

# Game design at schools

SESAME –  
WE'RE LEARNING GAME DESIGN

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Inspirations for teaching art and  
computer science lessons at secondary level

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CENTRS 



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**Editor and project coordinator:**

BGZ Berliner Gesellschaft  
für internationale Zusammenarbeit mbH  
www.bgz-berlin.de

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and the

**Project partners:**

Ventspils Digital Centre (LV)  
<https://www.digitaiscentrs.lv/>

Playful Solutions (AT)  
<https://www.playfulsolutions.net/>

**2023**

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# 1. Project idea

## Stimulating enthusiasm for computer science through game design

Since the start of the digital transformation in the new millennium, special attention has been paid to the STEM subjects (Science, Technology, Engineering, Mathematics) as drivers of innovation. These subjects provide future-proof skills that are particularly relevant for the labour market. Therefore, in order for Europe to remain competitive and thus ensure the prosperity of its societies, it is essential to motivate young people to choose IT-based careers.

One of the key questions is therefore: How can we make STEM subjects more attractive for all students, especially for groups that have previously shown little interest in these subjects?

Georgette Yakman, then still a Master's student at Virginia Polytechnic Institute (US), launched the concept of STEAM-based teaching back in 2006. Since then, she has made her many years of experience available to parents, teachers, didactic researchers and decision-making bodies in numerous publications.

**STEAM is about more than bringing together visual arts and design thinking with design thinking with STEM subjects.  
The humanities provide the "who & why" for the 'what & how' of the STEM subjects.<sup>1</sup>**

The arts and other humanities subjects can bring out the inherent innovative potential in the STEM subjects. Because innovation requires creativity. And creative action and thinking are primarily promoted by the humanities and in particular by creative subjects and programmes.

The STEAM approach can open the door to a "new" attractiveness of STEM subjects and technical professions. With this approach, it may be possible to inspire young people who are in the career orientation phase with enthusiasm for technical and IT skills.

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<sup>1</sup> Freely translated from English: Article by Georgette Yakman in Digest K12 "STEAM- An Educational Framework to Relate Things To Each Other And Reality", <https://bit.ly/45EWKid>

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## 2. Game Design

Game development = art + technology

Game design is the development of a game, the form design, the game idea, the game structure and process, the gameplay and the material or digital realisation. (Almost) all people like to play. Game design, on the other hand, requires talent and expertise.

Many of the skills and competences required to develop a game can be found in the curriculum of artistic and humanities subjects: from narration, imagination, abstraction and research to design and craftsmanship.

Basic building blocks of game design:



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## Promoting competence through game development

In addition to technical competences and skills, the integration of game development into lessons also promotes numerous social skills, as game development takes place in teams. Game development can, therefore, help to promote the following competences:

- being a team player & co-operate
- recognising your own strengths and weaknesses, evaluate your strengths in the group and use them sensibly
- making decisions
- organising yourself
- Solving problems and making compromises
- Weighing and prioritising
- Taking responsibility

Game development also contributes to the acquisition of media skills - because the responsible use of media is also addressed. And the decisive factor here is:

**Media skills cannot be taught, they can only be acquired.**

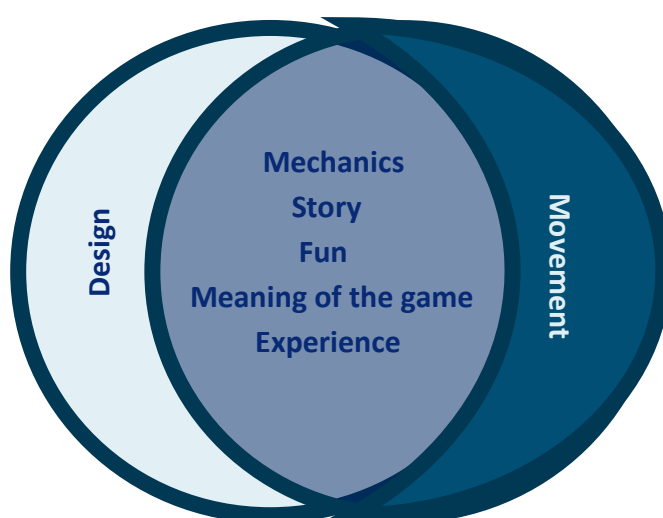
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## 3. Combining art and computer science

### Breaking new grounds - but how?

Due to the combination of creativity and technology, game design lends itself to interdisciplinary teaching, especially for subjects with rather different teaching methods such as art and computer science.

