Free Play, Sandboxes, and Games: Children and Learning

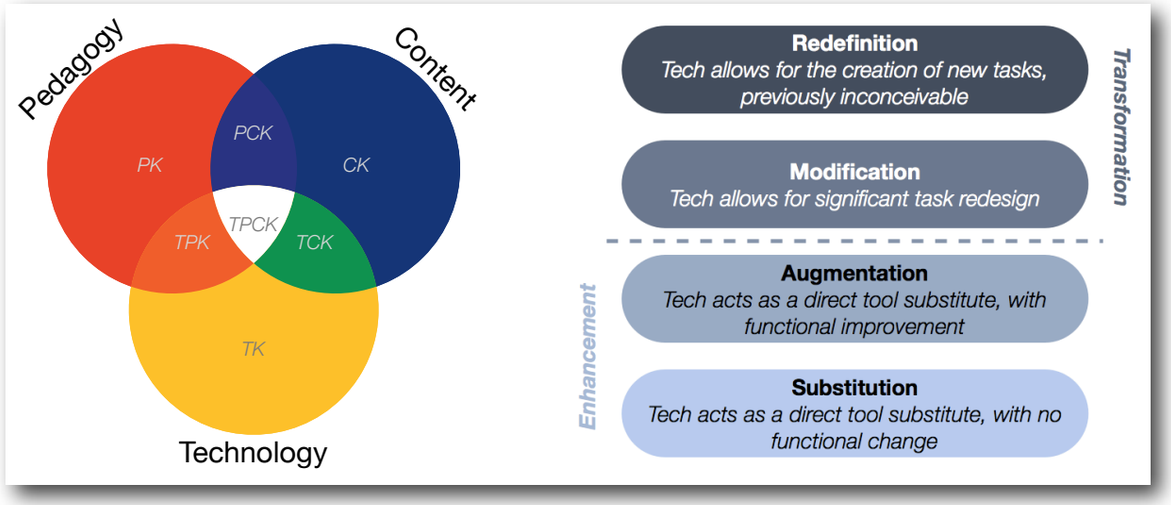
Ruben R. Puentedura, Ph.D

Social Computing

Digital Storytelling

Social

Narrative



Visual

Play

Visualization and Simulation

Educational Gaming

Game And Learn: An Introduction to Educational Gaming - Audio/video

Dr. Ruben Puentedura

Description

Game And Learn: An Introduction to Educational GamingVideogames can provide learners with rich worlds and complex narratives that both enhance and transform their educational experience. Harnessing this potential calls for understanding the principles underlying successful games, and how to apply them in the classroom. This 14-part podcast series, created by Dr. Ruben Puentedura as part of a joint research project between MLTI and the Ewing Marion Kauffman Foundation, will provide educators the knowledge needed to successfully use educational gaming in their classroom. Dr. Ruben Puentedura, Founder and President of Hippasus, has implemented transformative applications of information technologies for over twenty years in educational institutions, hospitals, and arts organizations. He has worked with the MLTI since 2003, and is the creator of the SAMR model for selecting, using, and evaluating technology in education, as well as research on educational gaming and digital storytelling.

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Maine Department of Education
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Links

