Gaming and the scientific mind

The impact of digital gaming on the development of the scientific mind

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- Videogaming: why bothering?
- The impact of videogaming on the contemporary society
- Videogaming and learning
- Videogames within formal educational and scientific environments
- Games at a glance
- Conclusions

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Videogaming: why bothering?

- **Main interest: contributing to the development of the scientific mind**
  - **Within formal educational and scientific environments**
  - **Transcending boundaries imposed by formal educational and scientific environments**
- **It is important to use all the available means in order to achieve such goal**
  - **Focus on means of massive impact, widely available in everyday's life**

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Videogaming: why bothering?

- **Hence, the key questions are:**
  - **In terms of impact and relevance in the contemporary society, are videogames worth the attention of the scientific community?**
  - **Can/does videogaming engender learning activities that can contribute to the development of the scientific mind?**
  - **How can videogames affect the development of the scientific mind within formal educational and scientific environments?**

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The impact of videogaming on the contemporary society

- **The electronic entertainment industry** (1)
  - **Mature and very strong sector**
    - Rivaling music and movie industries
    - More than 400 million players in the western world
    - US situation
      - $9.5 billion revenues in 2007
      - Projected size for the 2009 labor market: over 250.000 American Jobs (direct employment)
    - Similar situation in Europe
    - Even better situation in the Asian markets…

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The impact of videogaming on the contemporary society

- **The electronic entertainment industry** (2)
  - **Average gamer is 35 years old**
    - 26% over 50
  - **Gender**
    - 44% women
    - 33% adult women; 18% boys 17 or younger

(Source: Entertainment software association (2008). *2008 Essential Facts About the Computer and Video Game Industry*" . http://www.theesa.com

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The impact of videogaming on the contemporary society

- **In terms of impact and relevance in the contemporary society, are videogames worth the attention of the scientific community?**
- **Answer: YES!**
  - **Gamers constitute a huge crowd**
  - **Considering the demographics, gamers can have an impact on the world**
    - Individually
    - As decision-makers having an impact on groups
    - As individuals having a direct influence on decision-makers
- **If possible, videogaming must be exploited as a means to develop the scientific mind**

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Videogaming and learning

Can/does videogaming engender learning activities that can contribute to the development of the scientific mind?