In digital game formats, computer science brings movement into play, and art brings form. But only together do they develop a story, define the rules, the gameplay (game mechanics) and the meaning of the game. Together they create the fun and the experience.



Breaking new ground is not a sure-fire success - schools in particular, with their fixed structures, cannot be changed in passing. Teacher shortages, framework curricula, but also a lack of further training, flexibility and technology are obstacles to trying out new things.

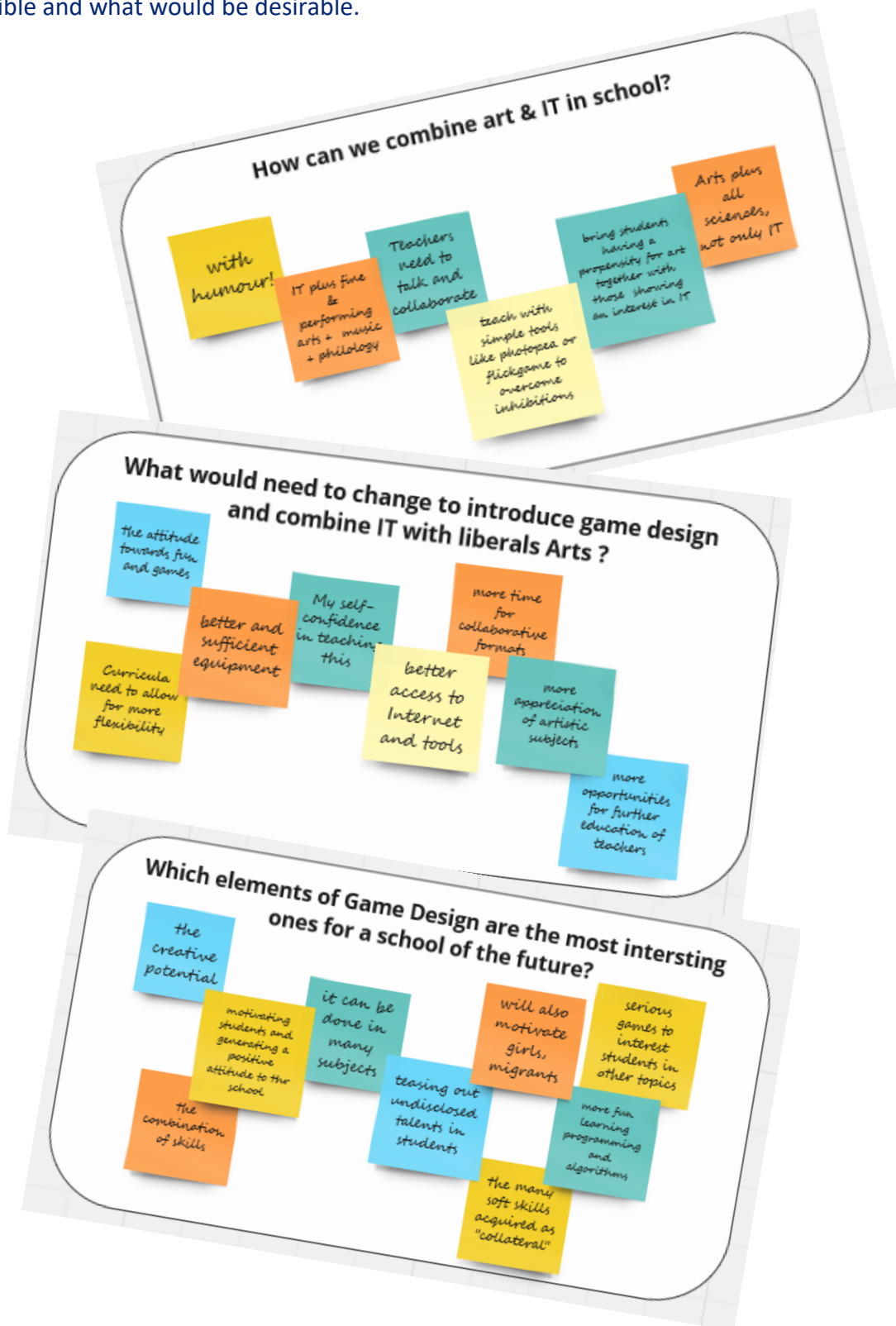
### Combining art + computer science = game design

