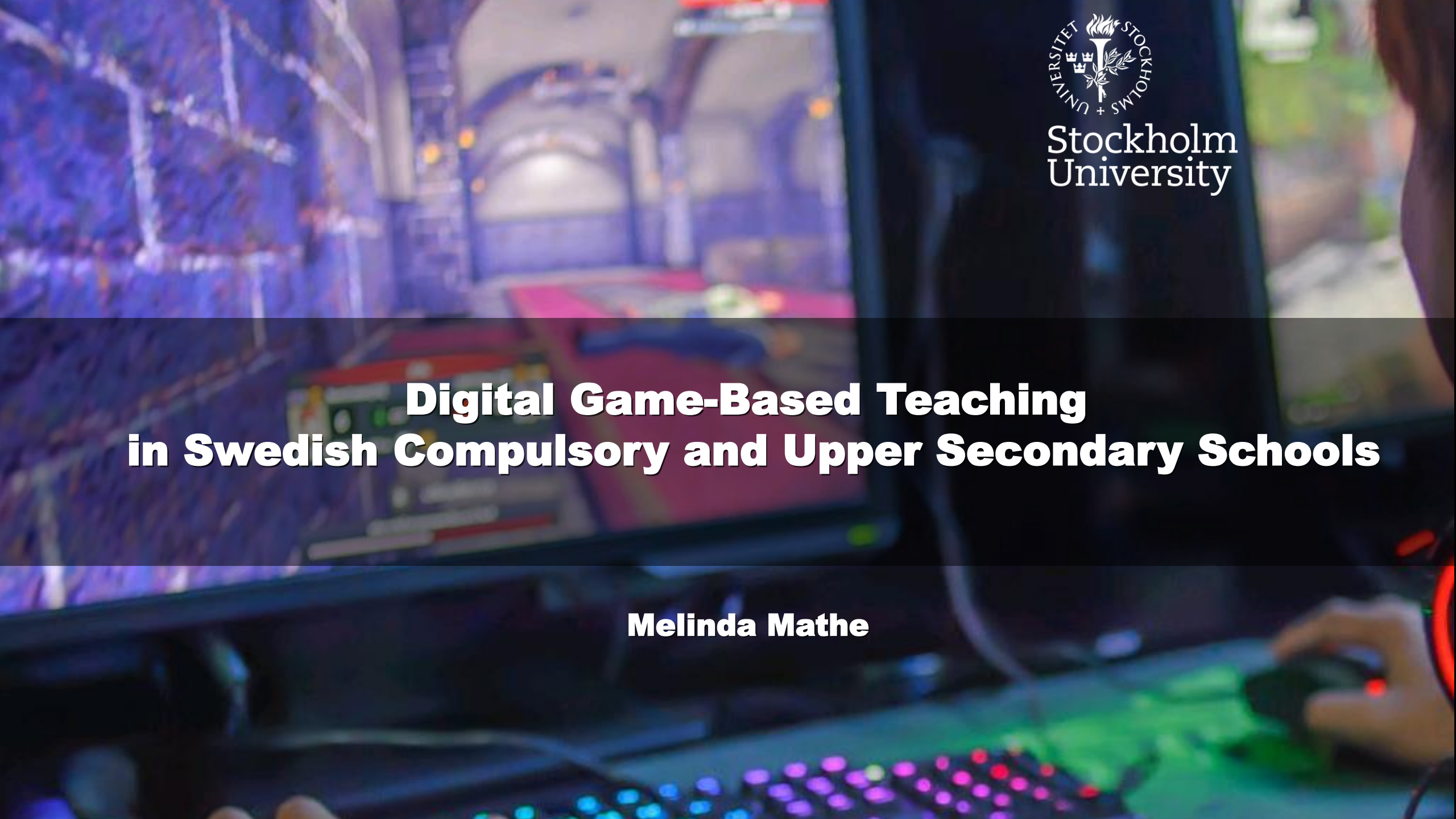


Digital Game-Based Teaching in Swedish Compulsory and Upper Secondary Schools

Melinda Mathe

Stockholm University

Content

1. Background
2. Theoretical Positioning
3. Research Methods
4. Findings
5. Next steps

1. Background

Why digital games?

- 79% of 9-12-year-olds in Sweden play digital games
- 68% of 13-16-year-olds in Sweden play digital games
- Most children in Sweden play video games 5-7 hours per day

Statens Mediaråd. (2019) “Ungar och Medier 2019”

Statista. (2016) “Survey on playing video games among children in Sweden by hours”

Why digital games?

Digital games potentials as powerful learning tools:

- Well-designed games engage and immerse in challenging game worlds and create intense sense of intrinsic motivation, learning new concepts, understading of complex processes
- Collaborative problem solving (Gee 2003, 2007)
- Promote literacy development (Gee 2003)
- Support identity development (Shaffer 2006)
- Provide building blocks to be manipulated and recombined (Kafai and Burke 2016)

Research

- Sparse and mixed solid evidence
- Controlled experiments
- Teachers´ use of digital games is underexplored
- Critical role of teachers in student learning (Hattie 2003)

Digital Games and Teachers

- **Diverse** and **complex role of teachers** when implementing games
- Requires the **coordination of various knowledge domains** (Bourgonjon, et al. 2013) and a diverse set of pedagogical, technological, collaborative and creative competences (Nousiainen, et al. 2018)

- Hanghøj (2013) proposes the use of the term **“digital game-based teaching”** in contrast to **“digital game-based learning”** to emphasize the focus on practices of teachers involved in selecting, facilitating and validating the use of games for educational purposes.

Research Aim

How do teachers in Swedish compulsory and upper secondary schools …

1. understand and implement digital games?
2. perceive challenges to using digital games in teaching?
3. learn about the use of digital games in teaching?

Delimitations

- Focus on digital games
- Focus on teachers grade levels 1-12
- Swedish context

Digital Games

The research employs a **broad view** on what a constitutes a game. Digital games are understood as blanket term that covers **any kind of game played entirely or partially on any kind of digital device**.

Digital Games and Learning

Marc Prensky (2001) in his book Digital Game-Based Learning argued for the great potential in the use of digital games for student motivation and learning in what he described as the “digital game-based learning revolution”.

Different approaches:

- Educational games
- Construction of games
- Entertainment games (Van Eck 2006)

What is a Game?

System

Game are a ”system in which players engage in an artificial conflict, defined by rules, that results in a quantifiable outcome”

(Salen & Zimmerman, 2003, pp 80)

Narratology

- Games as story and text
- Form of interactive storytelling
- Focus on events, settings, characters and perspectives

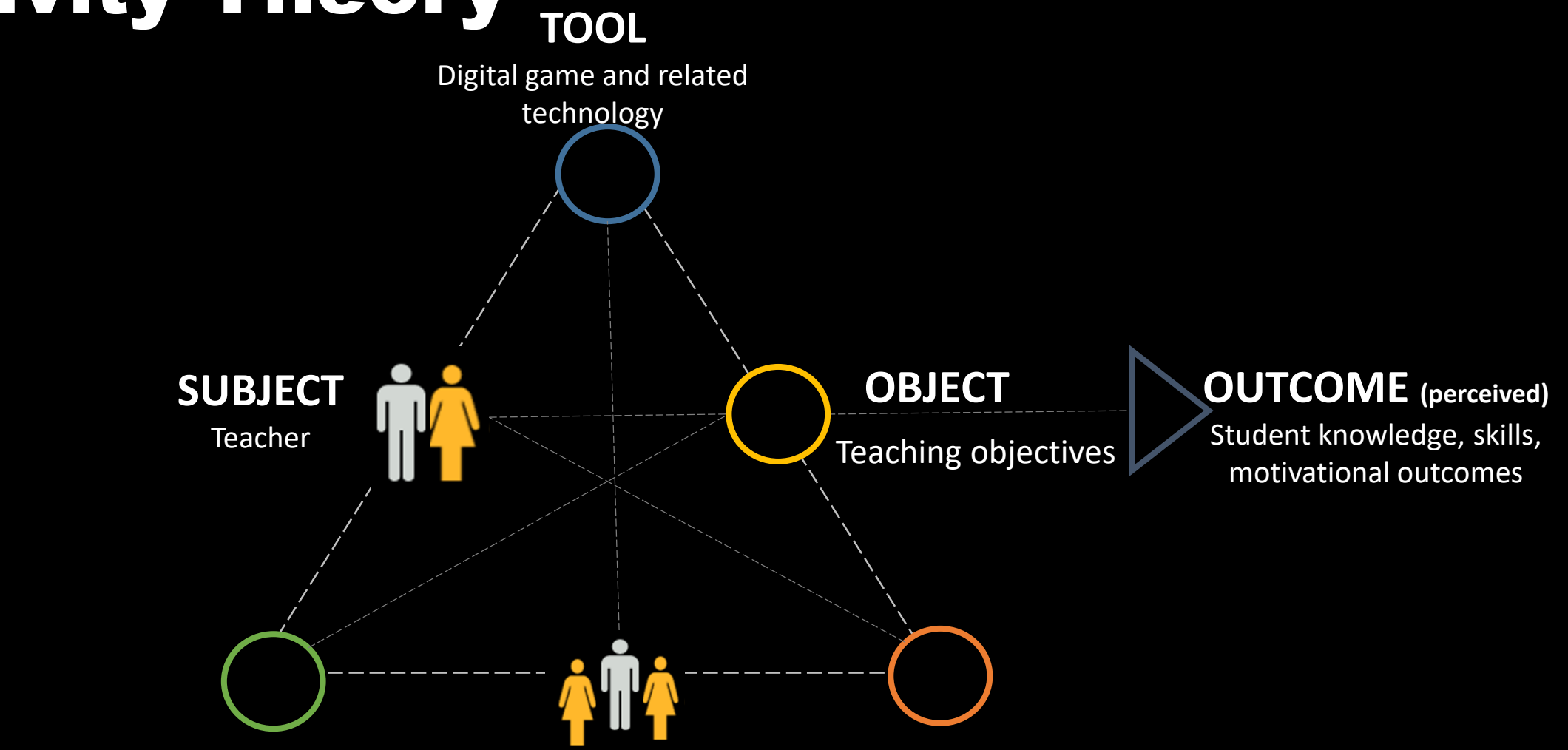
(Selwyn, 2014)

Gamification

- Gamification turns a non-game activity into a game to motivate learners (Deterding et al. 2011).
- Can take a wide range of forms from simple pointification to activities consisting of different game-like narrative, playful elements. Typical examples include rewards, points, badges and leader boards.

2. Theoretical Positioning

Activity Theory



Activity triangle model (after Engeström, 1987)

3. Methods

Research Design

Sequential mixed method design on study and cross-study levels

Study 1: Multi-case, exploratory study design, (in-depth interviews) thematic analysis

Study 2: Survey study (questionnaire), descriptive statistics, clustering, thematic analysis of qualitative data

4. Findings

Study 1.

AIM OF THE STUDY

Examine **teacher** use digital games on their own initiative

THE RESEARCH QUESTIONS

1. **What digital games** do teachers use and how do they select these?

2. **How** are the **games understood** and **implemented** by teachers?