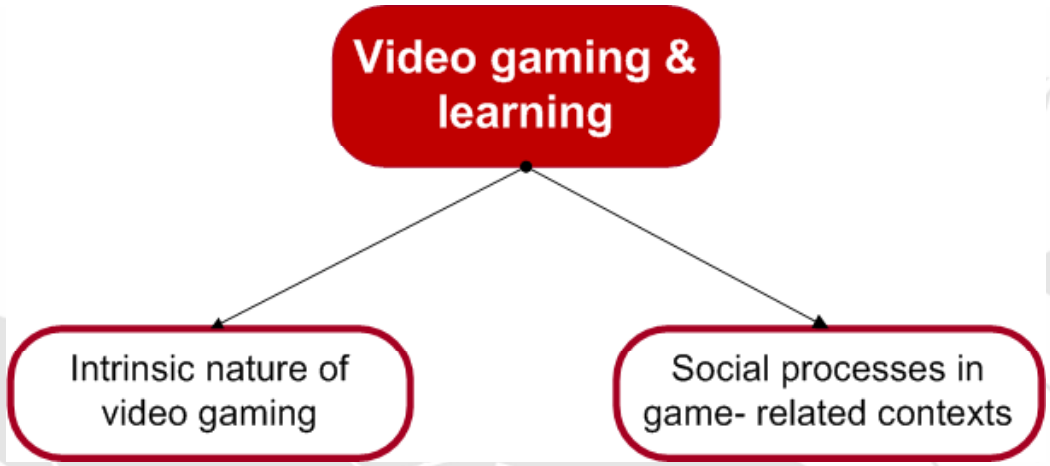
Gaming and the scientific mind

Videogaming and learning

Relationship between

video gaming and learning

2 perspectives



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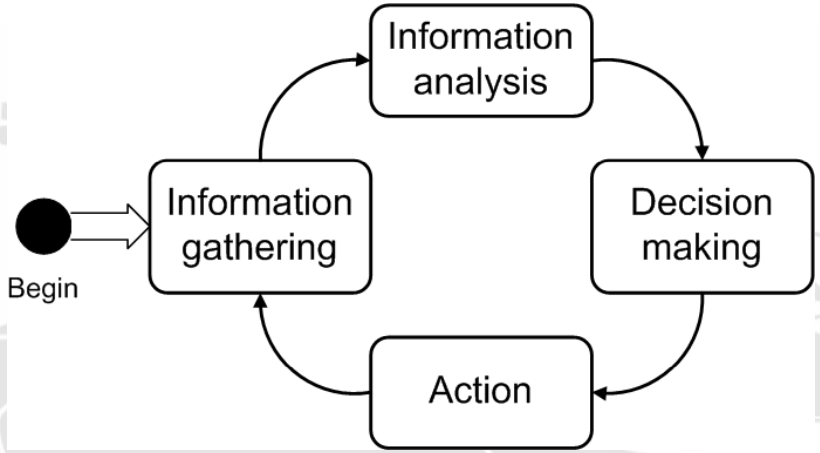
Videogaming and learning

What does any gaming experience involve?

In order to play a game, players interact with the gaming world in cycles that involve:



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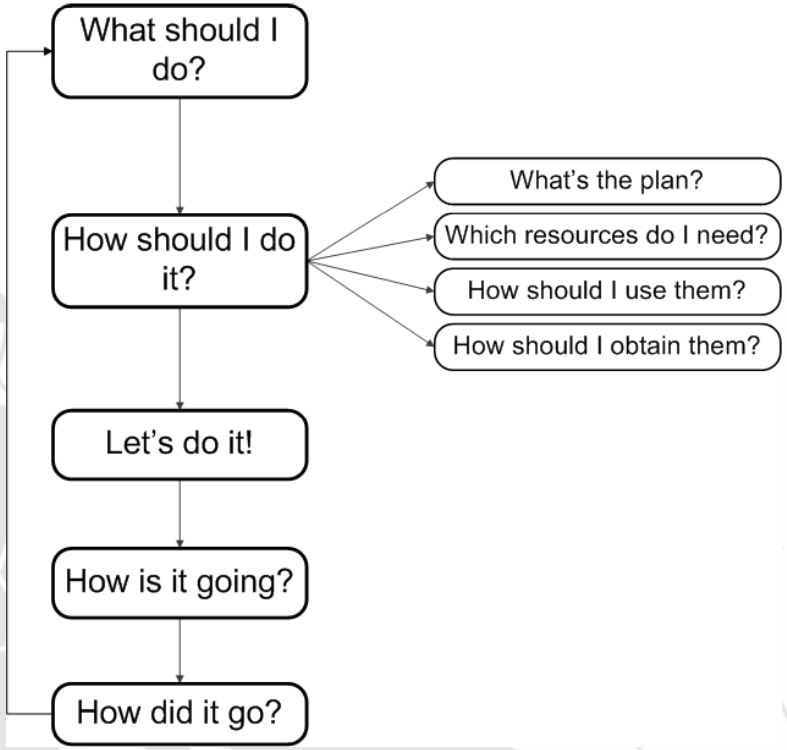
Videogaming and learning

- **In order to play, players engage in a sequence of steps involving different thinking processes, skills and knowledge**



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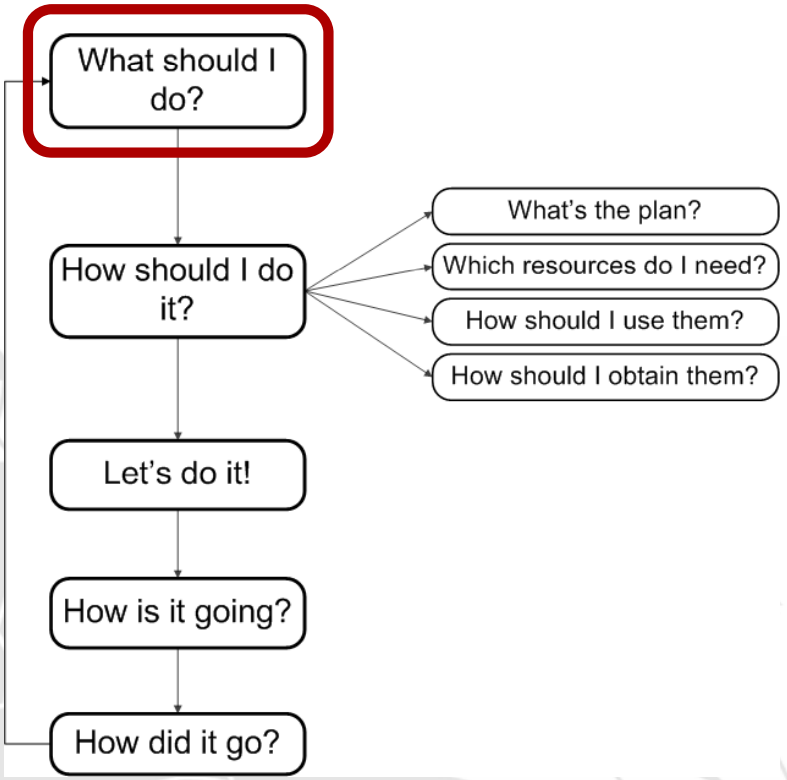
Videogaming and learning

Defining the goal to deal with is the starting point of the challenge proposed by the game.

