quickly understand that by practicing their maths skills they will obtain better results, progressing in the ranking and earning bragging rights, making the game more challenging and fun.

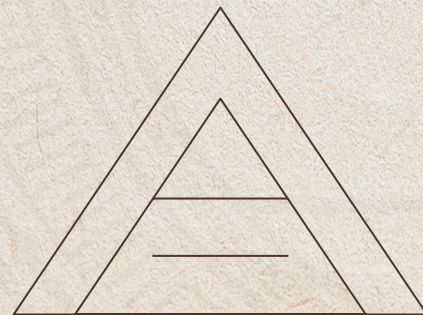
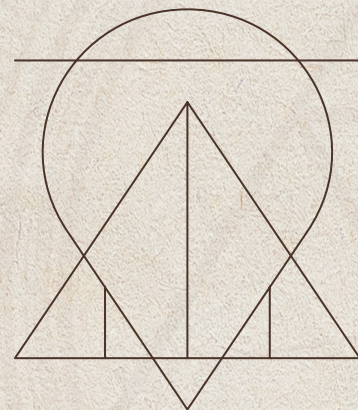
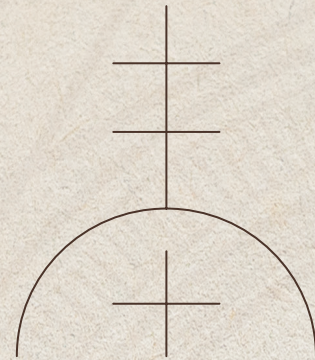
In the next topics teaching tips will be presented so you can fully enjoy and take advantage of Clash of Wizardry in (and outside) classrooms. Take a look!



## 6.1. RANKING SYSTEM.

While the game ranking provides an easy way of measuring the overall performance of players, as the further up on the list, the more points are achieved, it's important to keep in mind that this is not a learning ranking. Even the players further down on the ranking have practised their maths skills and thus the game has contributed to their learning.

The ranking system is also a source of motivation, providing a much needed sense of competition with other players. The effort of trying to be the top player and thus having the bragging rights of that tends to help “disguise” the educational nature of the game, because on a learning level the ranking system is “useless”. Thus the only really important matter is whether the students have learned and are progressing through their school studies and in that regard, even the student who lost the most is learning valuable lessons and practising maths skills.



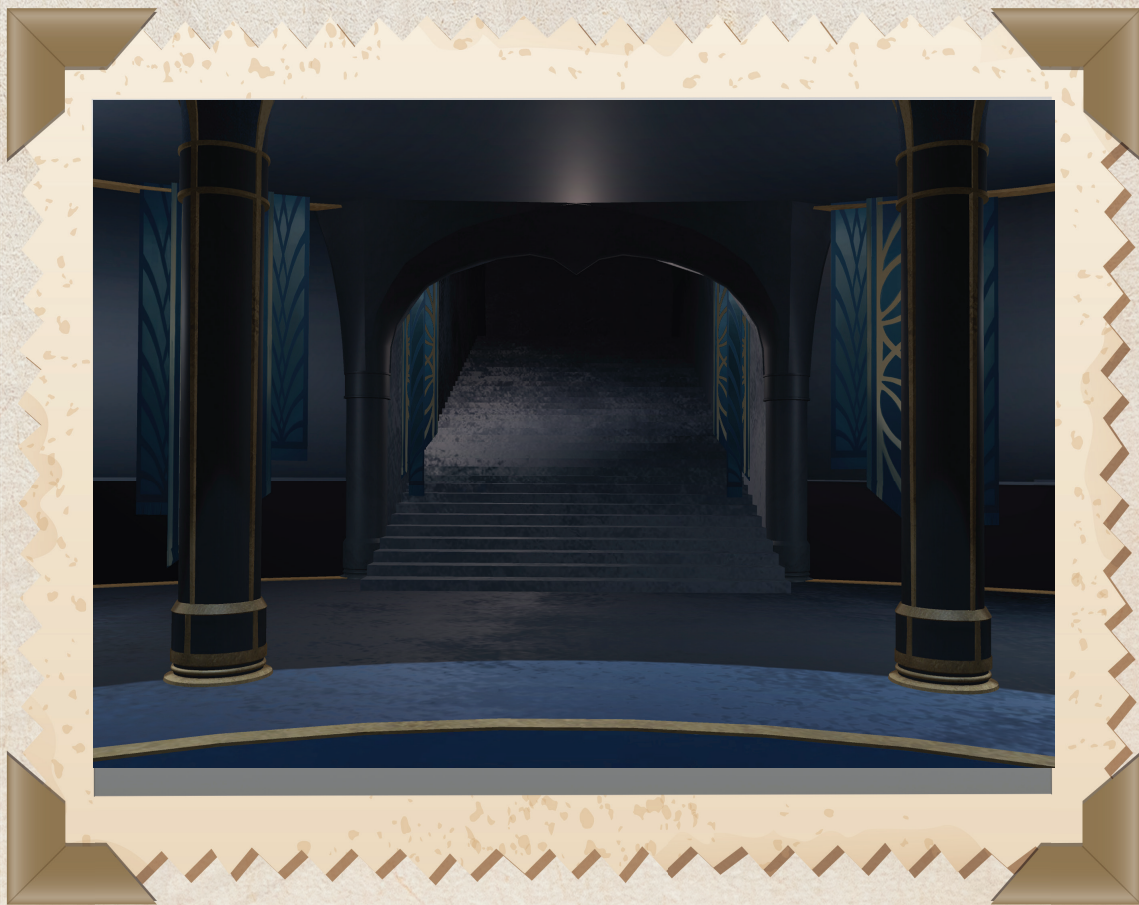
## 6.2. GAME ROOMS.