Website
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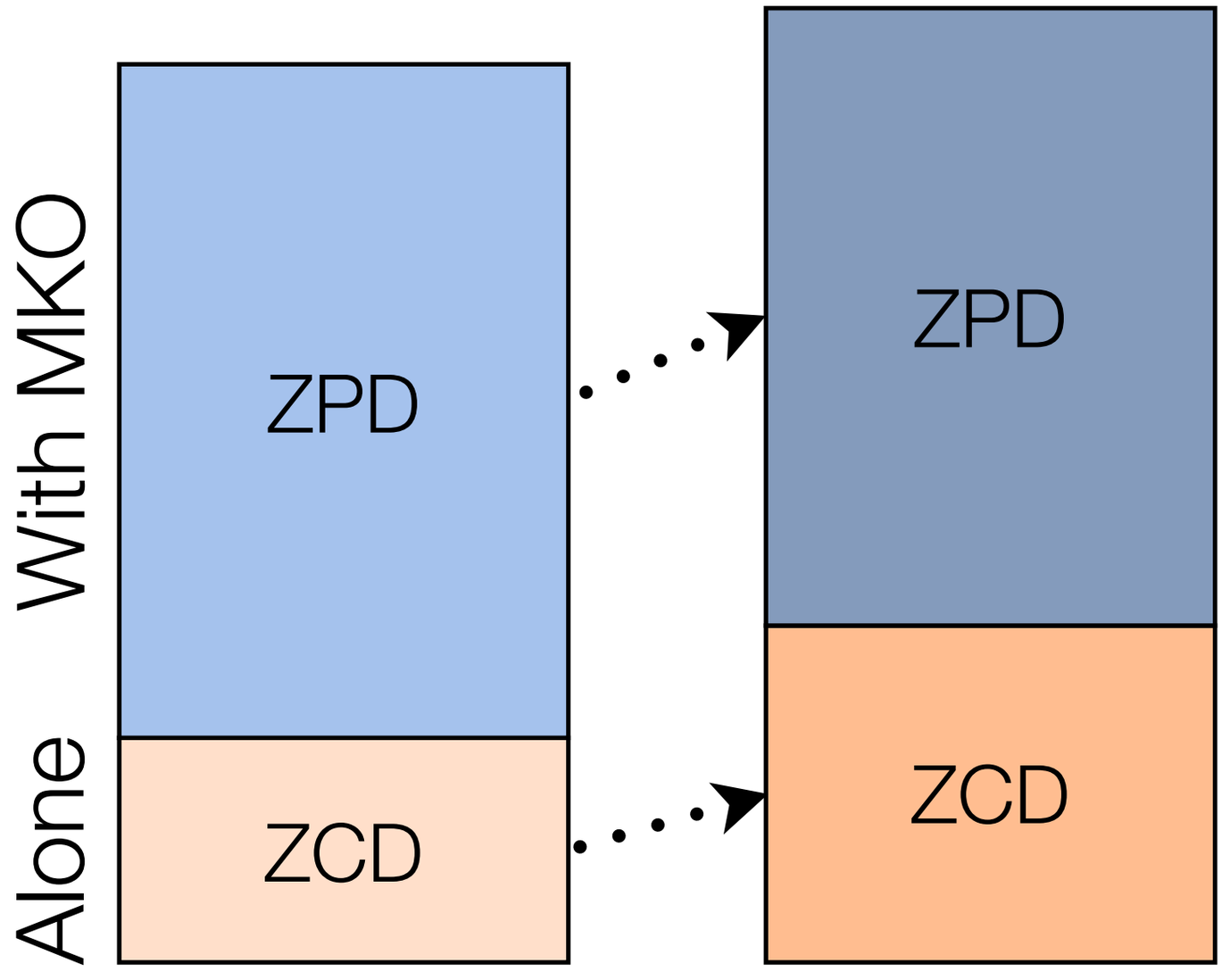
▲	Name	Time	Released	Description	Popularity	Price
1	What Is A Game?	23:07	7/5/09	Professional Development		FREE
2	What Is A Good Game?	21:54	7/6/09	Professional Development		FREE
3	A Menagerie Of Genres	31:54	7/8/09	Professional Development		FREE
4	Games And Learning	27:03	7/8/09	Professional Development		FREE
5	Games And Education	21:07	7/12/09	Professional Development		FREE
6	Critical Gaming	15:15	7/14/09	Professional Development		FREE
7	Games And Storytelling	29:00	7/14/09	Professional Development		FREE
8	Games And Players	30:26	7/16/09	Professional Development		FREE
9	Games And Assessment	25:39	7/19/09	Professional Development		FREE
10	The Design Perspective	26:16	7/20/09	Professional Development		FREE
11	Case Study: Scratch	25:50	7/21/09	Professional Development		FREE
12	Case Study: Inform 7	27:52	7/23/09	Professional Development		FREE
13	Serious Games	13:40	7/26/09	Professional Development		FREE
14	TPCK, SAMR, And Games	18:51	7/27/09	Professional Development		FREE

Total: 14 Items

Some Definitions

Formal Definition of **Play** (Salen & Zimmerman)

“Play is free movement within a more rigid structure.”


With MKO
Alone
ZPD
ZCD
ZPD
ZCD

Vygotsky on Learning

- Zone of Proximal Development (ZPD):
  - Gap between:
    - what a learner can accomplish independently (the Zone of Current Development, ZCD)
    - what they can accomplish with assistance from a “more knowledgeable other” (MKO)
- *“…what a child can do with assistance today she will be able to do by herself tomorrow.”*
- This is an iterative process:
  - The ZCD and ZPD change over time;
  - Independent practice is required to close the loop.

Vygotsky on Play and Learning

"…play creates a zone of proximal development of the child. In play a child always behaves beyond his average age, above his daily behavior; in play it is as though he were a head taller than himself."

Formal Definition of **Game** (Salen & Zimmerman)

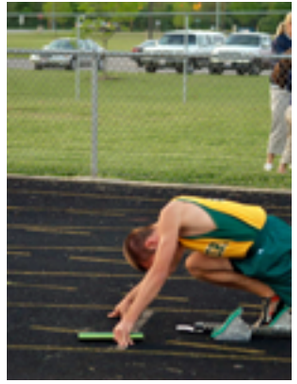
"A game is a system in which players engage in an artificial conflict, defined by rules, that results in a quantifiable outcome."

Semi-formal Definition of **Sandbox** (Puentedura)

"A sandbox is the result of relaxing one or more of the definitional aspects of a game."