3. What **challenges** do teachers identify?

4. To what extent is **change** evident in regards to teaching practices?

DATA COLLECTION

- One-on-one semi-structured interviews with 8 teachers during March-May 2018
- Snowball sampling strategy
- Conducted in Swedish / English
- Questions tested prior to the interviews, suggested modifications were included
- Sessions recorded and transcribed

PARTICIPANTS

Gaming experience	Teaching experience		
	0-5 yrs	6-10 yrs	10+ yrs
No gaming experience		x	
Some gaming experience/ identifies as a **casual gamer**	x	x	x
Long gaming experience/ identifies as **gamer**	x	xx	x

PARTICIPANTS

Gaming experience	Teaching experience		
	0-5 yrs	6-10 yrs	10+ yrs
No gaming experience		x	
Some gaming experience/ identifies as a **casual gamer**	x	x	x
Long gaming experience/ identifies as **gamer**	x	xx	x

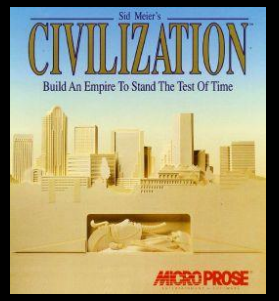
ANALYSIS

- Thematic analysis
- Main codes derived:
  - Technological and pedagogical implementation
  - Before-, during- and after-game activities
  - Perceived challenges, perceived changes

English

Religion, Ethics

English

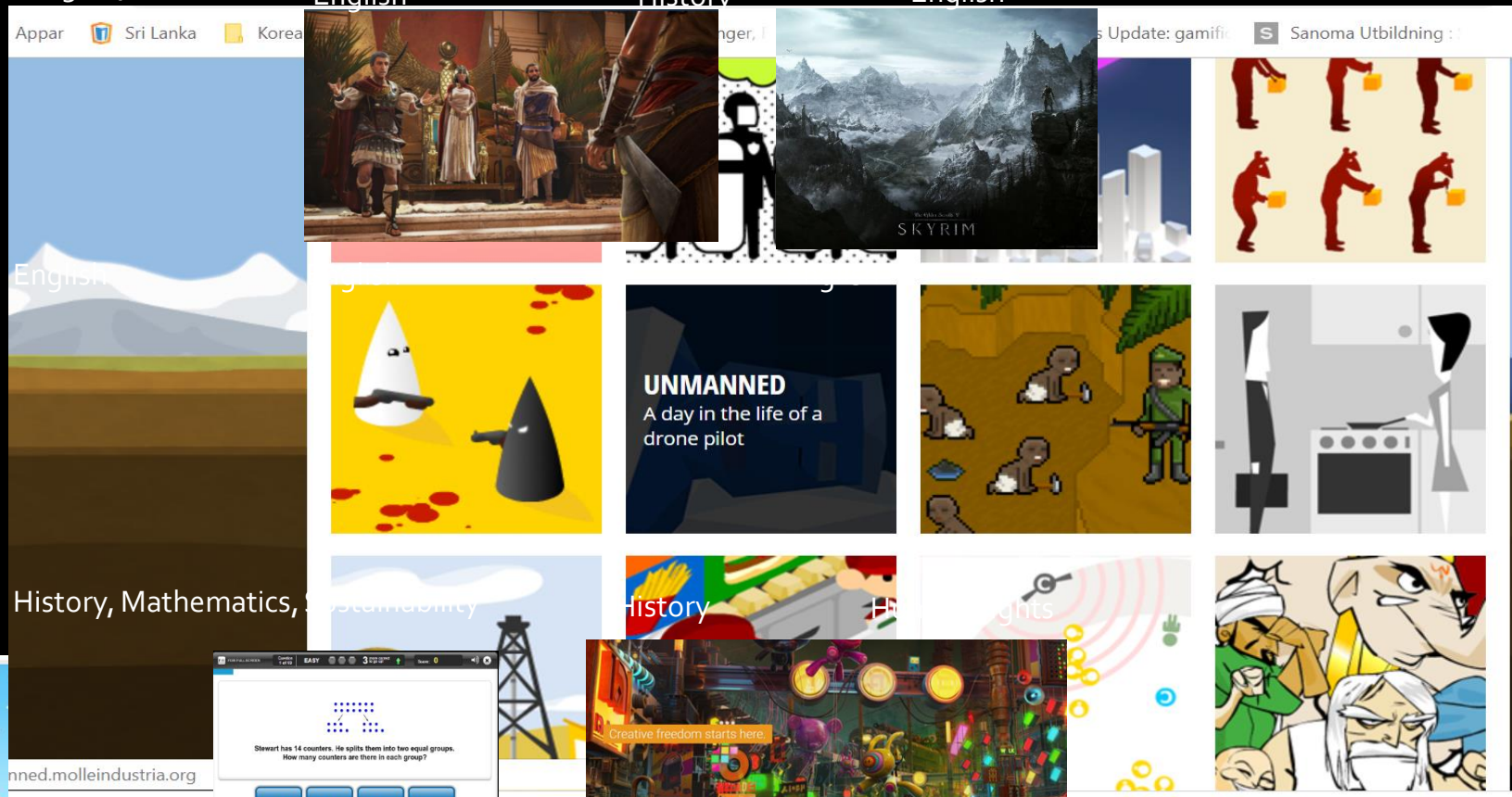


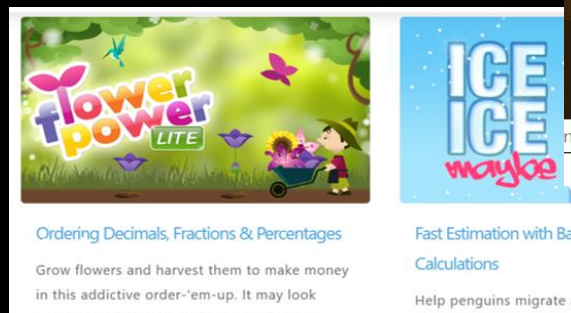
History

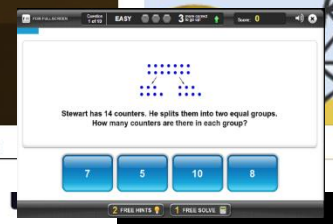
English

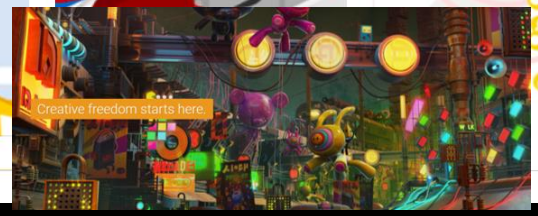
English

Social Studies









Technology / Programming

DEVELOPING A PEDAGOGICAL IDEA

- **Inspiration**
- Considering **Applicability**
  (Student background, game proficiency, age, level of knowledge, technology tools available)
- Considering **Appropriateness**

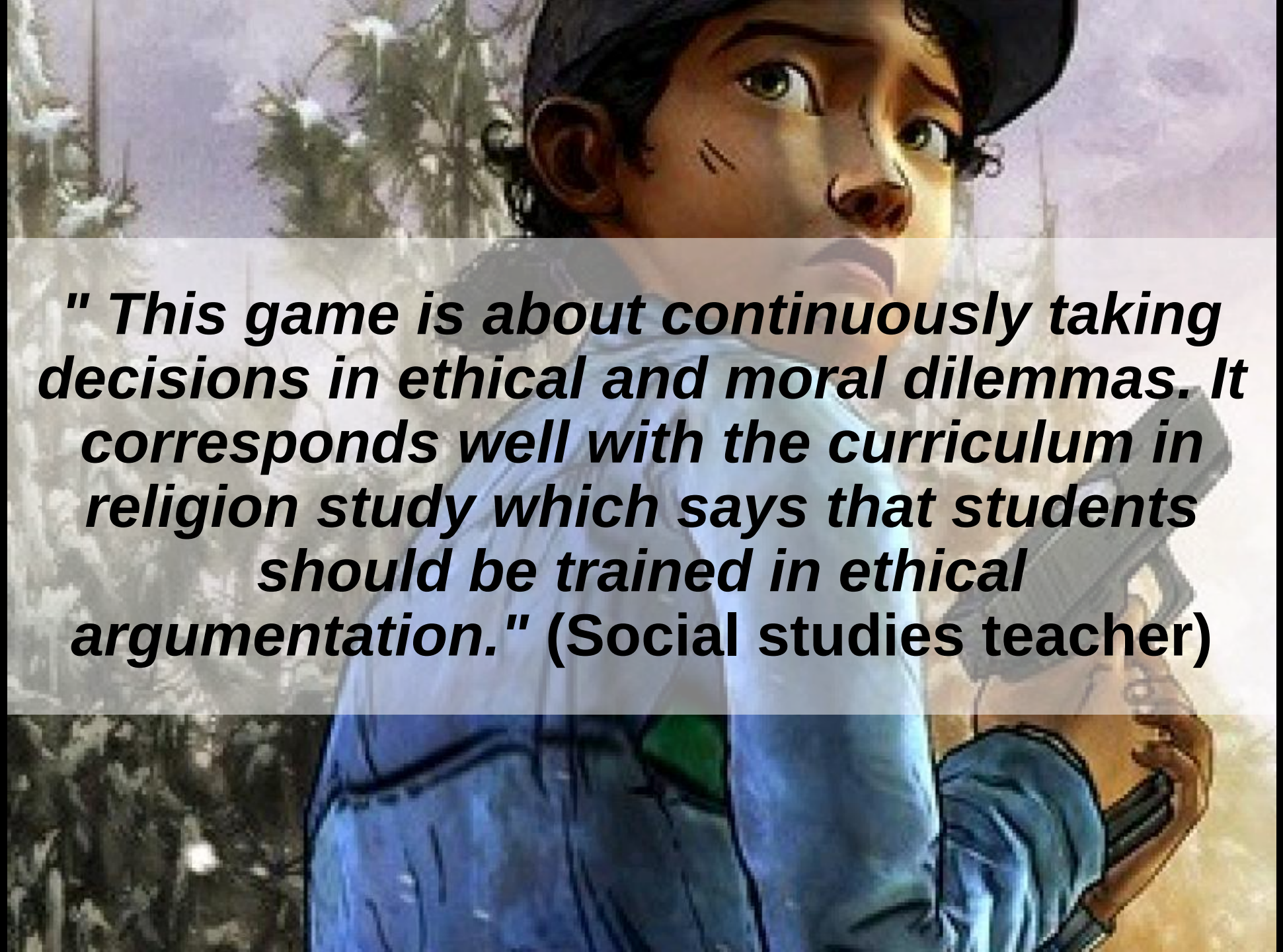
*" I have to **think about what kind of** **game** it is. Is it morally defendable? How are my students? It is not suitable to blow up bombs if there are students in the class who experienced air attacks in Syria. **I have to know my** **students** and what I can give them. Sometimes I cannot use games in the group because it does not work yet. But it is the same as showing different movies; **you have to know what you have in front of you**."* (Social studies teacher)

PEDAGOGICAL & TECHNOLOGICAL PREPARATION

- Connecting the **game** with **curriculum**
- Formulating learning **objectives**
- **Designing** conceptual and practical **tools** for scaffolding and collaborative work
- Setting up **technology**