The Rooms feature inside Clash of Wizardry provides a simple and easy way to create your very own private dueling arenas. These are akin to traditional classrooms, with one teacher, the game room creator and the pupils, in our case, the players.

Each room has its own ranking, further allowing teacher to informally evaluate their class and check on students'

progress. These rooms are managed by the room creator and have minimal management tools that allow the manager to delete them or expel a player.

This feature can also be used as a stepping stone in the process of creating a Clash of Wizardry tournament, allowing for individual group phase and a final phase where the top players will battle until a winner can be found (similar to the FIFA World Cup tournament qualifier system).



### 6.3. HOW FIGHTING AGAINST OPPONENTS MAKE STUDENTS IMPROVE THEIR MATHEMATICAL SKILLS.

Knowing that the “secret” to improving your maths skills is practice, practice, practice and even more practice, the development team set out to apply a way to “disguise” this repetitive task, enveloping it with a mantle of fun and enjoyment.

While “dueling” opponents in the arena of Clash of Wizardry, the player is in fact constantly practising their spells, that is, solving mathematical equations and consequently improving their maths skills.

Even if the player duels against a bot (virtual player) in the training mode, their skills are being honed and improved. Had the game been left in this state, with only duels against bots (training mode), it would already be a great achievement in the goal of disguising the learning of maths skills, but with dueling between players this goal is further enhanced with the addition of the competitive element. This sense of competition is maintained with a ranking system, providing constant motivation for the students who want to be at the top of list.

### 6.4. HOW TEACHERS CAN INTEGRATE THE GAME IN CLASSES.

By being a freely available game that can be downloaded from the main app stores, Clash of Wizardry gives a greater flexibility to teachers who wish to use this learning tool in their classes. This flexibility translates into two different ways of integrating the game, inside and outside of classrooms. So the teacher is no longer restricted to using a game that might not be freely available to their students, or whose license stops him from distributing it to the pupils: the Clash of Wizardry is freely available to everyone.





## 6.5. USING CLASH OF WIZARDRY IN THE CLASSROOM.

Inside classrooms, the game can easily be integrated in multiple ways, some of which will further be detailed in the next chapter.

This list of different modes is neither final nor complete, and surely new ways of integration will be created by the users of the game.

You can use the game Clash of Wizardry as:

- Consolidation exercise.

At the end of the class, as a form of consolidating what was taught, a time period can be set aside to use the game with your students, especially while teaching each one of the different types of equations and their particular difficulty. Traditional teaching methods can be used in conjunction with Clash of Wizardry. Normal lectures can instruct the students with all the explanations required and then you may pass on to the practicing sessions directly in the app.