Goals can be provided partially undefined, thus requiring players to analyze, decode and complete their definition, through learning, deduction, induction and inference of knowledge.

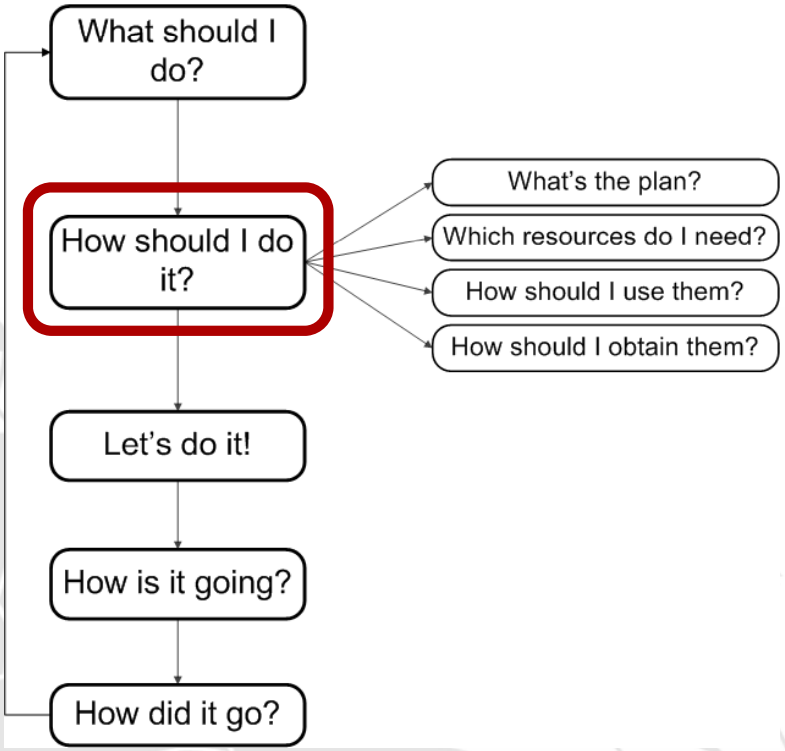


Videogaming and learning

Once the goal is set, players face the challenge of planning how to achieve it.

Problem solving skills and tactic/strategic thinking are required to:
- **define a course of action;**
- **understand and decide which resources are required;**
- **choose the optimal way of obtaining/generating and using them.**

Learning is required to understand the purpose, effects, and inner workings of the resources.



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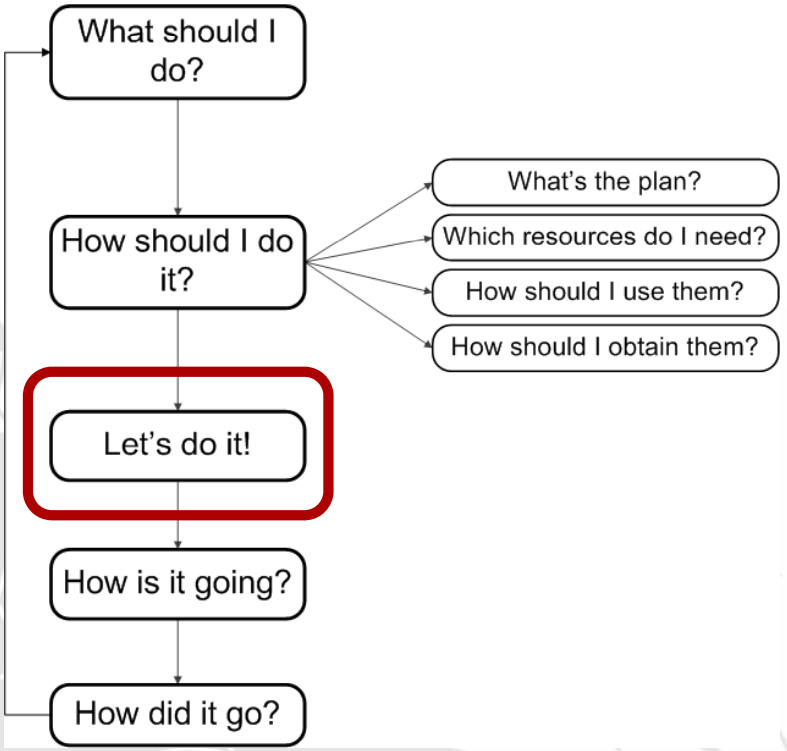
Videogaming and learning

With the plan defined, players face the challenge of accomplishing it.