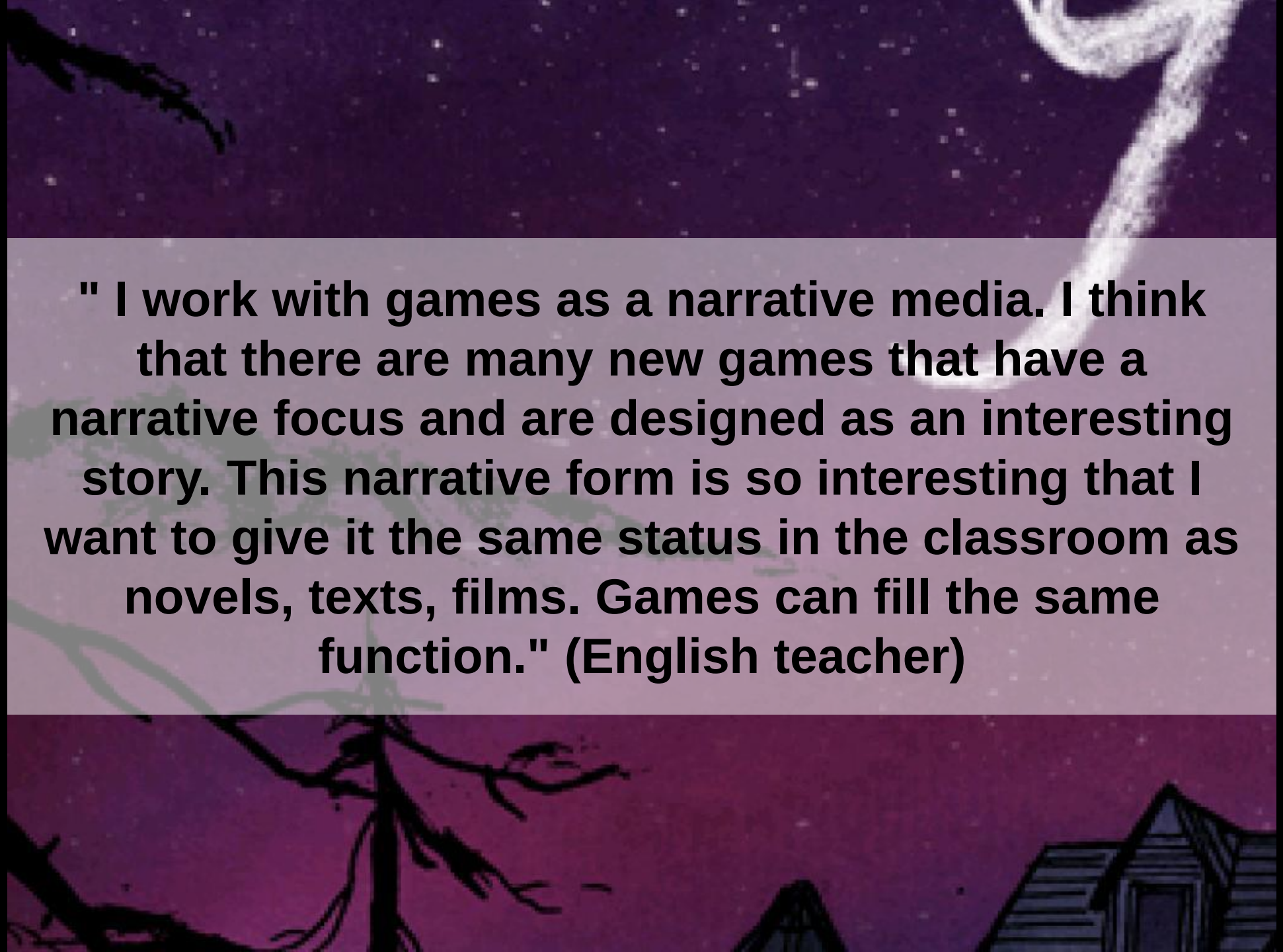
How do teachers understand and implement digital games?

DISCUSSING ETHICS: WALKING DEAD (Social studies)



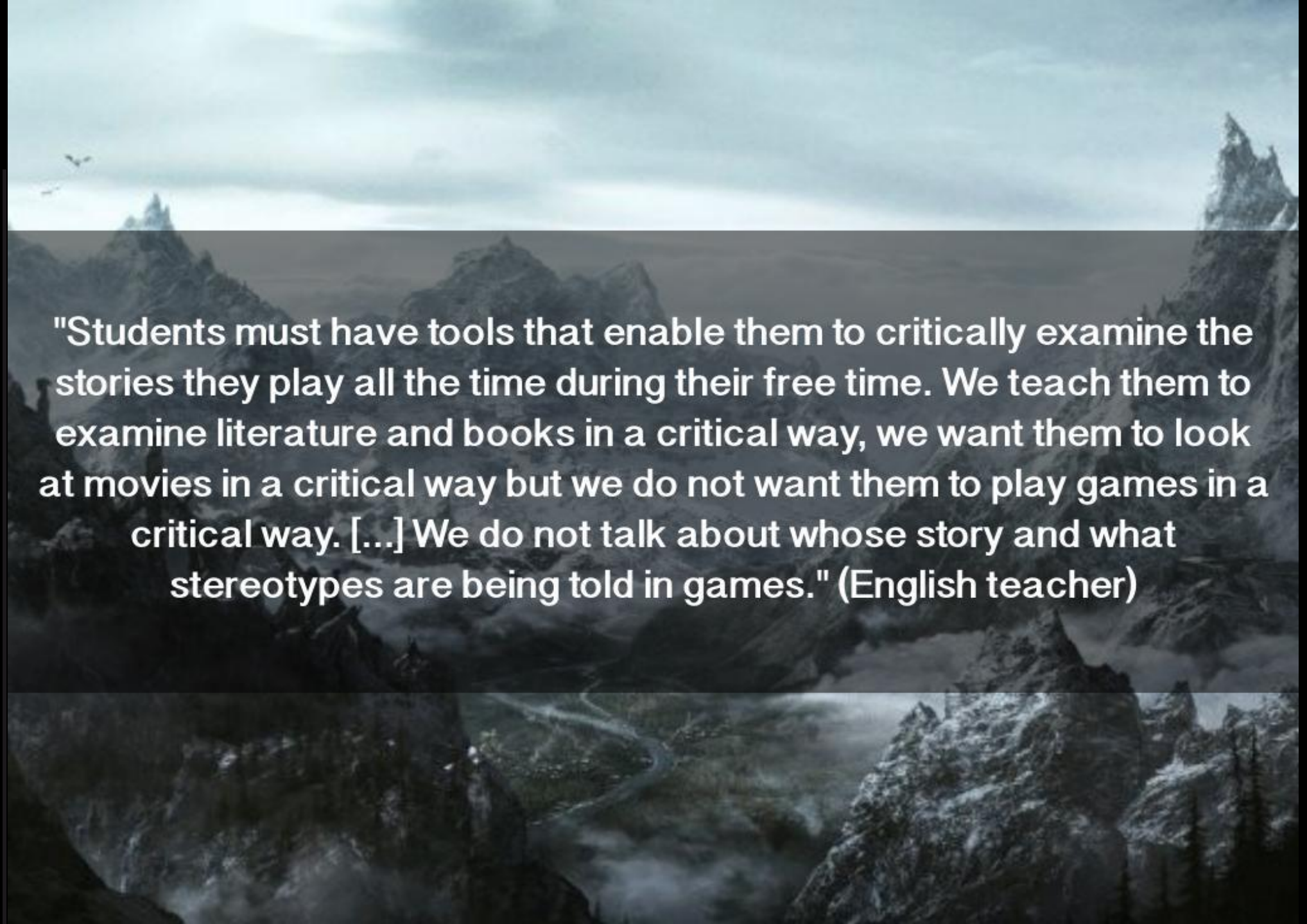
" This game is about continuously taking decisions in ethical and moral dilemmas. It corresponds well with the curriculum in religion study which says that students should be trained in ethical argumentation." **(Social studies teacher)**

ANALYSING THE NARRATIVE (English)

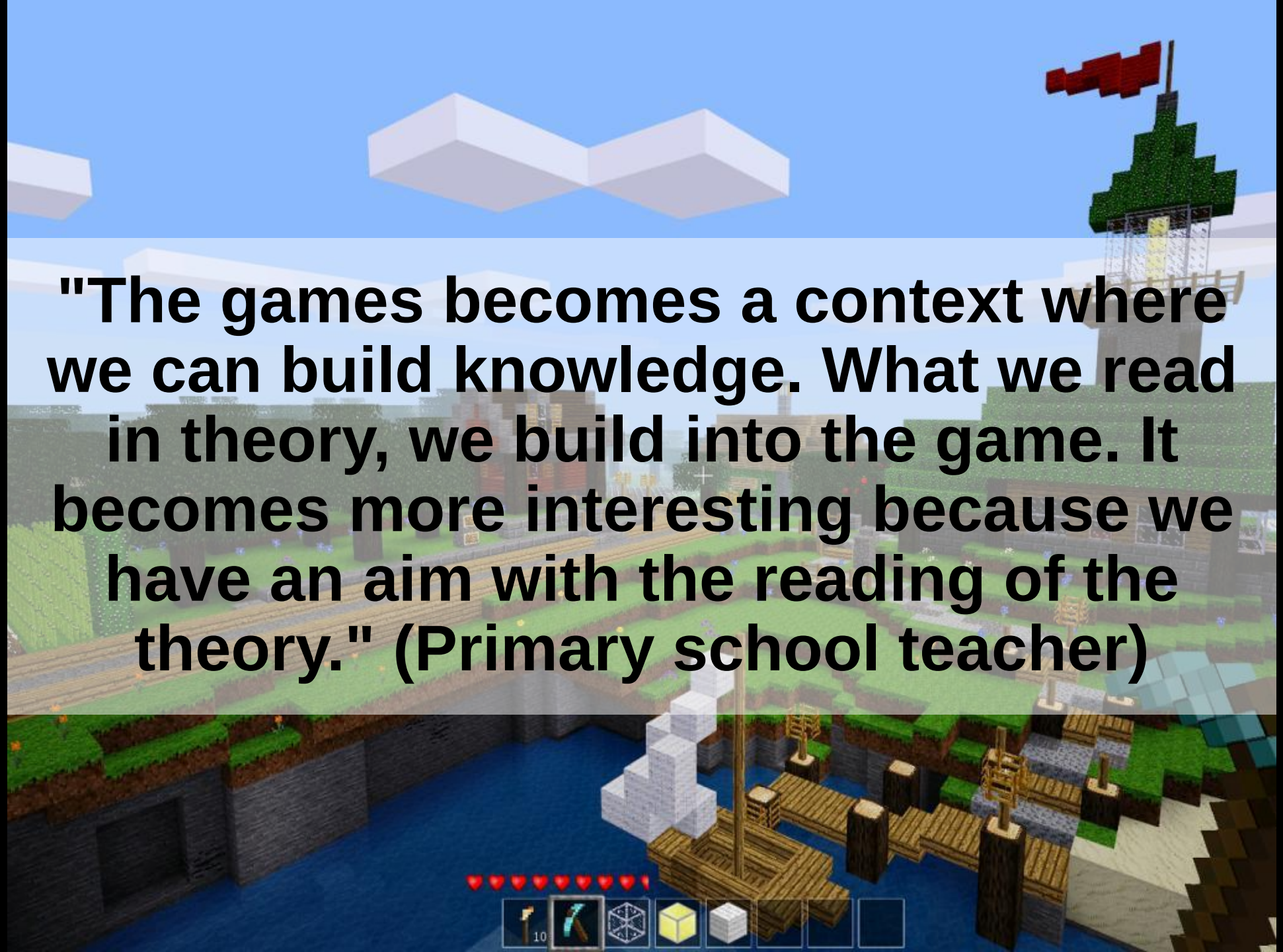


" I work with games as a narrative media. I think that there are many new games that have a narrative focus and are designed as an interesting story. This narrative form is so interesting that I want to give it the same status in the classroom as novels, texts, films. Games can fill the same function." (English teacher)


CRITICAL VIDEO GAME ANALYSIS
The Elder Scrolls V
SKYRIM


"Students must have tools that enable them to critically examine the stories they play all the time during their free time. We teach them to examine literature and books in a critical way, we want them to look at movies in a critical way but we do not want them to play games in a critical way. [...] We do not talk about whose story and what stereotypes are being told in games." (English teacher)


BUILDING HISTORY IN "MINECRAFT"



"The games becomes a context where we can build knowledge. What we read in theory, we build into the game. It becomes more interesting because we have an aim with the reading of the theory." (Primary school teacher)

Game	Conceptual and practical tools designed by teachers
Minecraft	Pedagogical "frames", **reflective game journals**
Gone Home	**Project-based learning plan** for 4 weeks, questions, templates, **learning "tracks"**, **reflective game journals**, multimodal presentations for assessment
Walking Dead, This war of mine, Her Story, Stanleys Parable	**Reflective questions** for discussion, templates and tasks
Assassin´s Creed, Skyrim	**Game analytical tool**, gaming background, **reflective game journals**
"Rolling Ball" Game development in Unity 3D	Pedagogically structured **multimodal learning material** for 4-5 weeks

CHANGES

- Less lecturing, more **guiding** and **supporting** (classrooms using non-serious games, game development)
- **Diversification** of teachers´ toolbox
- **Reaching** low participation **students**

CHALLENGES

- **Technological** issues
- Student **diversity**
- Lack of general **pedagogical methods**
- Lack of **good quality games relevant** to the **curriculum** and to **teachers´ needs**
- Rarity of **professional networks on DGBL**
- Absence of digital games from **teacher training** programs

Learning does not happen automatically from the games

- **Game integration** with learning activities in the meta-game context
- **Teachers as co-designers** of the gaming and learning experience when using non-serious games

Digital games are not only **interactive teaching tools** but also **contemporary literature and media** that should be critically analyzed.