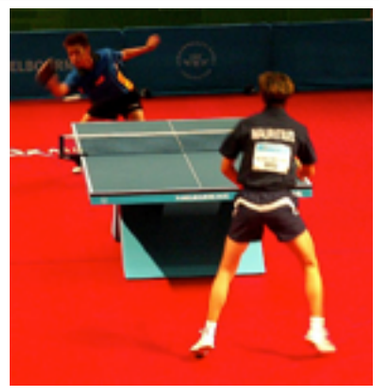
Taxonomies

Athletic



Target

Net/Wall



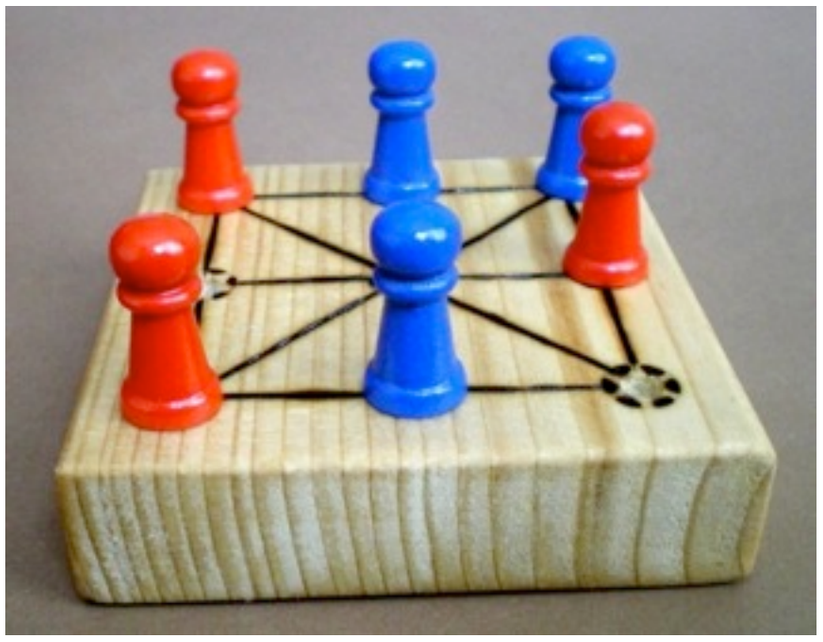
Batting & Fielding

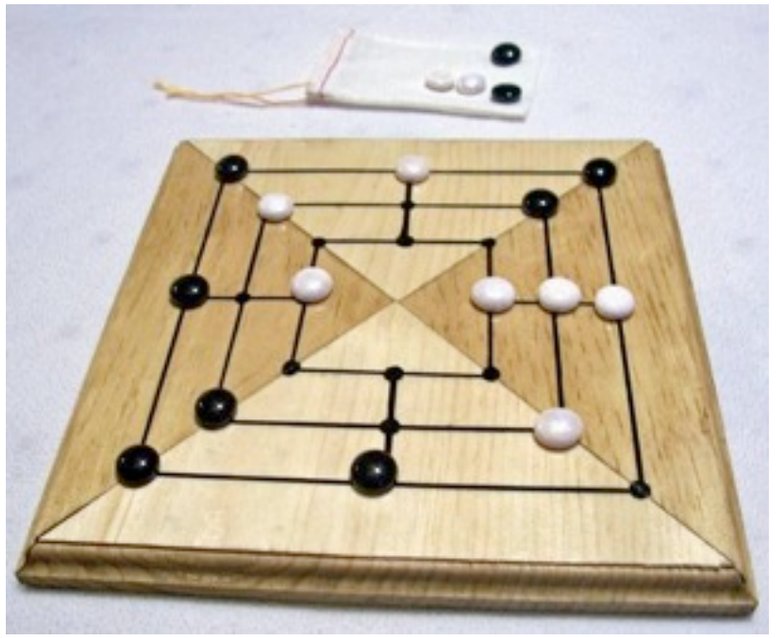
Territory

The T.A.C.T.I.C. Matrix (Bell & Hopper)

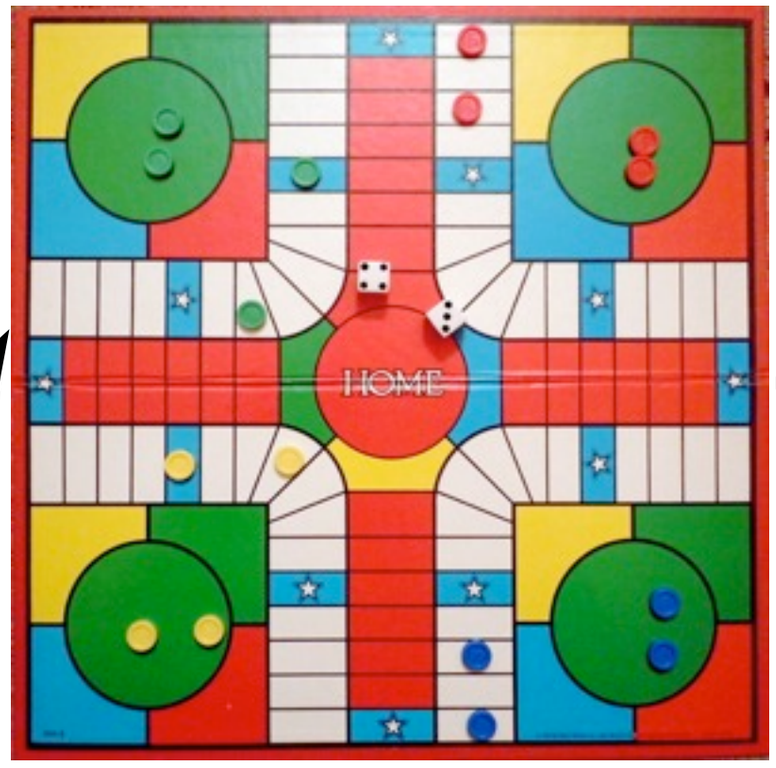
Game and Focus (from taxa)	**Principles of Play (depth)**	**Tactical Awareness Components (breadth)**				
		Initial			**Advanced**	
		Space	Force	Time	In relation to…	
		Where	*How*	*When*	*Self*	*Other*
Systems, rules, objectives of game	Basic elements of play that structure effective game playing	Where an object should be placed/ where a player should go in the area of play	How much and where to apply force on an object/self for height, directional control, distance	When to execute a skill, or create time to execute a skill, or reduce opponent's time to execute a skill	In relation to what you are able to do, what should you do to gain a tactical advantage over your opponent?	In relation to what your opponent is able to do, what should you do to gain a tactical advantage over your opponent?