They have to put in practice the decisions previously made, and employ all the knowledge acquired or generated through the previous stages.

Different skills are required, depending on the game (psychomotor skills, rhythm, attention, memory, among others).



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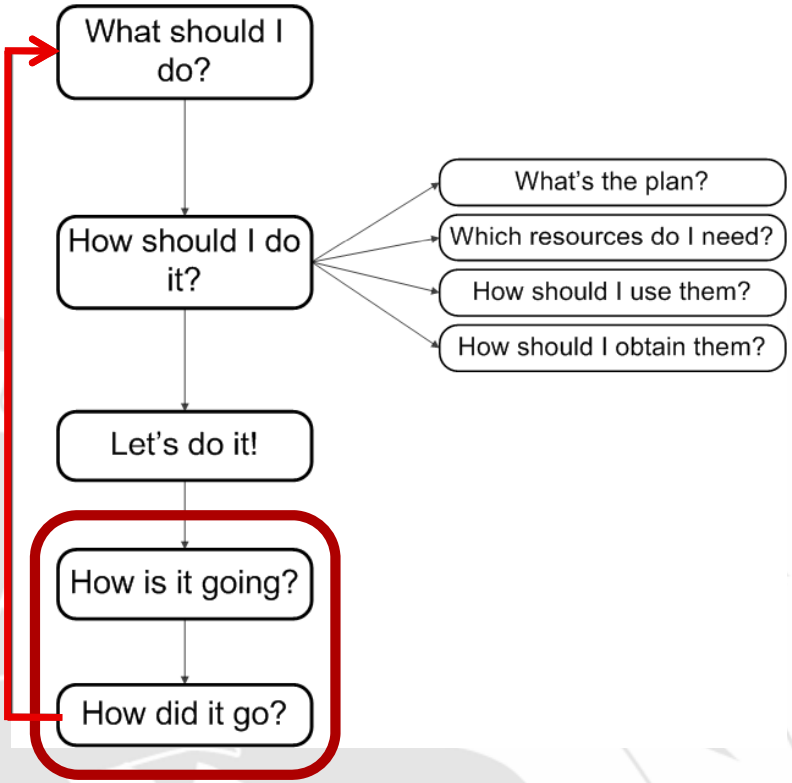
Videogaming and learning

After the action is taken, players assess the outcome both during and after the execution of a plan.

Assessment results are used to modify, to continue or to abort current plans, and set goals for future planning…

… so the cycle starts again.