Study 2

Online Survey

- Teachers from Grade 1-12 regardless of their game experience
- 2019 spring, 1200 Swedish compulsory and higher secondary schools and social media platforms
- 37 single, multiple choice, scaled and open-ended questions
- Informed by relevant previous studies (Takeuchi&Vaala, 2014) and Study 1 (Mathe at. al. 2018)

Data Analysis

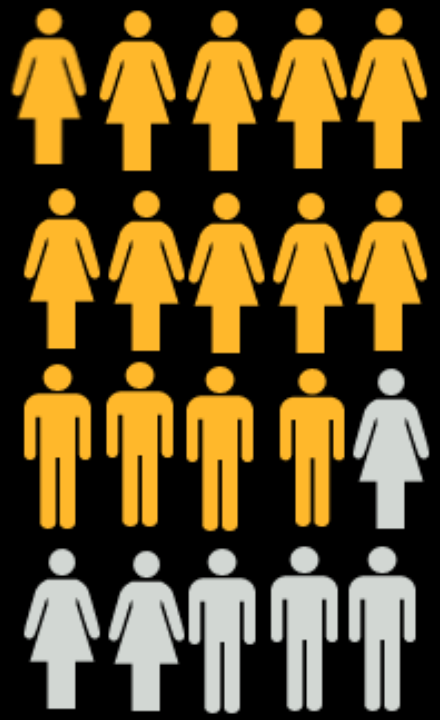
- **Statistical analysis** using frequency distribution
- **Classification** and **descriptive statistical analysis** using frequency distribution
- Thematic analysis of qualitative data

Applying Games in Teaching

YES

YES

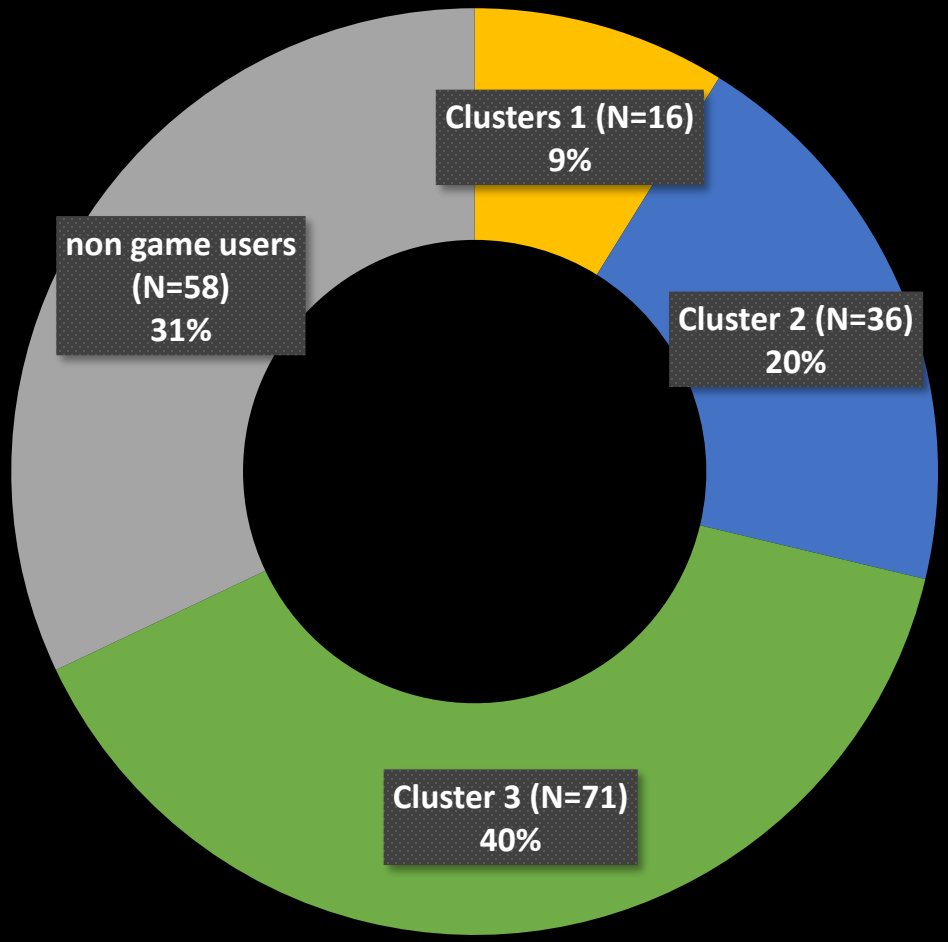
70%



NO

30%

Teacher DGBT characteristics



CLUSTER 1: SKEPTICS

- **Uninterested** in **playing** **games** for entertainment (75% of cluster members)
- **Uninterested** **in** **applying** **games** for teaching (100% of cluster members,)
- **Uncomfortable** **in** **applying** games for teaching (87% of cluster members)

CLUSTER 2: CURIOUS ADOPTERS

- **Uninterested** in **playing** **games** for entertainment
  (94% of cluster members)
- **Interested** **in** **applying** **games** for teaching (89% of cluster members)
- **Comfortable** **in** **applying** games for teaching (81% of cluster members)

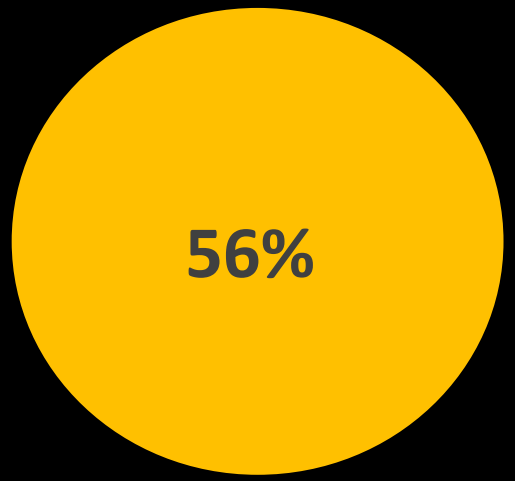
CLUSTER 3: ADVANCED ADOPTERS

- **Interested/strongly interested** in **playing games** for entertainment (97% of cluster members)
- **Interested/strongly interested in applying games** for teaching (100% of cluster members)
- **Comfortable/very comfortable in applying** games for teaching (92% of cluster members)

What games do teachers use?

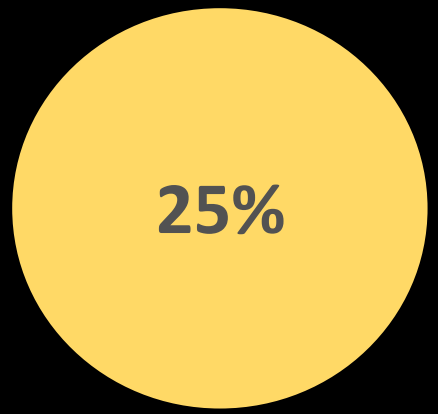
What games do Skeptics use?

Gamification tools



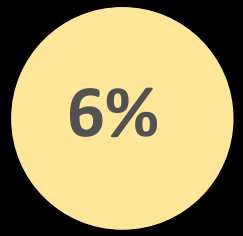
e.g. Kahoot, Mentometer

Educational games



e.g. Chefrens pyramid, Kheops Pyramid, Dragonbox, motallaods, Vektor

Game creation tools



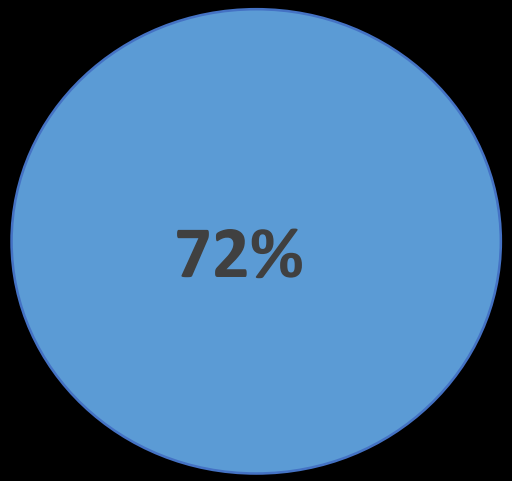
Code.org

None

Q: What type of games do you apply in your teaching?

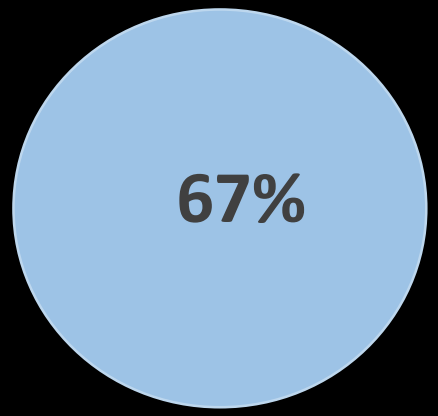
What games do Curious Adopters use?