We have, therefore, brought together teachers from Berlin and Ventspils (Latvia) in two workshops. Many teachers are as unfamiliar with game design as they are with programming. Incorporating video game design into the classroom, even if it could be used to teach a great deal of knowledge from the curriculum is, therefore, rather frightening at first.

The aim of the workshops was to inspire, motivate and reduce an existing reluctance. This was a great success and the participants were enthusiastic. Many of them were encouraged to immediately try out the first steps of game design in class with their students.

## Teachers' experiences

We used the workshops and also the teachers' reflections to find out where the hurdles lie, what is currently feasible and what would be desirable.



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## Opportunities for game design in the classroom.

It:

- harbours great motivational potential for the students
- brings "hidden talents" to light
- improves the teacher-student relationship
- brings together teachers from different disciplines
- requires no special prior knowledge on the part of the teachers due to the cooperation with experts and their pre-produced material for use in the classroom
- promotes language and presentation skills, but also the use of digital media such as PowerPoint, video, etc. preparing a presentation of the game

## The added value of game design



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## 4. This is how it works: Game design in practice

### THE ENTRY

Not all games are the same

Analysing games offers a good introduction to designing games.

Pupils could start by presenting their favourite game. Key questions could be:

- What type of game is it?
- What is the context of the content?
- Is there a story, if so, what is it?
- What rules are there?
- How can the design (style) be described?
- What do you need to play it?
- Who is the game made for?

In a second step, the students explain what they like most about this game and whether there are things they would change if they could.



If the students do not present enough game presentations, there are numerous portals to find good examples of (digital) games. We would like to recommend two portals in particular:

- a) <https://www.stiftung-digitale-spielekultur.de/games-erinnerungskultur/> (here you can search for thematic focuses)
- b) Recommendations of the Austrian Federal Chancellery:  
<https://bupp.at/>

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## Didactics and "serious" games

When designing games in the classroom, it makes sense to link content to them that also covers learning content (health, environment, migration, democracy, etc.). As relevant as the context is, you have to be careful with game design: an "educational" game can quickly become boring if the didactic goal takes precedence over the fun and playful experience. The advantage of games is the pleasure and attention they generate. The structure of the game is elementary. If students work out the content of the game themselves, then there is already a big difference to "didactic" games, as they have to deepen, research and understand the topic themselves.

## Aesthetics and graphic design

Students often play games that have been purchased on the market and developed in large teams. They are used to complex games with a very high quality look.

In class, it must be made clear right away that the style of the first games will have nothing in common with games such as "Legends of Zelda". Nevertheless, these first steps lead to an appreciation of the artistry involved in game design. This leads to an understanding that there is a lot of knowledge and work behind what we as consumers take for granted.



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## Becoming a game designer in 30 minutes

The basic elements of a game can be developed in just a few minutes. At first glance, this may seem far too little time. But it turns out that it is quite feasible. Because game design has a lot to do with "limitation". Limitation is one of the most important elements of game development. The approach here is: You create something very simple in a very short time. And then you work it out in several iterative loops. The trick is to make quick decisions and not think too much. Only in constant repetitions, revisions and test runs is it polished, deepened and improved.