- **Abstract Strategy**
  - Figures in a landscape
- **Themed Strategy**
  - Figures in a landscape + resources
- **Wargames**
  - Multidimensional figures, resources on a terrain
- **Deduction Games**
  - Derive answers from clues
- **Role-Playing Games**
  - Storytelling as gaming
- **Card and Tile Games**
  - Accumulate or shed points
- **Party and Social Games**
  - Match dexterity/speed/signaling/trivia/word





Chutes and Ladders
Chutes and Ladders


HOME

Narrative

IF

Graphic Adv.

Action/Adv.

RPGs

MMOGs

ARGs

Board

Traditional

Puzzle

Other

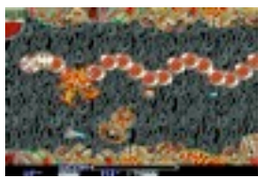
Sims

RTS

Mil. TBS Wld. TBS

Simulation

Shmups



Platformers

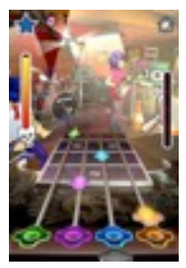
FPS

Fighting

Sports

Vehicle

Rhythm



Action

Games People (Might) Play

- RTS: *Plants vs Zombies*
  http://www.popcap.com/allgames.php?p=online

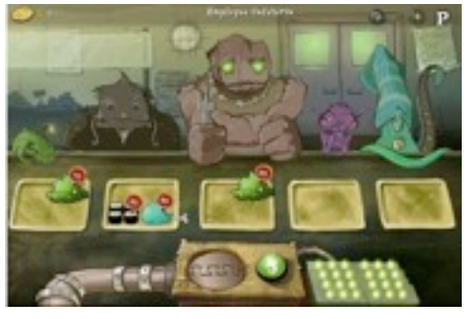
- Puzzle: *Bookworm*
  http://www.popcap.com/allgames.php?p=online

- Platformer: *Portal: the Flash Version*
  http://portal.wecreatestuff.com/

- Interactive Fiction: *Bronze*, *Lost Pig,* or *Photopia*
  http://parchment.toolness.com/

- Graphic Adventure: *Samorost 1*
  http://www.amanita-design.net/samorost-1/

- Puzzle (Educational): *Lure of the Labyrinth*
  http://labyrinth.thinkport.org/www/