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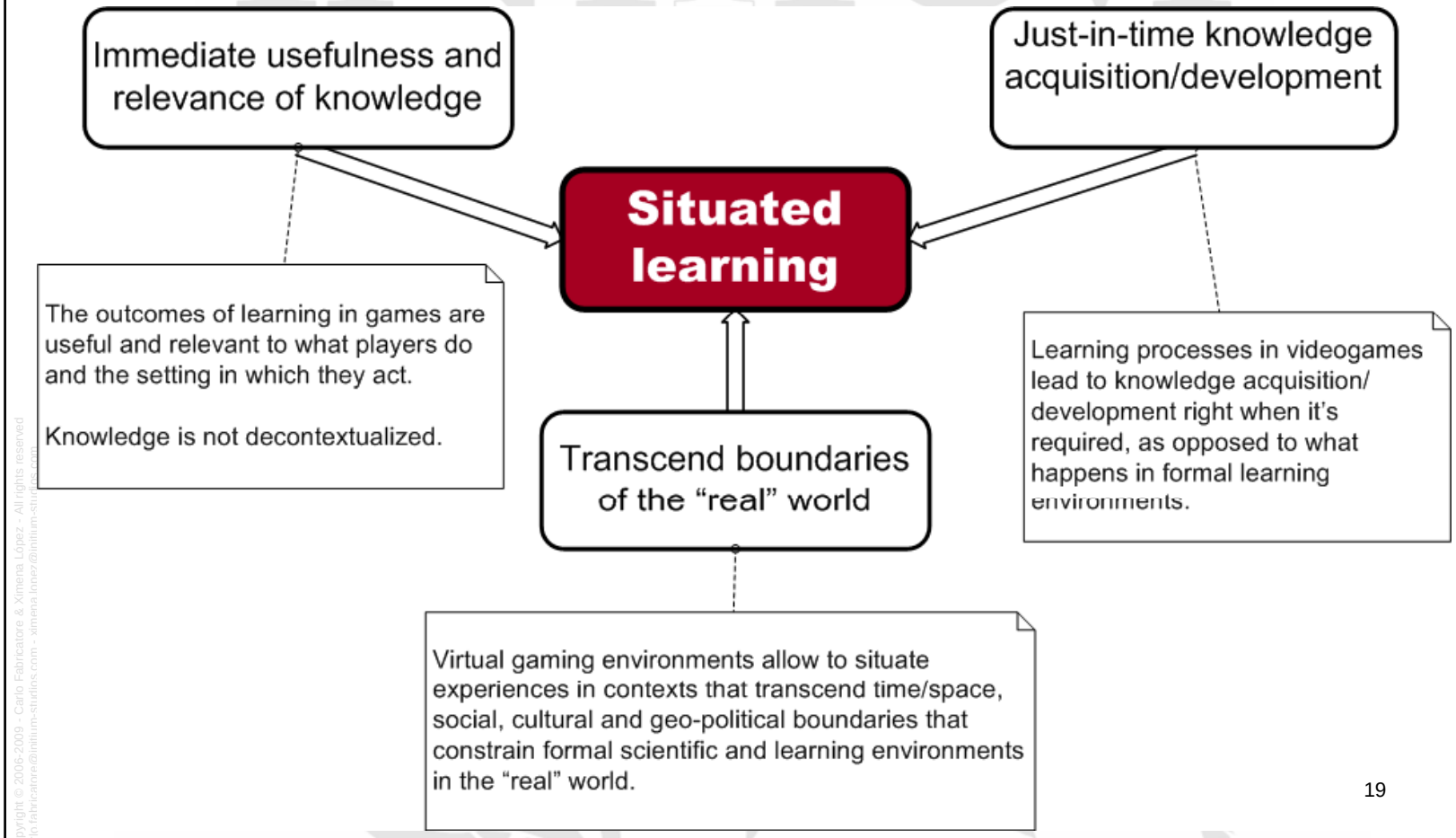
Videogaming and learning



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Videogaming and learning: game-related environments

The learning possibilities in games go beyond the boundaries of the games themselves…

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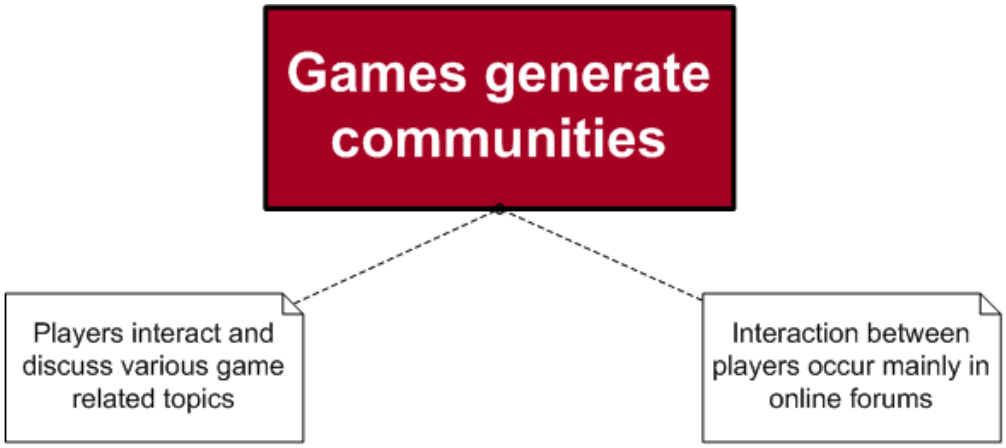
Videogaming and learning: game-related environments



Frequently, forum discussions are oriented to solving complex problems faced in the gaming world

Evidence from research has shown that scientific thinking and scientific habits emerge from the interaction between players in forums