### Analogue version

With different materials (you should also pick them up individually) such as:

Lego  
Dice  
Playdoh  
Halma tokens  
Felt pens  
UNO cards  
Rummy cards  
Paper



a prototype is created: unfinished, ugly, fast, but fun!

The focus here is on:

**Mechanics:** How does the game work? What do the players do? The rules limit what the players can do. So first ask: What should the players do?

**Story:** Is there a story or content in the game?

**Purpose:** The intention of the game. This is important in the teaching context if you want to develop "serious games".

### The task at hand

The first step is to collect concepts.

To do this, take a well-known character, e.g. James Bond, and collect verbs that describe what James Bond "does" (saves, shoots, drives fast, protects, loves, lies, etc.).

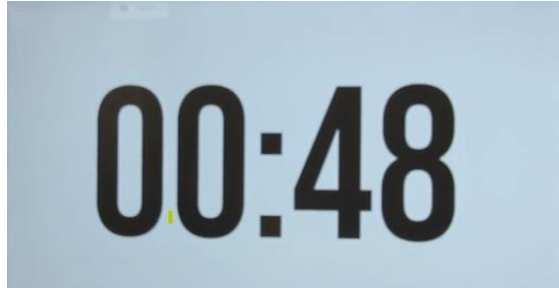
This is done as a brainstorm in each group. All the verbs are written down and then only three are chosen.

Of course, it makes sense to choose a suitable character or even a topic (e.g. youth culture) as a brainstorm topic. The topic (or a selection of topics) could be given for the sake of simplicity so as not to waste time unnecessarily. In the next steps, the teams could look for a topic themselves.

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And off we go!

The clock is ticking (use the digital countdown on the screen - keep telling the time in between):



Step 1:

2 min: Brainstorm on the topic area e.g. on the overall topic "youth culture".

1 min: Select a topic.

Step 2:

2 min: Collect verbs on the chosen topic.

1 min: Choose 3 verbs.

Step 3:

5 min: Based on the three chosen verbs, create a goal, a story and a game mechanic in the group. The restriction: There can only be 3 rules, e.g. you roll the dice and then you can do X = one rule. Tip: Don't think too much, just get started. "Messy, quick and dirty" is the motto.

Step 4 (2 repetitions):

1-2 team members stay at the table and explain the game to members from other teams.

5 min (per round): Player gives feedback on the game experience, what worked, what was unclear, what was fun, what wasn't? At the end, the players have to say which 3 verbs were chosen at the beginning.

Run through this block in at least 2 rounds. The team members "explaining the game" should change.

Step 5:

5 min: Record points of criticism, take inspiration from the other games, improve the game.

Block 6:

3 min: Game presentation in front of everyone.

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## Example: Game on the CO<sub>2</sub> footprint:

The **content of the game** is the CO<sub>2</sub> footprint.

The **game type** is a dice game.

The **story** is that players have to choose between different modes of transport in order to be the first to reach their destination with a small carbon footprint. You first decide which of the three routes you want to take: the most expensive and shortest route is red (e.g. by plane), the green route is the cheapest and slowest (on foot or by bike) and the third route (train/bus) is blue. There are objects (food) along the way that you can recycle as soon as you roll a six. There are many objects on the red route and the fewest on the green route. You can arrive at your destination with a maximum of two objects - then you have won.



The three rules:

- First, you choose a path, roll the dice and take as many steps on this path as the dice indicates.
- If there is an object at the point where you arrive, you must pick it up.
- If you roll a six, you have to explain how to recycle the object and if it is possible and convincing for the others, you can roll the dice again. You can also - if it is not recyclable - perform a physical exercise instead.

Test game:

You choose the blue path and roll a four. There is an egg in this position. The next time you roll the dice, you get a six and can now recycle the egg (you place it in a different position).

Now you keep rolling the dice until you reach your final destination. And since you have no objects in this case, you win.

Suggestions for improvement:

The objects (represented by small coloured balls) could be differentiated by colour based on their own CO<sub>2</sub> footprint (green = food, red = hairspray etc.).



## Digital development

Two free game design tools were tested that require no prior technical knowledge other than basic computer skills.