- Part of the learning process of a given topic.

The game can be used as preparation for teaching other specific topics, such as more advanced maths, or even as prep for studying other STEM topics. You can have the students play Clash of Wizardry prior to studying the topic to get their minds ready, or immediately

after to check how effectively your students have learnt.

- Final/intermediate tournament.

As an incentive and as a form of tracking your students' learning development, tournaments can be organized, aligned with school breaks, that can provide some insight into the strong or weak learning points of the students (example: by checking their favourite spell - type of equation - you can see the level of their maths proficiency).

## 6.6. TRAINING MATHS SKILLS OUTSIDE CLASSROOMS.

Homework / training.

While the practice of sending homework is sometimes frowned upon, it is still one of the available tools for teachers to use and can be effective when used correctly. One of the reasons for the ineffectiveness of homework is usually related to how unmotivating it can be to do. And what better way to fight that lack of motivation than to ask your students to play a game that, despite being educational, is quite fun to play, has multiplayer and is as graphically attractive as Clash of Wizardry is? Taking full advantage of its key strengths, a special "homework" room could be created, allowing the teacher to check if the students have in fact practiced and how many duels they have participated in.

- Long-term tournament.

Along similar lines to the previous suggestions, a global long-term tournament could be set up. This could either be something akin to a World Cup tournament qualifier system (as previously suggested) or similar to a national football tournament (the one who gets more points in the ranking wins) by taking full advantage of the ranking system. Either way, the final result would be a tournament that would cover the entire school year and provide extra motivation for the entire time. The motivation could be further enhanced by the creation and awarding of a trophy to the students who stood out.

## 7. PROPOSALS OF ACTIVITIES FOR IMPLEMENTATION OF THE GAME INSIDE CLASSROOM.

From an early age, children are bombarded with messages about the challenging nature of maths. Girls in particular are susceptible to stereotypes that they aren't good at maths and these stereotypes can hinder their performance, while developing confidence in mathematics can help thwart maths anxiety. Learning addition helps children gain confidence and demonstrates to them the real-life usefulness of maths. This can create a lifelong interest in maths that helps students excel when they reach more challenging mathematics classes.

## ACTIVITY 1 - LEARNING OF ADDITION (ELEMENTARY SCHOOL).

The spell activated by the simple equation ( $a + x = b$ ) is the Darkness Embrace spell. If a teacher wants students to be trained in different levels of difficulty of the spell the three levels (Darkness Embrace Level 1, 2 & 3) can be added in student's current spells.



Image: Spell Darkness Embrace (for equation  $a + x = b$ ) and respective levels.



Image: Spell Darkness Embrace Level 2 selected by student

If it's the first time addition is taught to students only Level 1 Darkness Embrace Spell should be used. If students are trained in addition at higher levels then all the Darkness Embrace spells can be used. Moreover, it will be more challenging if students play against each other using the matchmaking feature of the game or if they create a room with all the students of the class and play with against each other. Competition enhances motivation and when we have motivated students the learning process is more efficient.

The same activity that can be implemented exclusively for addition can be also implemented exclusively for subtraction (equation  $a - x = b$ ), multiplication (equation  $a * x = b$ ) & division (equation  $a / x = b$ ) with Water Burst, Necromancy Touch & Fireball spells respectively.

Equation	Spell Name	Category	Spell Logo
$a - x = b$	Water burst	Water	
$a * x = b$	Necromancy is Touch	Death	
$a / x = b$	Fireball	Fire	

Table: Spells that apply to basic equations  $a-x=b$ ,  $a * x = b$  &  $a / x =b$



ACTIVITY 2 - TRAINING MORE COMPLEX EQUATIONS  
(SECONDARY SCHOOL).

For more complex equations training Poison Arrow, Blinding Ray, Life Touch and Energy Blast spells can be used by students which apply for equations  $a \cdot x - y = c$ ,  $a/x - y = c$ ,  $a/x + y = c$  &  $a - x + y = c$  equations respectively (see table below).