Educational games



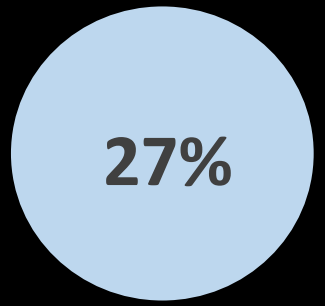
e.g. Elevspel, Rixdax, Bingel, Studi.se, Legimus, Lexia, Vektor

Gamification tools



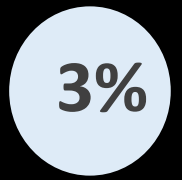
e.g. Kahoot, Mentometer

Game creation tools



e.g. Scratch, Code.org , light bot

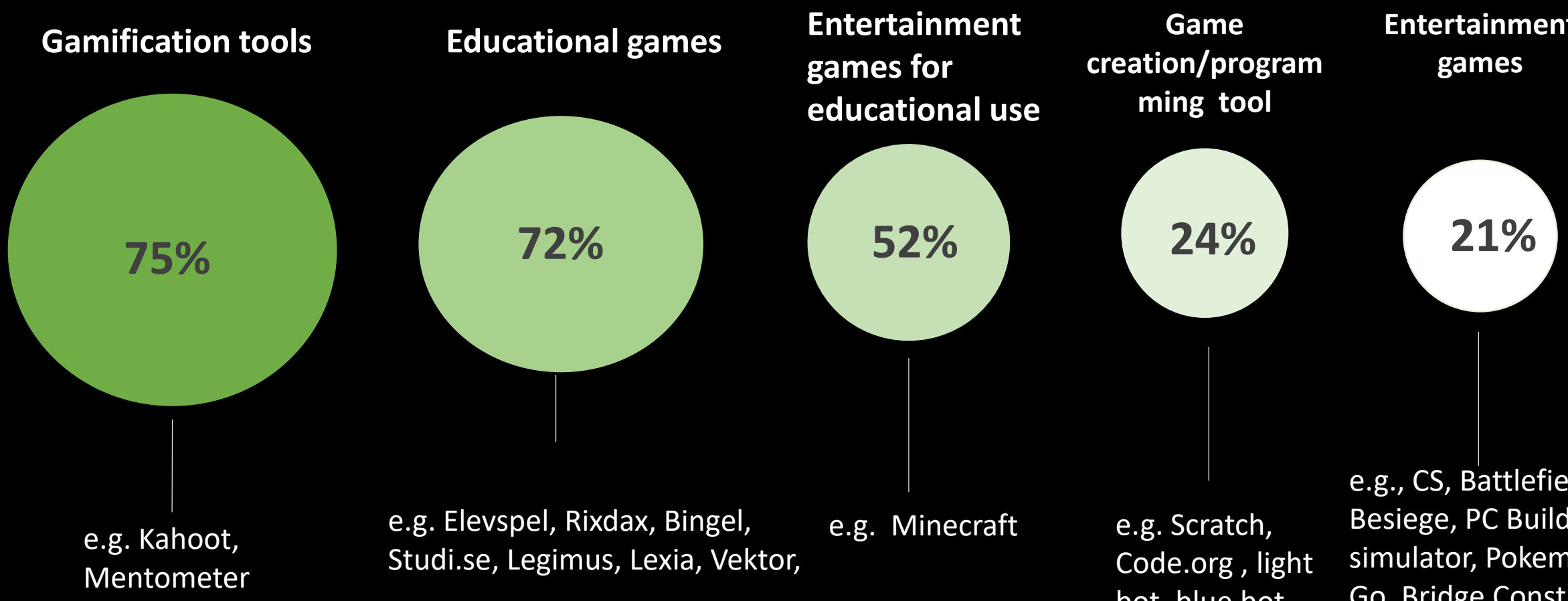
Entertainment games



e.g. Seterra, One more story games

Q: What type of games do you apply in your teaching?

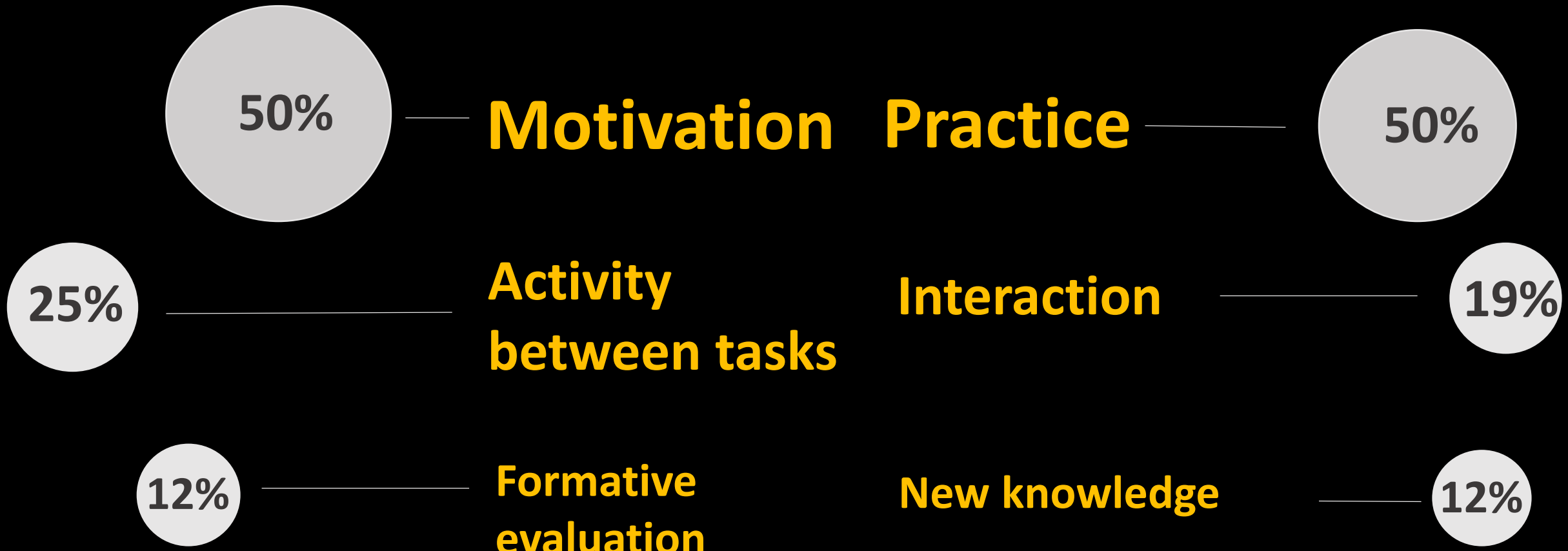
What games do Advance Adopters use?



Q: What type of games do you apply in your teaching?

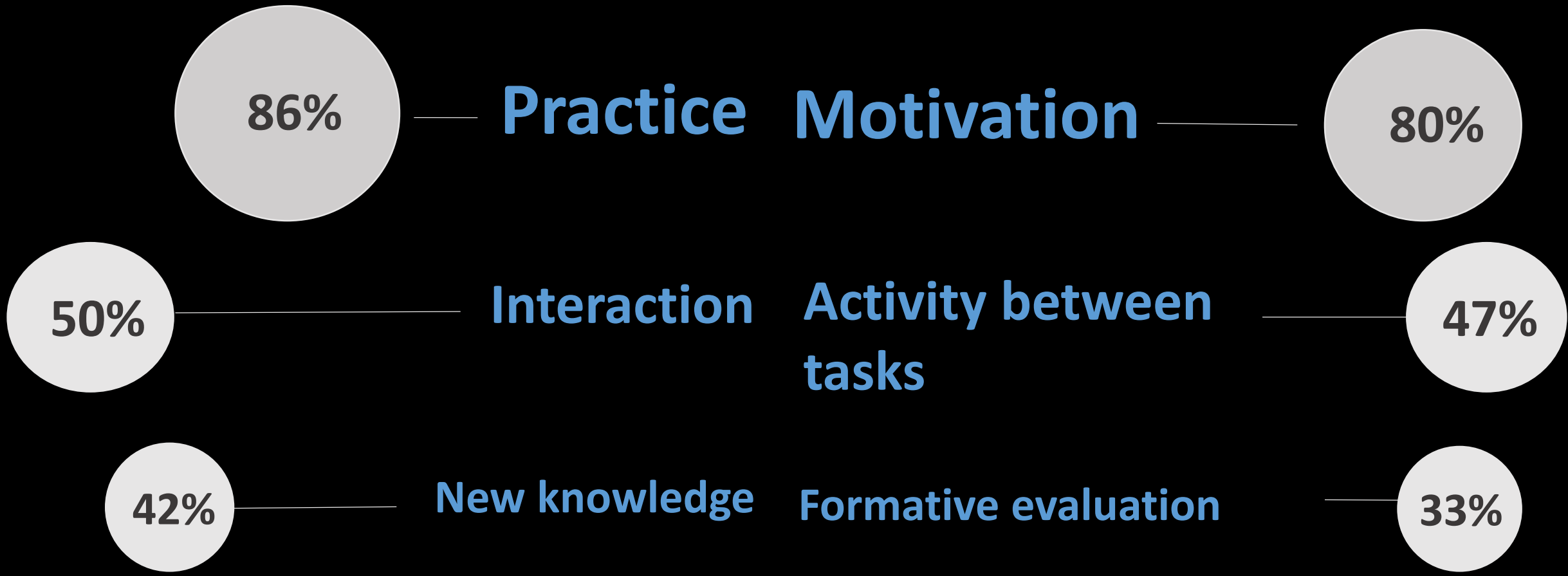
Why do teachers use digital games to teach?

Why do Skeptics use digital games to teach?



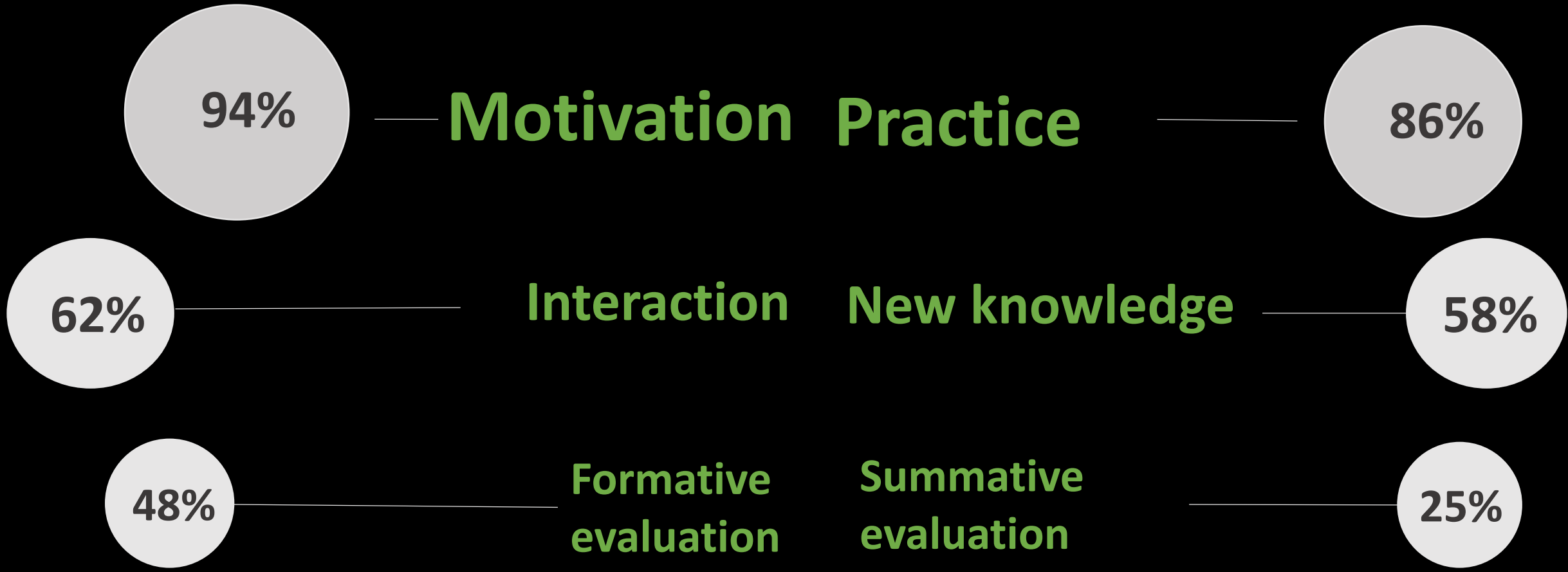
Q: What are the most important reasons of applying games in your teaching?

Why do Curious Adopters apply digital games in their teaching?



Q: What are the most important reasons of applying games in your teaching?