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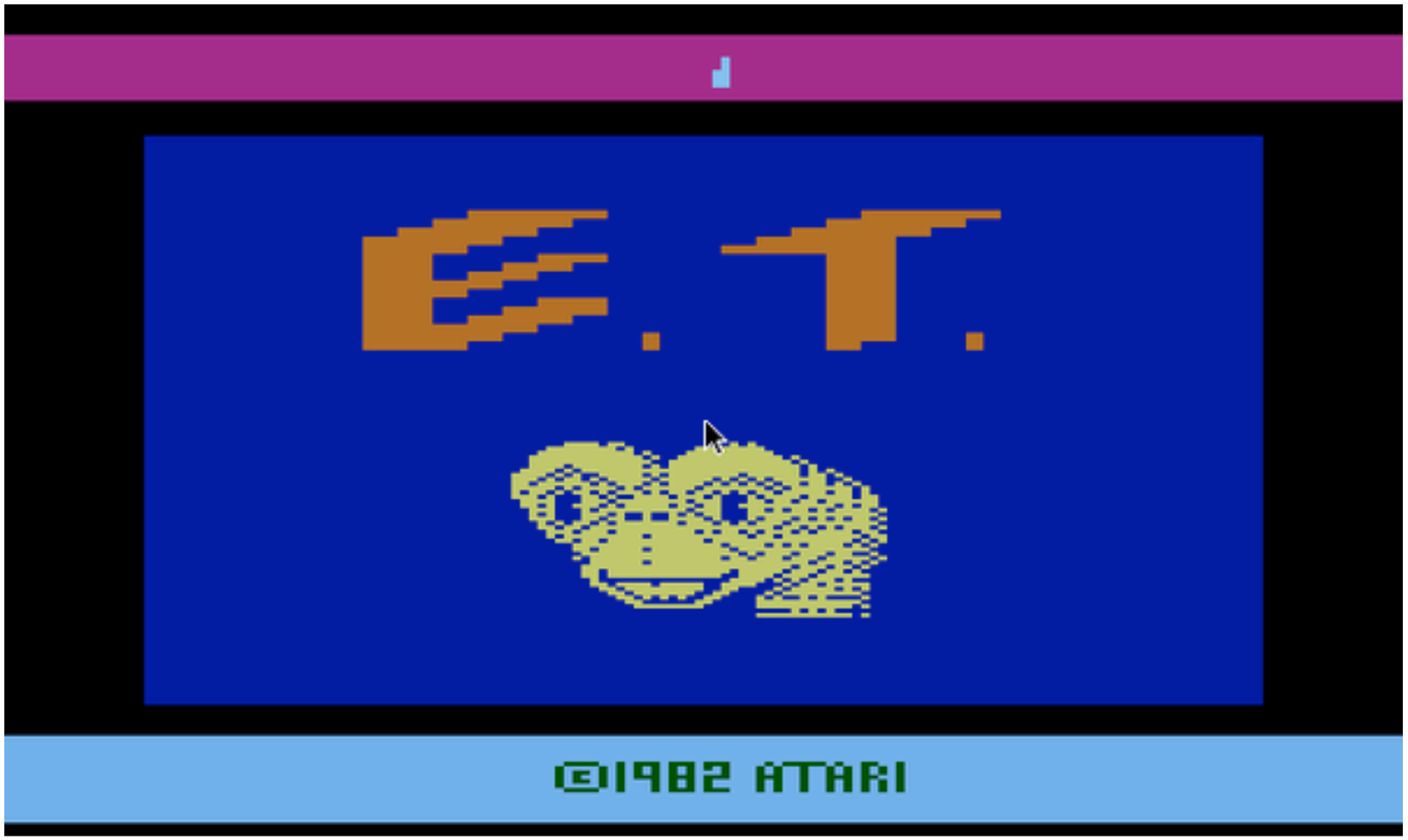
Action

A Tale Of Two Games

One of The Best Videogames of All Time: *Pitfall!*

One of The Worst Videogames of All Time: *ET*



What Makes a Game Engaging?

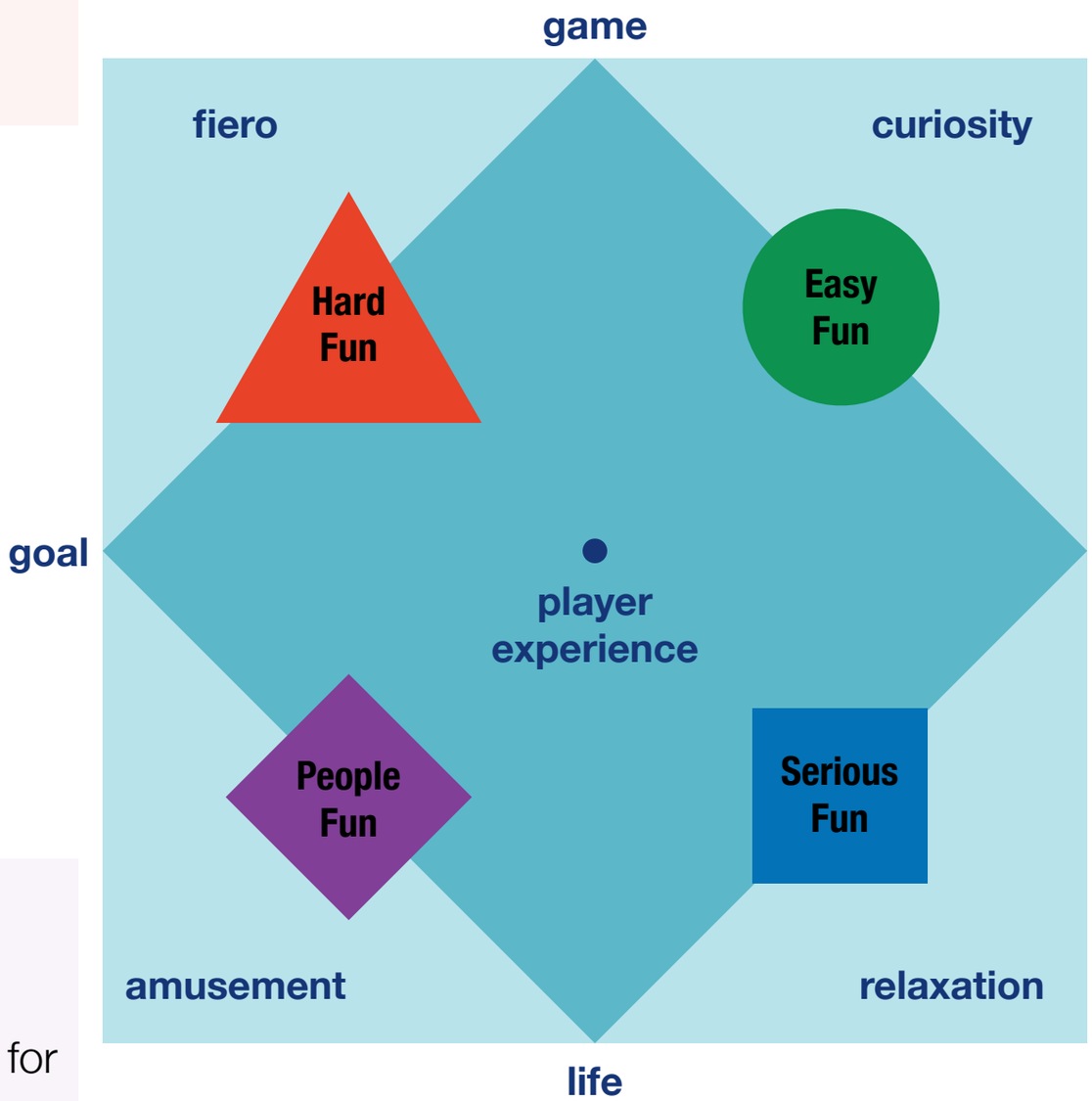
Games and Fun (Koster)