Equation	Spell Name	Category	Spell Logo
$a \cdot x - y = c$	Poison Arrow	Poison	
$a / x - y = c$	Blinding Ray	Light	
$a / x + y = c$	Life Touch	Healing	
$a - y + x = c$	Energy Blast	Energy	

Table: Spells that apply to equations  $a \cdot x - y = c$ ,  $a/x - y = c$ ,  $a / x + y = c$  &  $a - x + y = c$

We advise that teachers have an introduction to each equation category in class prior to having the students play the game.

You may also have better outcomes if the students start by playing each spell category by itself, for example fill their spell book with just Light spells of various levels. Once the students are familiar enough with each spell you can then suggest they mix their current spell book with different spell types.

Last but not least, it is important for teachers to explain in each lesson how these equations apply to everyday life. Mathematical equations are used in traffic control, aircraft design, space programs, medicine and so on. So we should always remember that any mathematical equation result has the potential to change the world. That is the reason all mathematical equations are important in our lives.

## 8. PROPOSALS OF ACTIVITIES FOR IMPLEMENTATION OF THE GAME FOR DISADVANTAGED LEARNERS (INCLUSIVE STRATEGIES).

Children are better at remembering information that they create for themselves than information they receive passively. Real competence only comes with extensive practice (Anderson, Reder, & Simon, 1995). Clash of Wizardry, at its core, is a game in which students actively practice solving equations in a way which is engaging and motivating since it's an enjoyable activity. Teaching maths to special needs children is slightly different from teaching maths in a regular classroom. Therefore, in this chapter we will propose some simple activities that will make the integration of special education students with the game smoother.

### ACTIVITY 1 - OFFLINE TRAINING IN BASIC EQUATIONS ( $a + x = b$ & $a - x = b$ ) IN EASY MODE & LEVEL 1.

Since disadvantaged students lack strong competence in solving equations the best strategy is to introduce them gradually to the game. We suggest using offline training only with the basic equations in easy mode to let them tackle at a level that works for them and not to lose their confidence.

Through this activity students will play the game while using only the basic equations ( $a + x = b$  &  $a - x = b$ ) in their easiest form. For those operations only the following two spells should be used in their simplest form:

- (a) Darkness Embrace,
- (b) Water burst,



Equation	Spell Name	Category	Spell Logo
$a + x = b$	Darkness Embrace	Darkness	
$a - x = b$	Water burst	Water	

Table: Spells for equation  $a + x = b$  &  $a - x = b$

Only when they feel comfortable with these should they proceed with the next step.

(1)

(2)



Image: Screen of the game for spells (1) Water burst,  $a - x = b$  & (2) Darkness Embrace,  $a + x = b$

ACTIVITY 2 - OFFLINE TRAINING IN BASIC EQUATIONS (  $a * x = b$  &  $a / x = b$  ) IN EASY MODE & LEVEL 1

Through this activity students will have to play the game using only the basic equations ( $a * x = b$  &  $a / x = b$ ). For those operations only the following two spells should be used:

- (a) Necromancy Touch &
- (b) Fireball.

Equation	Spell Name	Category	Spell Logo
$a * x = b$	Necromancy Touch	Death	
$a / x = b$	Fireball	Fire	

Table: Spells that apply to basic operations  $a * x = b$  &  $a / x = b$





(1)

(2)



Image: Screen of the game for spells (1) Fireball,  $a / x = b$  & (2) Necromancy touch,  $a * x = b$

Only when they feel comfortable with these should they proceed with the next step.