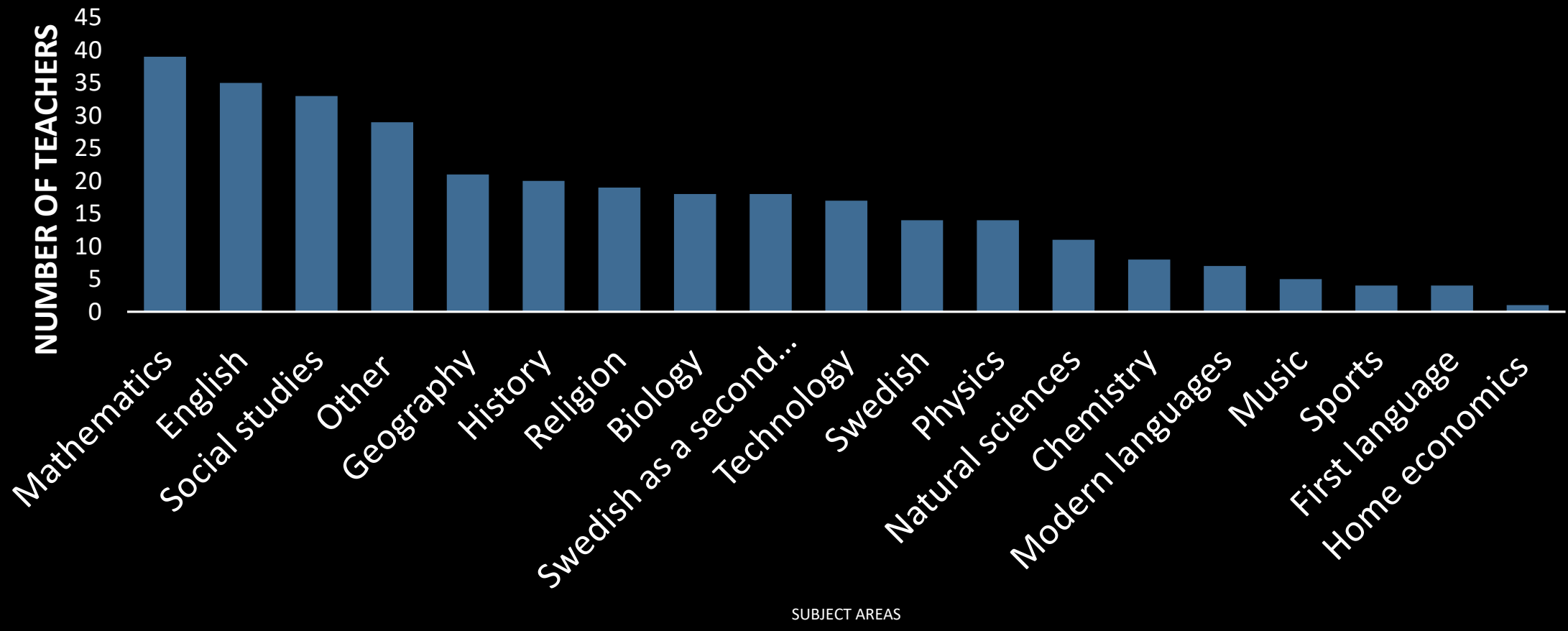
Why do Advanced Adopters apply digital games in their teaching?



Q: What are the most important reasons of applying games in your teaching?

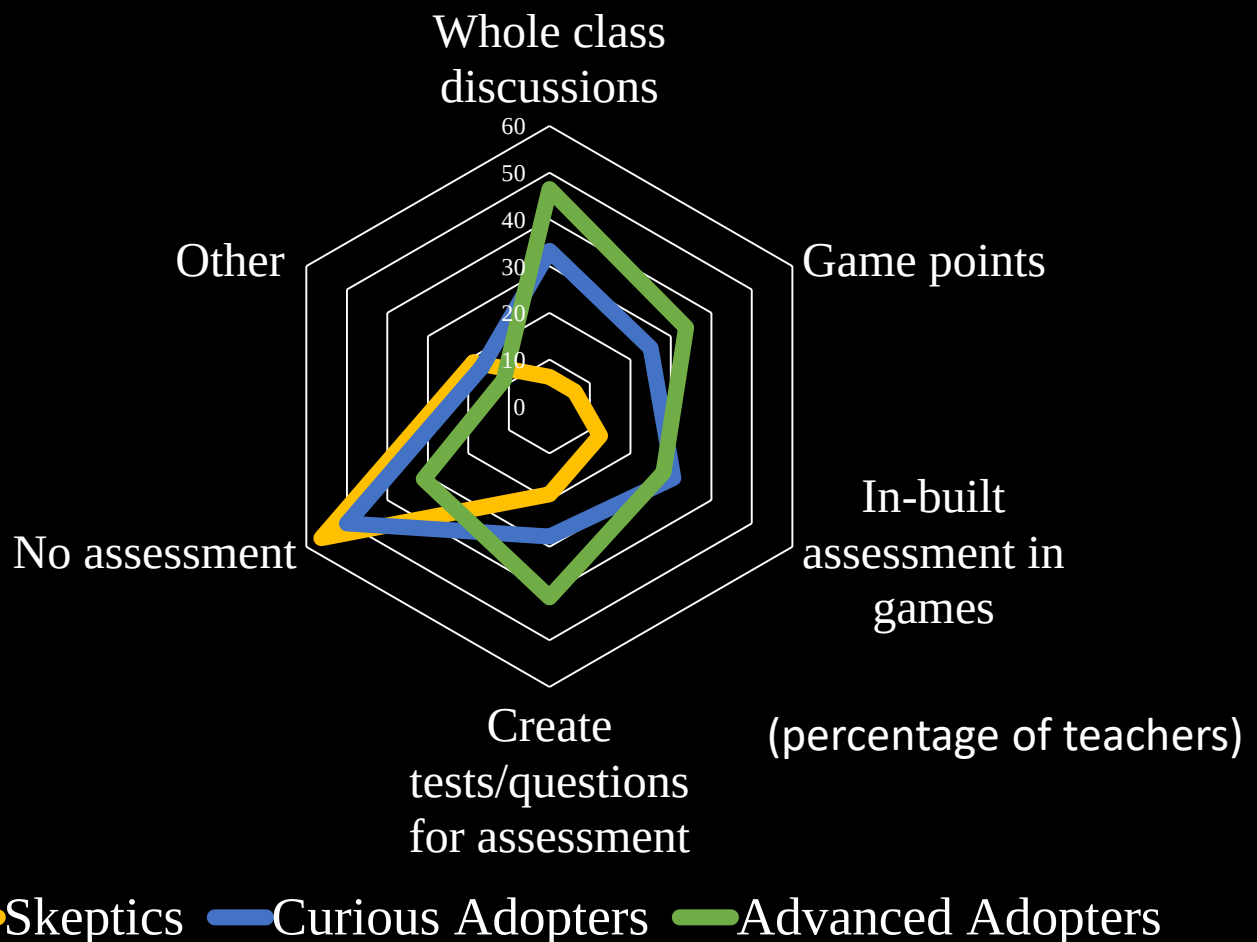
How do teachers apply games?

Subject Areas



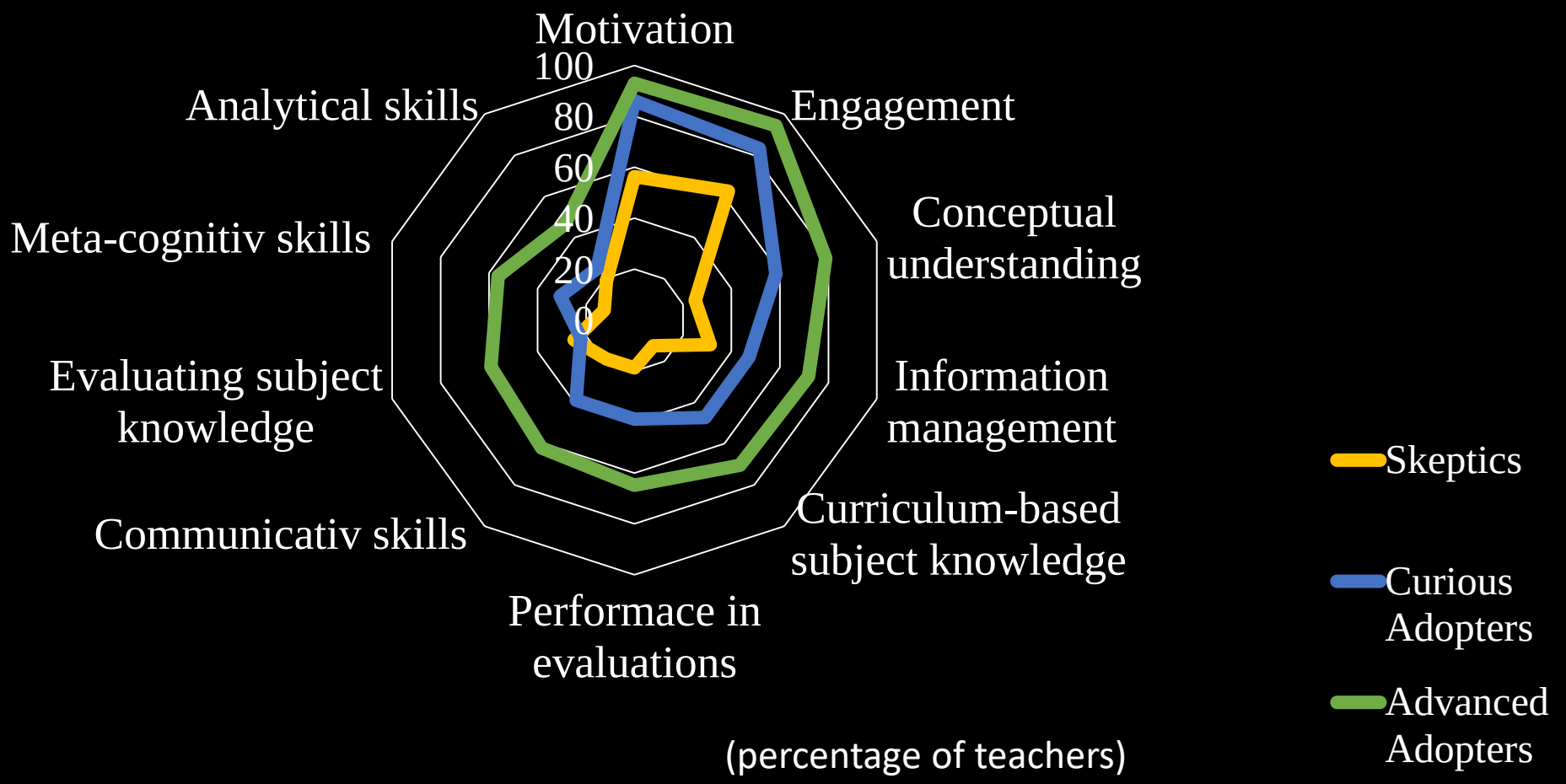
How do teachers apply games /assess learning with games?

- **Individual** game play
- **Shorter** time , **during a lesson** , few longer game play and outside of class



How do teachers perceive the learning outcomes?

How do teachers perceive the learning outcomes?