Gaming and the scientific mind

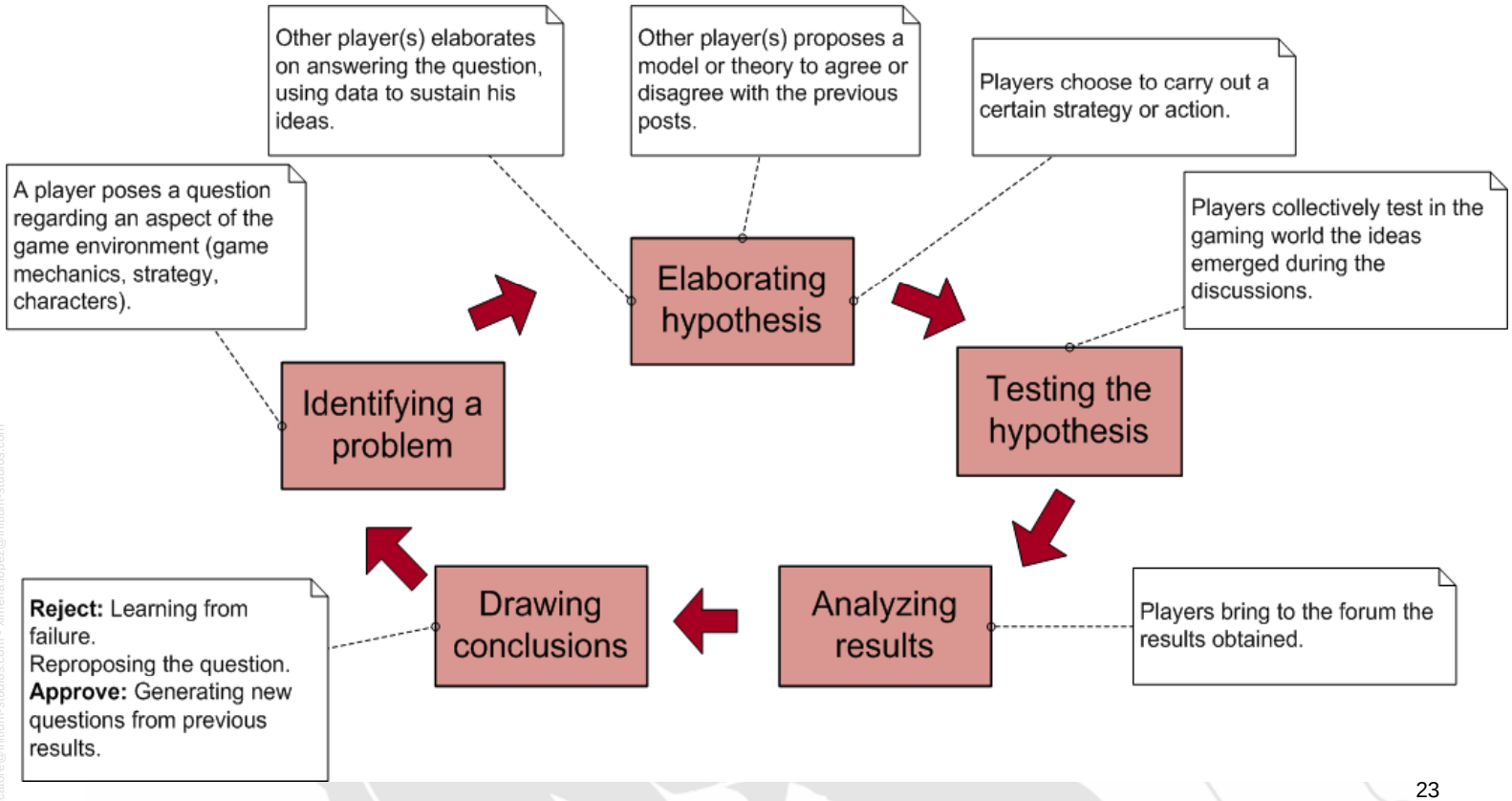
Videogaming and learning

- **Forums allow players to engage in social construction of knowledge**
  - **Knowledge sharing**
  - **Shared vocabulary**
  - **Shared practices**

Processes in game-related environments like online game forums are very similar to the intellectual and social practices that characterize communities in scientific fields

Gaming and the scientific mind

Videogaming and learning



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Videogaming and learning

Can/does videogaming engender learning activities that can contribute to the development of the scientific mind?