## 9. ADDITIONAL RESOURCES.

### SPELLS AND CORRESPONDING EQUATIONS.

Equation	Spell	Category	Level 1	Level 2	Level 3
$a + x = b$	Darkness Embrace	Darkness	Deals 1 damage. SPECIAL: Your opponent will be covered in darkness for 2 seconds	Deals 2 damage. SPECIAL: Your opponent will be covered with darkness for 2 seconds	Deals 3 damage. SPECIAL: Your opponent will be covered with darkness for 3 seconds
$a - x = b$	Water Burst	Water	Deals 2 damage	Deals 3 damage	Deals 4 damage
$a * x = b$	Necromancy Touch	Death	Deals 2 damage. SPECIAL: Spinning numbers for 2 seconds	Deals 3 damage. SPECIAL: Spinning numbers for 3 seconds	Deals 4 damage. SPECIAL: Spinning numbers for 3 seconds
$a / x = b$	Fireball	Fire	Deals 3 damage	Deals 4 damage	Deals 5 damage
$a * x + y = c$	Energy Blast	Energy	Deals 4 damage	Deals 5 damage	Deals 7 damage
$a * x - y = c$	Poison Arrow	Poison	Deals 2 damage. SPECIAL: 1 poison damage per 2 seconds for 4 seconds	Deals 3 damage. SPECIAL: 1 poison damage per 2 seconds for 6 seconds	Deals 3 damage. SPECIAL: 1 poison damage per 2 seconds for 10 seconds
$a / x + y = c$	Life Touch	Healing	Heal 4 hitpoints	Heal 5 hitpoints	Heal 6 hitpoints
$a / x - y = c$	Blinding Ray	Light	Deals 4 damage. SPECIAL: Your opponent will be blinded for 2 seconds	Deals 5 damage. SPECIAL: Your opponent will be blinded for 3 seconds	Deals 6 damage. SPECIAL: Your opponent will be blinded for 3 seconds
$a + x = b + y$	Blizzard	Water	Deals 5 damage	Deals 7 damage. SPECIAL: Freeze your opponent for 1 second	Deals 9 damage. SPECIAL: Freeze your opponent for 1 second

$a - x = b * y$	Thunder Strike	Energy	Deals 6 damage	Deals 8 damage	Deals 11 damage
$a + x - z = b * y$	Poisonous Vines	Poison	Deals 4 damage. SPECIAL: 1 poison damage per 2 seconds for 2 seconds, block sight for 2 seconds	Deals 6 damage. SPECIAL: 1 poison damage per 2 seconds for 4 seconds, block sight for 2 seconds	Deals 8 damage. SPECIAL: 1 poison damage per 2 seconds for 6 seconds, block sight for 3 seconds

TEACHER'S INSTRUCTIONAL VIDEOS.  
Please visit Clash of Wizardry Youtube channel.

## 10. FAQ

I'M NOT A STUDENT, CAN I PLAY THE GAME?

Sure! This game is available for everybody, it is always beneficial to train our minds and our maths skills.

CAN I PLAY THIS GAME ON MY COMPUTER?

Clash of Wizardry was developed and optimized for mobile devices (tablets and smartphones). It is available for free on Google Play (Android) and the App Store (iOS).

DO I NEED INTERNET TO PLAY CLASH OF WIZARDRY?

You have to be online to create a

character. However, as soon as you have a character created you'll be able to use the offline mode to play in the training feature (against a bot).

CAN I INVITE AND ADD FRIENDS?

Yes! Your friends must download the game to their mobile devices, then create a character (username) and join a room (whether private or public) to play together.

WHAT IF MY STUDENTS DON'T HAVE A MOBILE DEVICE?

Check if your school has tablets or smartphones so you can use Clash of Wizardry in your classroom. In case your school allows the use of mobile devices for educational purposes, encourage your students to download

the game. Some schools have rules regarding the use of mobile devices, check if it is possible to make use of them in your class.

Even one device will make it possible to use Clash of Wizardry in your classroom. For example, you can project the screen and play with the class.

By applying the strategy of “learning by sharing” you can set up a group for the class if you have access to limited devices.

Remember to ask around and search on our website and YouTube channel when you’re looking for ideas. Also, we would love to hear from you if you want to share something amazing that you came up with.

WHAT IF MY STUDENTS ARE MINORS AND HAVE LIMITATIONS ON THEIR DEVICES?

Reach out to the parents, explain why Clash of Wizardry is a good way to train mathematics skills and ask for parent authorizations.

HOW CAN I ADD STUDENTS TO MY CLASH OF WIZARDRY ROOM?

With the room feature it is possible to create a league for each of your classrooms and monitor your students’ progress in the game (the further they go, the better their maths skills). Don’t underestimate students with fewer points in the ranking because, despite

having more defeats in their game history, this does not mean that they are failing to practice mathematics.

In order to set up a room just click the room button and create a private or public room.

If you create a private room, provide the room code to your students to allow them to join it.