Successful Games	
Include These Items…	**…To Avoid**
Preparation before challenges	Results due to pure chance
A sense of a game space	The perception of the game as trivial
A solid core mechanic	The game not being perceived as a game
A range of challenges	The game being exhausted too quickly
A range of required abilities	The game being perceived as simplistic
Skill in using the required abilities	The game being perceived as tedious
Also Have…	**…Because**
Variable feedback	Players like to see greater skill result in greater rewards
Ways to accommodate beginners & experts	Beginners need not get clobbered, or experts “bottom feed”
A definite cost for failure	Players feel cheated by “never-lose” games

In Boring Games	
When Players Say…	**…They Mean**
The game is too easy	Game patterns are too simple
The game is too involved	They are uninterested in the info required to detect patterns
The game is too hard	Patterns are perceived as noise
The game becomes too repetitive	New patterns are added too slowly
The game becomes too hard	New patterns are added too fast
The game runs out of options	All game patterns are exhausted

Four Keys to Emotion in Games (Lazzaro)

Players like the opportunities for challenge, strategy and problem solving.
Generates Frustration, Fiero



Players enjoy intrigue and curiosity, becoming immersed in games that absorb their complete attention or take them on an exciting adventure.
Generates Wonder, Awe, Curiosity, Mystery.

Players use games as mechanisms for social experiences of competition, teamwork, and opportunities for social bonding and personal recognition.
Generates Amusement, Schadenfreude, Naches.

Players enjoy the internal experiences in reaction to the game's visceral, behavioral, cognitive, and social properties.
Generates Excitement, Relaxation.

Learning from Games (Gee)

Active Learning

Gamers Learn From:

1. Doing and reflecting critically

Symbolic Systems

2. Appreciating good design and its principles

3. Seeing interrelations within and across symbolic systems

4. Mastering game symbolic systems

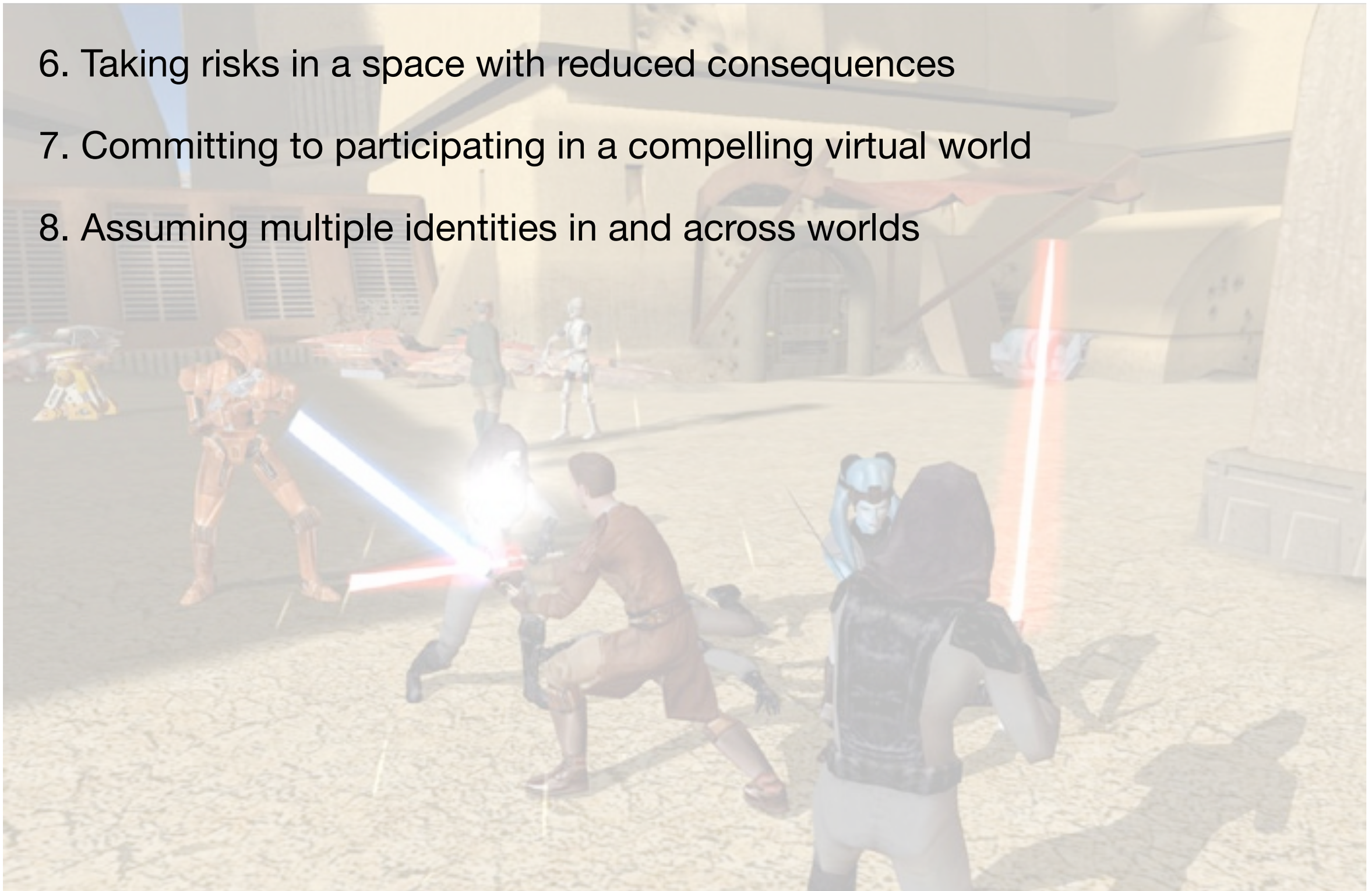
5. Relating the game world to other worlds

Worlds and Identities

6. Taking risks in a space with reduced consequences

7. Committing to participating in a compelling virtual world

8. Assuming multiple identities in and across worlds



Development of Capabilities

9. Observing the evolution of their own capabilities

10. Getting more out than they put in

11. Being rewarded for achievement at every level of expertise

12. Extensive practice in a rewarding context

13. Learning new skills at each level of expertise

14. Operating at the outer edge of their capabilities at each level of expertise

Experiential Learning

15. Interacting experimentally with the game world

16. Finding multiple approaches to a solution

17. Discovering meaning from experience

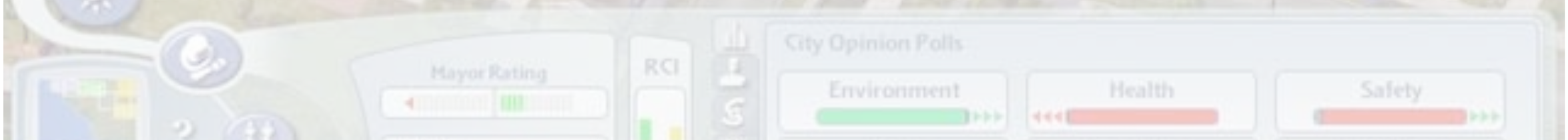
18. Understanding texts experientially and contextually

19. Understanding the interconnections among texts that define them as a family

20. Constructing meaning from the intersection of multiple media

21. Understanding how information and knowledge are stored in the game environment

22. Leveraging intuitive and tacit knowledge



Developing Skills

23. Practicing in simplified game subdomains

24. Tackling later problems via generalizations of earlier ones

25. Seeing early on concentrated samples of generalizable skill sets

26. Acquiring basic skills that apply to a range of games

27. Receiving information on-demand and just-in-time

28. Experimenting with only a minimum of explicit instruction

29. Transferring, modifying, and adapting earlier learning to later problems

Cultural Models

30. Reflecting safely about their cultural models and assumptions about the world

31. Reflecting safely about their cultural models and assumptions about their learning processes

32. Reflecting safely about their cultural models and assumptions about the workings of a symbolic domain

33. Searching for knowledge in all aspects of the game, in themselves, and in their interaction with the game

Community

34. Sharing their knowledge with other players

35. Forming a distinct community via shared interests in the gaming world

36. Teaching others and modifying the game experience

The Educational Research

Some Facts About Videogame Players

- The average videogame player is 34 years old
- 40% of all videogame players are women
- 67% of households play videogames
- Among teens ages 12-17:
  - 97% play videogames (99% boys, 94% girls)
  - 80% play five or more different game types; 40% eight or more
  - 76% play games as a social activity:
    - 65% play with others in the same room; 27% online
  - Same-room game play relates positively to civic outcomes
  - Game-related social interaction relates positively to civic outcomes