**“I found working with simple programmes like Flickgame very good. You understand it very quickly, even if you're not a "digital native", and lose your own inhibitions in front of the students, who usually have better digital skills than their teachers.”**

### a) Flickgame



Flickgame: [www.flickgame.org](http://www.flickgame.org)

The focus here is on the design: the brush thickness can be determined on the right. Below the colours, below those the linked scenes.

You create different scenes - the linking is then done via the colour, e.g. sky (scene 1) => blue. If you click on blue, the next scene (2) appears because you have selected the box with the two in blue.

Initially, this is just a sequence of possible scenes. By linking them, however, a picture story is created by deciding between two possibilities, each of which then leads to different pictures/results.

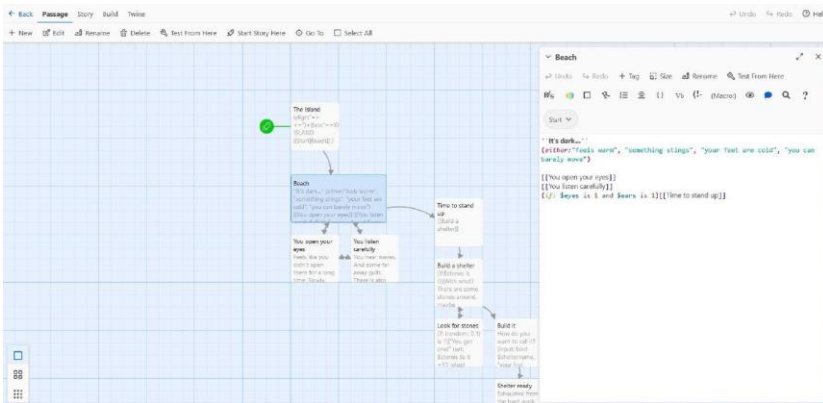
Siehe auch: <https://youtu.be/49uqiUlsuLc?si=GoaNjNGV8yDGroCP>

**„The use of Flickgame in the classroom also proved to be very valuable pedagogically, because the students learn how to physically interact with a computer on a very simple level and at the same time it is very complex.“**

- Teacher of an inclusive class

Examples of games made with Flickgame: <https://itch.io/games/made-with-flickgame>.

## b) Twine



[www.twine.org](http://www.twine.org)

Twine is a free open source software for the development of interactive fiction that can be played in a web browser.

Other game tools that were tried out by the teachers in the workshop and then used with their students in the classroom were Bitsy and Scratch.



<https://bitsy.org/>

## TOPIC: LOST AND FOUND

AVATAR	WORLD	OTHERS	GOALS	THINGS
CHILD	HOME	DINO	DISCOVER	FIRE
PET	FOREST	ROBOT	REACH	BATTERY
GUIDE	SUBWAY	PARENT	CATCH	TIMEMA CHINE
GHOST	SCHOOL	PLANT	CREATE	FOOD
BIRD	BORDER	ALIEN	REMEMBER	COSTUM

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The approach here is similar to the analogue game: From the task and the theme to the game mechanics. With Flickgame, for example, you could first draw the individual "frames" (slides) in analogue and then transfer them to digital.

The following procedure is recommended:

- 1. WHAT DO YOU WANT TO CONVEY**
- 2. SITUATION WITH TIME-CRITICAL PROBLEM**
- 3. TITLE WITH START BUTTON ON FIRST PAGE**
- 4. TEST OFTEN VIA "EXPORT"**
- 5. AT LEAST 1 LOOP**
- 6. BONUS POINTS FOR CODE-PUZZLE**

C : copy current image  
V : paste current image  
Z : undo

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The difficulty lies in the limitations of the tools available. This can be the incentive to switch from analogue and simple tools to programming in order to have more creative possibilities.

**Programming is then recognised as a tool for creative design.**



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## 5. PILOT PROJECTS

### Analogue

Project week at Carl-von-Ossietzky-Gymnasium in Berlin

Games are a good way to get people with different opinions and attitudes talking to each other. Art teacher and artist Ms López had already experienced and tried this out in her art projects.