If you created a public room, your students will only need to tap “Find Room” and search by its name.

HOW CAN I DELETE A ROOM?

Go to your room’s overview and tap the gear wheel in the top right corner, this action will bring you to the “Room” settings and then, tap “delete room”. Keep in mind that you must be the room creator to use this function.

DOES CLASH OF WIZARDRY PROVIDE GRADES?

No. As students successfully win duels they progress through the ranking by earning more points.

Clash of Wizardry does provide data such as ranking points, favourite spells, win rates, match history and ranking overview for you to assess students’ progress.

WHAT IF I'VE CAST A SPELL AND NOTHING HAPPENS?

When the spell is not triggered it means that your operation was not correct. In that case, reset the energy clouds and try again.

CAN I SEE HOW LONG A STUDENT SPENDS PLAYING?

The game does not currently track the exact time a student spends practicing by playing. The time it takes students to battle a duel depends on their game strategy and maths proficiency. From the hands-on activities experience showed that students take approximately 10 minutes to win a duel.

I HAVE FOUND A BUG, WHAT CAN I DO?

Please, write us an email to [support@ingeniousknowledge.com](mailto:support@ingeniousknowledge.com)  
Your contribution will be highly appreciated.

HOW CAN I DELETE MY ACCOUNT OR CHILD'S ACCOUNT?

It's a pity if you don't want to belong to the Clash of Wizardry community any more. However, you can always go to "Settings" and then choose "Delete Character".

ARE THERE ANY ARTICLES ABOUT CLASH OF WIZARDRY?

Yes! This game was developed by a multidisciplinary team with different skills. All members contributed with their know-how to create this digital educational game. The design is scientifically validated as a quality requirement.

As of the release of this handbook the following articles have been published:

- Pechuel, R. & Beutner, M. (2019). Math or Magic? Creating a Serious Games through Design-Based Research. In: K. Graziano (Ed.), Proceedings of Society for Information Technology & Teacher Education International Conference (pp. 753-760). Las Vegas, NV, United States: Association for the Advancement of Computing in Education (AACE). Retrieved October



21, 2019 from <https://www.learntechlib.org/primary/p/207728/>.

- Ferreira, L., Garcês, E., Azevedo, M. (2019). Clash of Wizardry - Um Jogo Matemático. In: Casa das Ciências (Ed.), VI Encontro Internacional da Casa das Ciências - Ensino das Ciências e a Sociedade Moderna (pp. 9-10). Lisbon, Portugal: Casa das Ciências - EDULOG - Fundação Belmiro de Azevedo. Retrieved October 21, 2019 from <https://www.casadasciencias.org/6encontrointernacional/comunicacoes.php>

- Capone, R., Barbieri, R., Barbieri, G. (2019). I Serious Games per una didattica della matematica inclusiva. In: Benedetto di Paola (Ed.), GIMat 2019 - Giornate di Studio dell'Insegnante di Matematica (pp. 95-96). Palermo, Italy: Dipartimento Di Matematica e Informatica Università di Palermo. Retrieved October 21, 2019 from [http://math.unipa.it/~grim/quaderno2\\_suppl\\_5\\_2019.pdf](http://math.unipa.it/~grim/quaderno2_suppl_5_2019.pdf)

HOW IS PRIVACY AND PERSONAL DATA PROTECTED?

Please find out more about our privacy and data processing practices from our Privacy Policy in the respective app store.

## 11. REFERENCES.

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Anderson, J.W., Reder, L.M., & Simon, H.A. (1998). Applications and Misapplications of Cognitive Psychology to Mathematics Education.

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[www.emagic.eduproject.eu](http://www.emagic.eduproject.eu)

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Clash of Wizardry is an innovative game that helps your students train their skills in mathematics. This handbook can support you as a teacher to make use of the game in the context of your teaching activities and it can help you find out how to best implement it in your class.

Find out how Clash of Wizardry can motivate your students to challenge each other in a fun activity without realizing they are actually solving equations. Find out how this game can supplement your teaching activities and how it can encourage your students to train their calculation skills, something you probably never have enough time for in class.

Clash of Wizardry is a free tool to enhance your teaching, feel free to make use of it!