YES

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Videogaming and learning: conclusions

Gaming means learning, even in games whose purpose is mere entertainment

- Learning is required to play
- Games are natural learning environments

Learning is a major part of fun

- Learning is part of the challenges posed by the game
- Video games are one of the leading forms of entertainment, despite (or given!) the complexity and the considerable cognitive investment they demand to those who play

Learning is supported by extra-game contexts

- Video games generate new contexts for material and social interaction, complex problem solving and scientific habits of mind, in both individual and collective dimensions

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Videogames within formal educational and scientific environments

- **A "traditional" approach: using videogames as learning tools**
  - **Benefit of motivation on learning processes**
  - **Complexity, richness and accuracy of simulated environments**
  - **Development of *ad hoc* games**
  - **Usage of commercial off-the-shelf products**
  - **Significant amount of bibliography**

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Videogames within formal educational and scientific environments

- **A less popular approach: learning through making games**
  - **Game development education: project "Redeemed" (2006)**

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Videogames within formal educational and scientific environments

Gaming and the scientific mind

Videogames within formal educational and scientific environments

- **Team:**
  - **16 students**
  - **6 teachers/seniors**
- **Duration**
  - **8 months study programme**
  - **3 months production lab**

Gaming and the scientific mind

Videogames within formal educational and scientific environments

- **Knowledge & skills**
  - **Game design**
  - **Screenplay writing & interactive storytelling**
  - **2D & 3D graphic arts**
  - **Interface design**
  - **Game programming**
  - **Sound design**
  - **Agile project management**
  - **Marketing**
  - **…**

Videogames within formal educational and scientific environments

- **Evolution of students :**
  - **Archeologist -> lead sound designer & programmer**
  - **Computer engineer -> lead programmer**
  - **Graduated in sciences of communication -> lead game designer**
  - **Former PC assembler - > lead graphic artist**
  - **Sociologist -> game contents programmer/designer**
  - **…**

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Videogames within formal educational and scientific environments

- **Public impact: 2006 GameCon Expo**
  - **Public: “When is the game going to be released?”**
  - **Press: “A promise for the future of Italian game development”**
  - **Professional developers: “Impossile!”**

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Videogames within formal educational and scientific environments

- **Behind the scenes:**
  - **Problem-oriented learning**
  - **Scrum: agile project management**
  - **Multi and inter-disciplinary approach**

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Videogames within formal educational and scientific environments

- **How can videogames affect the development of the scientific mind within formal educational and scientific environments?**
  - **Video games can be used as learning environments within formal learning and scientific institutions**
  - **Learning through making games seems to allow achieving results otherwise difficult to attain…**

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Age of Empires

- **Series developed by Ensemble Studios and published by Microsoft**
  - **1997 – 2006**
  - **Each installment of the series sold over 1MLN copies**
- **Setting based on historical events**
  - **From the stone age to 1850**
- **Goal: develop different civilizations**

Gaming and the scientific mind

Age of Empires

- **Real-time strategy game** (1)
  - **Player has to obtain, develop and manage limited resources**
    - Human resources specializing in specific tasks
    - Natural resources that can be collected or produced
    - Artifacts, facilities and buildings that can be acquired or produced
  - **Resources are constrained by environmental conditions**
    - E.g. influences of weather conditions on agriculture and military campaigns

Gaming and the scientific mind

Age of Empires

- **Real-time strategy game** (2)
  - **Player has to face opposition and obstacles**
    - Both computer and player-controlled civilizations
      - Conflicts for territory and resources
    - Natural events
  - **The simulated system is proactive, and responds to players' decisions in real time**

Gaming and the scientific mind
Age of Empires

- **Some relevant knowledge and skills**
  - **Problem-solving, tactic/strategic thinking, planning and project management**
    - E.g. organize military actions
    - E.g. plan and carry-out policies of urbanization
    - E.g. plan the development of naval fleets
  - **Inner workings and usage of artifacts**
    - E.g. using a catapult or a trebuchet
  - **Epistemic learning**
    - Think like a politician
    - Think like a general
    - Think like an urban administrator

Gaming and the scientific mind
Age of Empires

- **Other knowledge/skills relevant in similar games**
  - **Social interactions**
    - E.g. diplomacy
    - E.g. facing reactions of the population being governed and developed
  - **Economics**
    - E.g. trading
    - E.g. management of fiscal systems

Gaming and the scientific mind

Age of Empires

- **Look and feel**

Images retrieved at http://www.gamespy.com

Gaming and the scientific mind
Age of Empires

- **Look and feel**

Images retrieved at http://www.gamespy.com

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Gaming and the scientific mind

Age of Empires

- **Look and feel**

Images retrieved at http://www.gamespy.com

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The Sims

- Series developed by Maxis and published by Electronic Arts
  - 2000– 2009
  - Best-selling PC game in history, with 6.3MLN between 2000 and 2002, and 16MLN as of 2005/02
- Setting based on real, contemporary society
- Meta-goal: create virtual people (the Sims), and control their lives to develop them

Gaming and the scientific mind

The Sims

- **Strategic life simulation**
  - **Player has to create and control simulated persons**
    - Create initial “persons”, based on simple characteristics, and belonging to “families”
    - Player exerts control instructing the Sims as to what to do
  - **Game goals are not preconceived: players define them**
    - Doll-house model: it’s a box of toys!