Her participation in the Sesame project gave her the idea of using game design in the welcome classes at her school to build bridges between young people from different ethnic backgrounds and promote empathy.

"Sustainability" was chosen as the theme for the board games to be developed - under the guidance of the artist duo López-Schmidt. The games were intended to promote understanding of climate change, illustrate the impact of human activity on the climate and develop strategies to influence or combat the consequences of climate change.

The choice of topic was interesting in that young people with a migration background sometimes have little understanding of the explosive environmental and climate situation or the wider context due to their previous experiences and socialisation, even if their migration may be climate-related.

After the project week, the games were and will continue to be presented in the library and in the school café and offer an opportunity to play together, laugh and socialise with the other pupils.

The video documentation also contains short descriptions of the games developed.



<https://youtu.be/gJ5VB7h73Jc>

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## Analogue & Digital

### Project days at John-Lennon-Gymnasium in Berlin

Project days allow more flexibility than regular lessons. Two teachers, one in the subjects of music, German and computer science and one in the subjects of history and maths, used this opportunity for a three-day game design workshop.

The following programme was carried out over three days, from 9am to 2pm, with 15 pupils (ten male, five female) aged between thirteen and seventeen:

- Day 1: Finding and applying analytical baselines for your own game design
- Day 2: Designing an analogue game
- Day 3: Programming digital games

The first step was to analyse the games selected by the group, how games work, how they are fun and how they cause frustration or boredom and how the respective game mechanics are structured. Then, in two mixed working groups (age/gender), a theme was developed for an analogue game.

At the beginning of the second day, two A-level students from the computer science course gave a 90-minute presentation on the use of AI in game development.

This was followed by an introduction to various digital tools for game design (scratch, Twine, Flickgame). A digital serious game was then developed in groups.

At the end of the day, problems and successes of the development so far were discussed and the tasks for the third day were defined in the groups. On the afternoon of the third day, the games should be ready for testing. The groups played each other's game and gave critical feedback.



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## DIGITAL

### Student workshop at the Digital Transformation Centre in Ventspils

Two one-day workshops were held with ten pupils each. The 20 participants included six schoolgirls and one young person with a disability.

The groups were divided into two to three young people, with each group always having the opportunity to go to the other groups after 30 minutes and see what they had developed.

All groups created their own video game on the topic: "Urbanisation - megapolis versus small city".

Hardware/software required:

One computer per participant, internet access, Roblox Studio (free download).

Registration of participants in Roblox Studio required.

Programme:

1 hour - Introduction to Roblox Studio - registration and first steps

2 hrs - Familiarisation with the tool - teacher goes from student to student.

4 hours - Think up a game idea in groups and work on it together in Roblox (activate group work and determine team members).

1 hour - Present the results within 10 minutes + feedback from the other groups.



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# 5. Game design in schools - What's next?

## The most important findings and recommendations after the Sesame project

### Use in teaching

There are numerous offers that lend themselves to the use of game design in art and computer science lessons (see list at the end of the document):

- **for schools:** involvement of game designers who have gained experience in teaching game design to children and young people outside of school and who can support project days and teaching modules in conjunction with teachers
- **for teachers:** just like for pupils, there are numerous opportunities to learn the basics of coding and game design

This would broaden the experience base and give the idea a broader base of support/advocacy and attract more attention from decision-makers.

### Qualification of the teaching staff

An important step towards permanently anchoring game design in school lessons is to enable the respective teachers to develop games. This would lend itself to further training for teachers of art and computer science, German, theatre, music and crafts (fashion/stage design), and social studies.

It would also be particularly effective as a creditable elective subject for teacher candidates. Not only is this easier to organise in terms of time for students than for practising teachers at schools, but students already belong to the generation of digital natives and the teaching can, therefore, encounter fewer hurdles from the outset, similar to younger teachers, and thus a more in-depth build-up of knowledge could take place.

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## Interdisciplinary teaching

More team- and project-based teaching by merging teaching phases as a first step towards developing topics such as "Game Design" or "XR Design" would be desirable.