Effectiveness of Games in Education I (Randel, Morris, Wetzel, and Whitehill)

- Meta-study of 68 studies from 1963-1991
    - Social sciences; mathematics; language arts; logic; physics; biology
- Most effective: language arts and mathematics
    - 12 out of 14 studies showed positive results
- Next most effective: social sciences
    - 13 out of 46 showed positive results
    - 33 out of 46 were as effective as traditional methods
- Game learning overall showed better retention than traditional learning
- Students showed greater interest in topics taught via games or simulations

Effectiveness of Games in Education II (Fletcher and Tobias)

- Review of research from 1992-2005
    - 42 papers directly related to use of games in instructional settings
- Topics:
    - Transfer to Real-Life Tasks: 5 positive, 1 neutral, 1 mixed
    - Facilitating Performance, Learning, and Transfer: 4 positive
    - Transfer to Related Tasks or Domains: 8 positive, 1 neutral
    - Effects on Different Variables: 5 positive
    - Effects on Cognitive Processes: 9 positive
    - Team Characteristics of Game Players: 1 positive, 2 mixed
    - Motivational Effects: 3 positive, 2 mixed

Effectiveness of Games in Education III (Mayo)

Table 1. Learning outcomes of several games compared to lecture on same material.

Game	Topic	Audience	N (study size)	Learning outcome over lecture	Reference
Dimenxian/ Evolver	Algebra	High school	193	7.2%	(*37–39*)
Geography Explorer	Geography	College	273	15 to 40%	(*40*)
NIU Torcs	Numerical methods	College	86	2× more time spent on homework, much more detailed concept maps	(*10–11*)
River City	Ecology/ biology	Middle/high school	≈2000	15 to 18%, on average	(*13*)
Supercharged!	Electrostatics	Middle school	90	+8%	(*41*)
Virtual Cell	Cell biology	College	238	40%, on average	(*40*)

Particularly Interesting Categories

- Interactive Fiction
  - Narrative structure analysis
- Role-playing Games
  - Dramatic structures, narrative building support, derived media creation
- MMOGs
  - Narrative building support, derived media creation, Social Sciences research
- ARGs
  - Narrative building support, media literacy
- Sims
  - Systems modeling, statistical analysis, research methodologies
- Real-Time Strategy Games
  - Modeling, decision optimization
- Turn-based World Strategy Games
  - Historical assumptions and causality analysis
- Twitch Games
  - Dexterity skills, spatial perception

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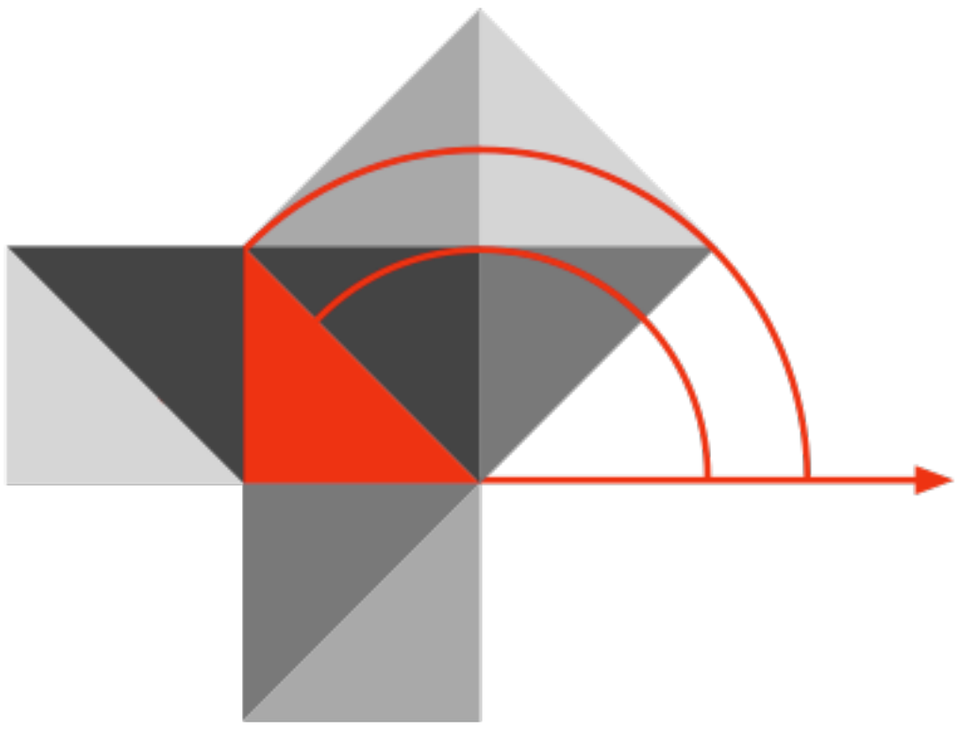

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