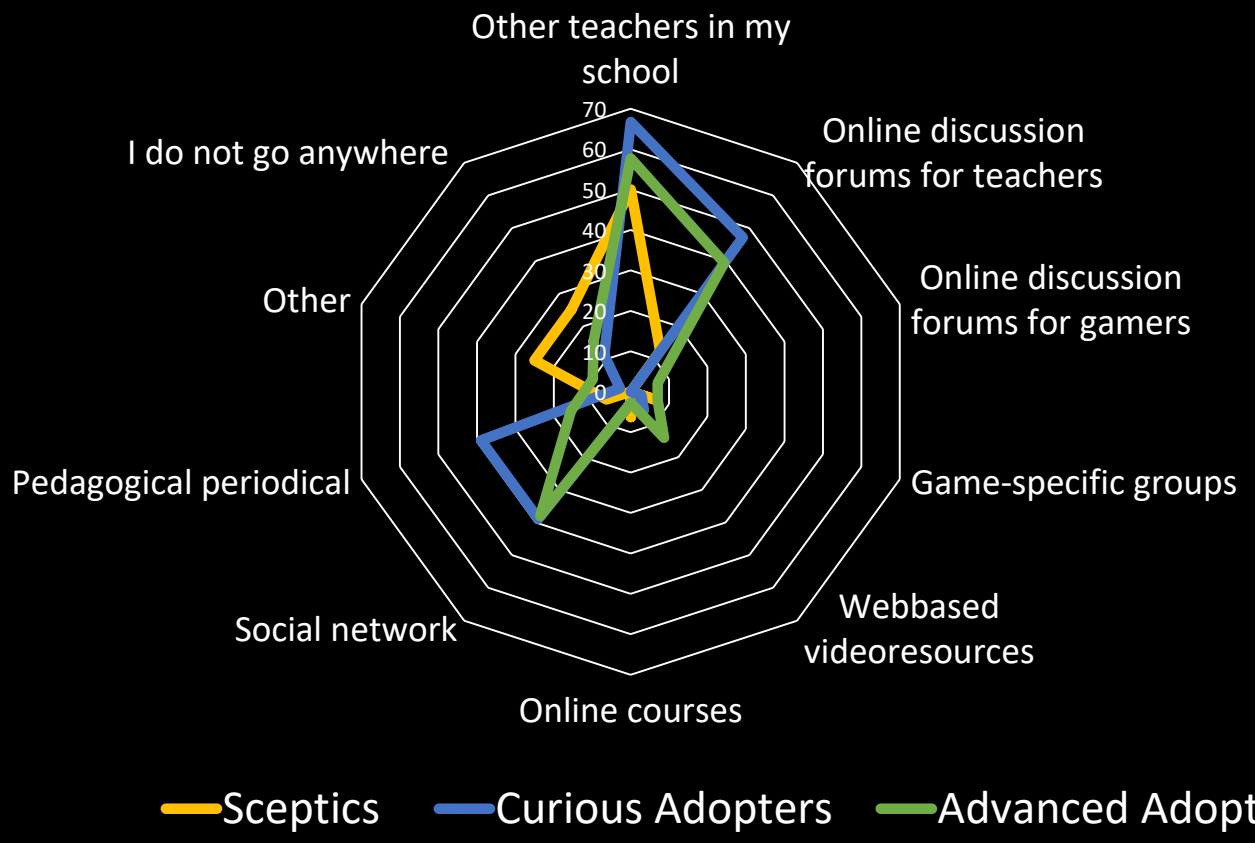


Q: Based on your actual experiences, indicate how much you agree with the following statements (on scale 1-5)

How do teachers learn about the use of digital games in teaching?

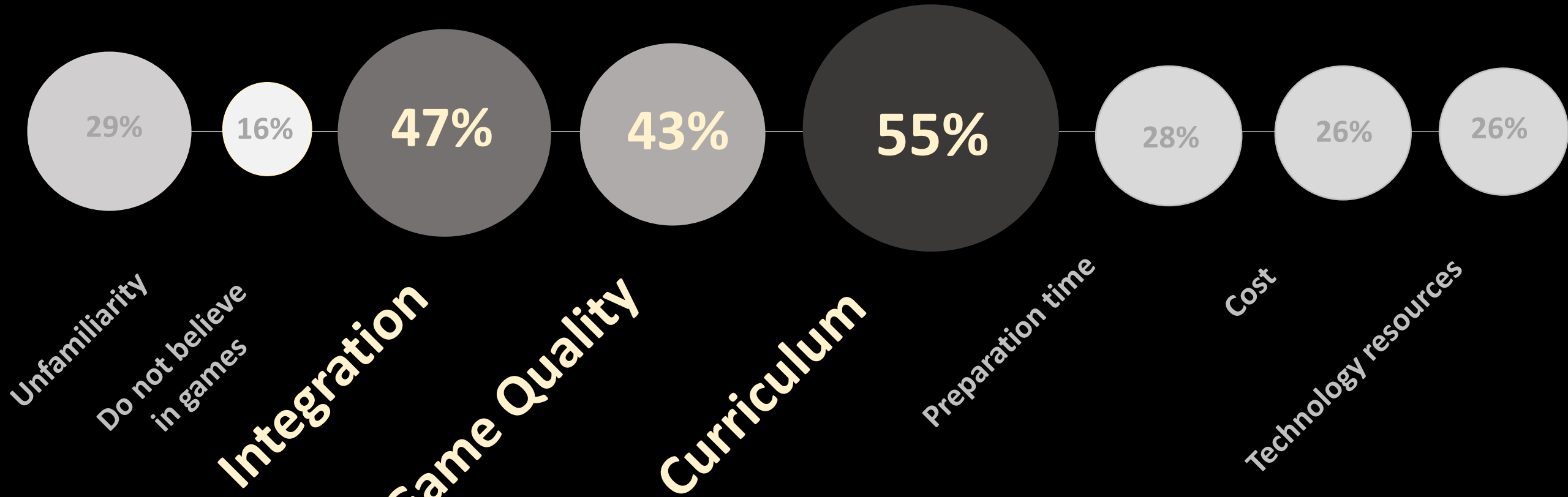
How do teachers learn about games?

Most teachers learn from other teachers



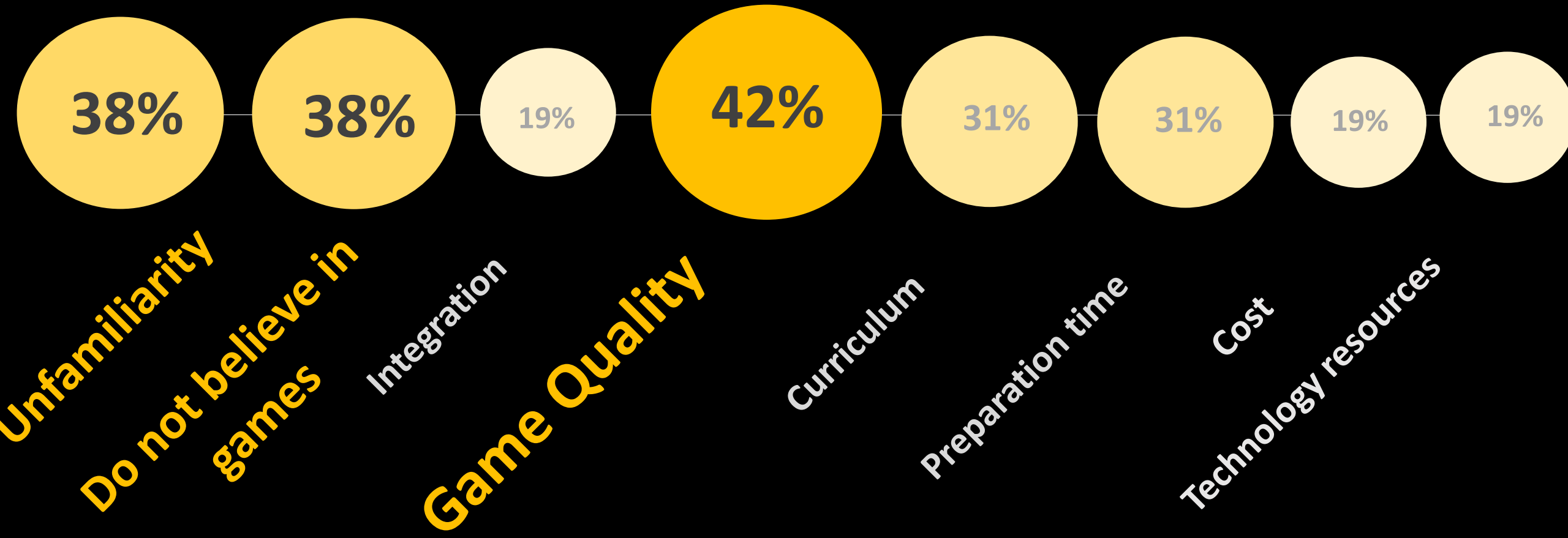
How do teachers perceive challenges of, and barriers to, using digital games in teaching?

Challenges of Non-Game Using Teachers



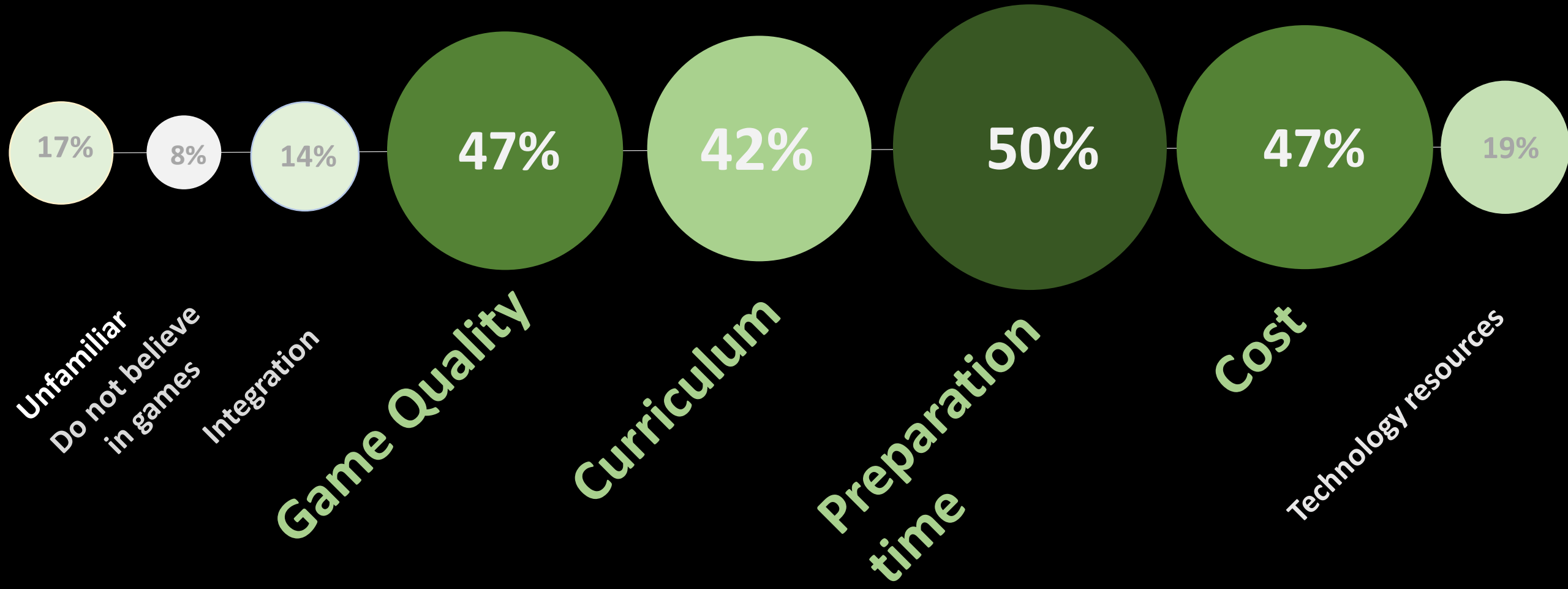
Q: What are your most signifcant challenges, if any, regarding the application of digital games in your teaching?