The interplay between the subjects and overcoming "silo" thinking, as is often still the case with STEM subjects, would be essential. Teachers could act as "guest experts" in the respective teaching units (e.g. music in games, textiles for design, history, politics, geography, biology, etc. depending on the subject). Especially in secondary schools, interdisciplinary project work, including game design as a multimodal subject, would be excellent for career and study choices.

## Compulsory elective subject Game Design

More and more schools have the opportunity to set up compulsory elective subjects for certain grades. A compulsory elective subject in game design could, therefore, be a good way to offer regular and continuous interdisciplinary lessons.

There are, therefore, numerous opportunities to combine art and computer science lessons and thus get more pupils interested in computer science. As part of the Sesame project, we were able to gain valuable insights and experience that we would like to share with others and expand on.

The dissemination of the guide and feedback on it is, therefore, expressly encouraged.

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## 6. Further sources

There are countless sources of information on the subject of game design.

This is just a small selection - limited to Germany and Austria:

**Playful Solutions** – <https://www.playfulsolutions.net/>- Conception and realisation of playful learning experiences, workshops, virtual events and much more.

**Creative Gaming** – <https://www.creative-gaming.eu/>

The Initiative Creative Gaming e. V. regularly organises training courses, workshops, lectures, school projects, exhibitions and the annual PLAY - Creative Gaming Festival. Under the motto "Play with games!", the initiative promotes an alternative and artistic approach to games and opens up concrete opportunities for young people, parents, teachers and students to engage creatively and critically with the medium.

**Vizium** – Science Centre Ventspils <https://vizium.lv/en/about>

Education of children and youth in STEM subjects in a playful environment.

**Stiftung Digitale Spielekultur** - <https://www.stiftung-digitale-spielekultur.de/> Workshop offers, coaches, database with games.

**Code Week** - <https://codeweek.eu/> - A participatory and broad-based initiative designed to familiarise the public with programming and digital skills in a fun and engaging way.

**HMKW** Scalable Game Design – online course

<https://www.hmkw.de/weiterbildung/psychologie/unterrichten-mit-scalable-game-design>

**Playing History** – <https://playinghistory.de>

Conveying historical but also critical, political and scientific content with games.

**TUMO** - <https://berlin.tumo.de/>

Free learning centre for young people. Here they can develop their skills voluntarily and outside of school. There are ten subject areas: From programming and robotics to music production, animation, photography or game design.

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Further tools:

**Makey-makey** – [www.makeymakey.com](http://www.makeymakey.com)

Crocodile clips are connected to conductive objects and allow the keyboard and mouse to be operated by closing an electronic circuit, e.g. with bananas, plasticine or aluminium foil. For making music, game design and much more.

**Scratch** - <https://scratch.mit.edu>

A visual programming language that was developed for use in educational contexts with children. Familiarisation is very simple, as "programming" is done by simply interlocking and nesting blocks that represent individual commands and can be combined with each other like pieces of a puzzle.

**itch.io** – A website where you can play indie games (independent of large industrial publishing companies) and upload your own games.

Interesting links to the STEAM concept and its use in the classroom (STEAM = Science, Technology, Engineering, ARTS, Mathematics):

<https://steameducation.eu/space.html>

<https://www.mintuitiv.de/blogs/mint/minkt-wie-die-kunst-mint-auf-das-nachste-level-hebt>

<https://www.k12digest.com/steam-an-educational-framework-to-relate-things-to-each-other-and-reality/>

<https://www.researchgate.net/profile/Georgette-Yakman-2>

<https://www.steampoweredfamily.com/what-is-stem/>

The Lower Saxony State Centre for Political Education has summarised brief descriptions of game production tools without software knowledge:

[https://www.politische-medienkompetenz.de/fileadmin/user\\_upload/2020\\_Gaming-Gamification\\_Game-Produktion.pdf](https://www.politische-medienkompetenz.de/fileadmin/user_upload/2020_Gaming-Gamification_Game-Produktion.pdf)