Challenges of Skeptics



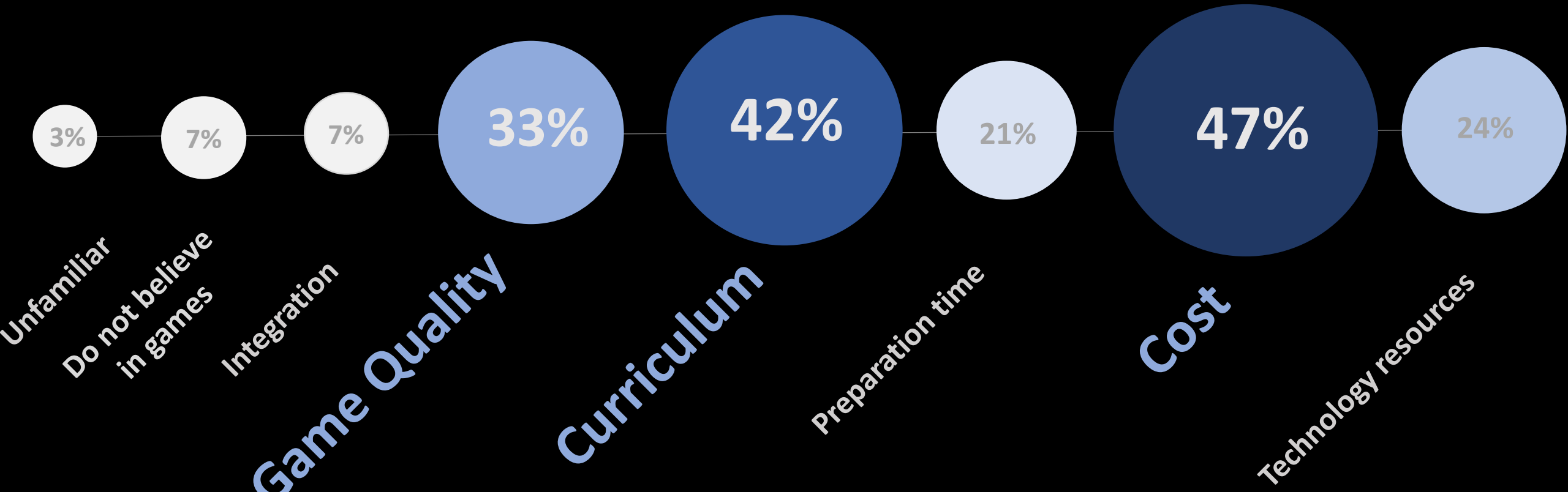
Q: What are your most signifcant challenges, if any, regarding the application of digital games in your teaching?

Challenges of Curious Adopters



Q: What are your most signifcant challenges, if any, regarding the application of digital games in your teaching?

Challenges of Advanced Adopters



Q: What are your most signifcant challenges, if any, regarding the application of digital games in your teaching?

Challenges in summary

- **Unclear** or **limited learning** **outcomes**
- **Student diversity**
- **Lack of good quality games** that **match the curriculum**
- Lack of **resources** (game, time, financial, technology)

What teachers say about games...

“ There is a **lack of games that have learning built in them** and they tend to take the form of glorified online textbooks.” (non-game using teacher)

“ There is a **need for games that have short playtime**, high **potential for learning** but still have **the attraction power** that good games have. So that is really a barrier. **There are no such [games].** You can find interesting ones on the commercial market but then they fall flat on the pedagogical side to be useful.” (Social Sciences teacher, interview)

”It is mostly about **finding games that really make students learn while they play**. The game mechanics should be integrated with the knowledge acquisition.” (Advanced Adopter)

“ Digital games are **often not adapted for school environment**.” (Advanced Adopter)

What teachers say about learning outcomes…

• “It is unclear what games would contribute.” (non-game using teacher)

• “I am worried that the students would not focus on their “normal” studies if we used games. (Non-game-using” teacher, survey)

•“. [...] my perception is that in digital game-based learning one is being led by a digital tool with the aim of keeping the students focused and entertained. Not everything is fun and it is also important to learn to deal with things when there is a bit of a resistance.” (Non-game-using teacher, survey)

•“I think that they [digital games] contribute to superficial learning that limits basic understanding.” (Sceptic, survey)

“I am unsure if the students learn the content, the subject matter or if they learn the ‘technique’ to progress in the game.” (Curious adopter, survey)

“Too much of the game-related takes from the school-related.” (Advanced adopter, survey)

“In my first year here I used it extensively with one class. […] I haven’t really had...it didn’t have the impact that I wanted to or what I was expecting. I was expecting students to engage more with mathematics outside of lessons and that didn’t really happen unfortunately.” (Maths teacher, interview)

Preparation time

One third of all teachers (31%) report that they lack (paid) preparation time, but particularly Curious Adopters (50%).

> "If I have time to do it? It is a threshold and many teachers think it is difficult. It requires an open mind and interest to make it work. But I think that the time and energy investment… it is so rewarding **that I have no problem using my private time to make it work**. As a teacher we also have 10 hours per week that we should invest in personal development, to be able to work with fun projects. For me, this is exactly like that." (Language teacher, interview)

> "I am not interested in games that do not contribute pedagogically, and it is also **that I should have time to acquaint myself** with it [game]." (Curious adopter, survey)

Costs

38% of all teachers and 42% of game-using teachers see game-cost as an important challenge

”It is first of all **cost and licencing problems**. I can list a dozen shorter games based on my own interest and I know how to integrate these in my teaching, but practically it is **very difficult to bring the games to the students**. It is too **expensive** to buy new for every year, to use only **free games do not work** and the game industry has so far **no infrastructure for educational licences**/ volume licences. I had to negotiate directly and personally with the developers of those two ‘normal games’ that I use to get **some kind of legal contract per game**. In one case, it required quite a **big personal expenditure**. ” (Advanced adopter, survey)

Technology Resources

Nearly every fourth teacher (24%) indicates the lack of technology resources as a bottleneck.

"I think that it is **technological process that is the biggest challenge** for games in schools. Partly because everything must work, the **network and the computers**. And it is mostly about that. And if you have computers that take time to start up, then **this process becomes heavy** and the **students often lose interest**. I had a student who sat with a computer the whole class that didn't work for some unknown reason. And then **they lose their interest because they want to be there and they want to build**." (Primary-level teacher, interview)

Summary

- Teachers report use of **gamificiation tools** and **educational games** most frequently
- Games typically used to **motivate** and **engage** students
- Perceived **motivational outcomes**, but less effective in teaching new knowledge and higher-level cognitive skills
- **Individual gameplay** and **short playsessions** are typical
- **Gaps among teachers** in their use of digital game/gamification games and to what extent they may leverage these for educational outcomes
- Teachers with more positive disposition report greater variety of game use, pedagogical integration, wider range of perceived educational outcomes and interest in professional development

Summary

- **Not all teachers** use games or have positive experience
- **Individual** and **short gameplay** sessions are characteristic
- More **collaborative** forms of learning, analytical and metacognitive **skill development** may **not** have been **fully explored**

Conclusion

How to address these challenges?

Two-fold focus

- Development of games relevant to educational needs
- Flexible and contextualized learning opportunities for teachers

Include further stakeholders such as game developers and a wider circle of educational stakeholders

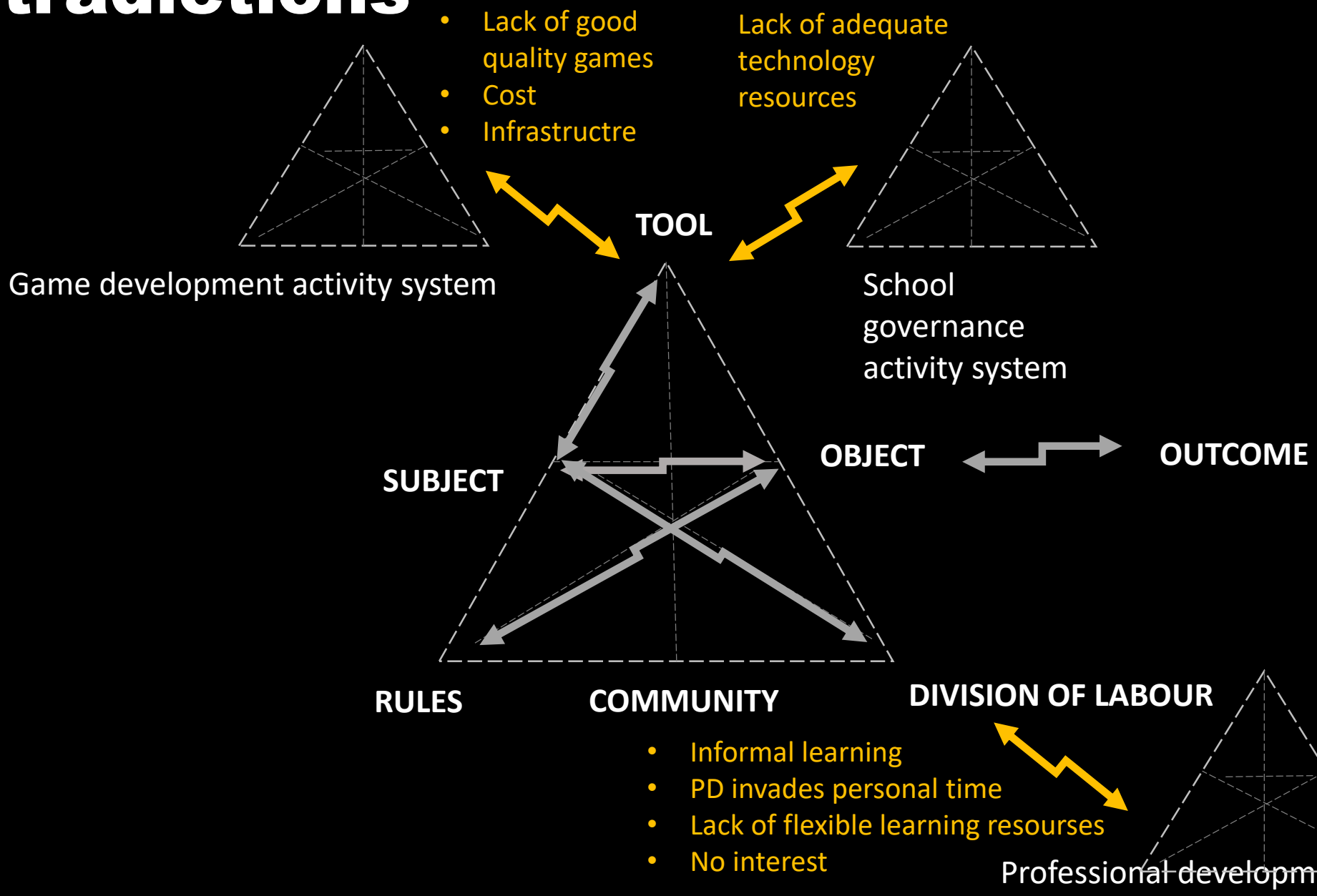
5. Next Steps

Study 3

Research Question

- How can game developers and educational stakeholders address the complex challenges of digital game-based teaching in school contexts?

Contradictions



Research Design

- Comparative, multi-case study during Spring 2021
- Purposive sampling:

  Teachers, students, educational game-developer company, municipalities in Edtest project

  Compulsory school in Stockholm
- Data collection: interviews, observations of playtesting, teacher-game developer meetings, document analysis

Questions?

melinda@dsv.su.se