Gaming and the scientific mind

The Sims

- **Progress in the game is based on:**
  - **Social development of Sims**
    - Relationships with their families
    - Relationships with the outer world
      - With other Sims
      - Social duties
  - **Personal care and development of the Sims**
    - Physical development
    - Skills: reading, creativity and logics
    - Personal hygiene and alimentation
    - Career

Gaming and the scientific mind
The Sims

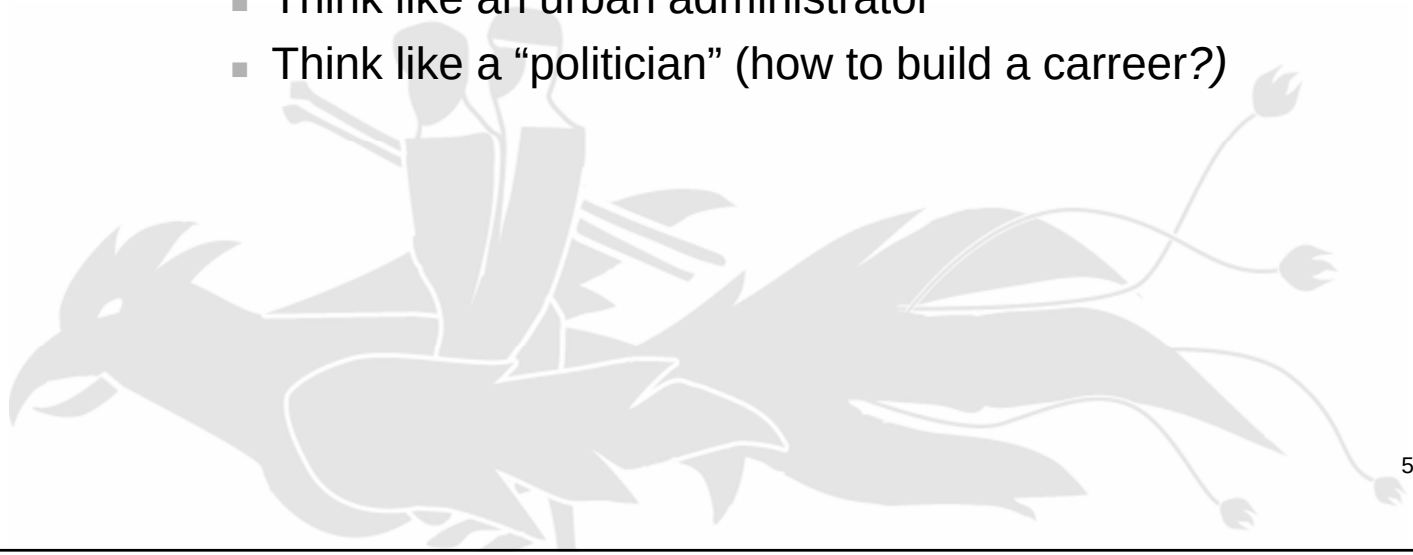
- **Sims have a limited autonomy**
  - **Main decisions and responsibilities rely on the player**
  - **Bad decisions can affect a Sim, making him/her exert his autonomy, possibly pursuing a negative development**
    - E.g. irritation bringing to autonomous bad social behaviors
  - **Sims communicate with each-other and the player through the *Simlish***
    - Fictional language, derived from experimentations with French, Ukranian and Talgalog

The Sims

- **Some relevant knowledge and skills (1)**
  - **Problem-solving, tactic/strategic thinking, planning and project management**
    - Manage “life!” (career, relationships, etc.)
  - **Inner workings and usage of artifacts**
    - E.g. all the artifacts required in a Sims’ life
  - **Social skills**
    - E.g. gaining popularity through conversations at parties, etc.
  - **Economics**
    - E.g. buy/sell houses and commodities, invest, etc.

The Sims

- **Some relevant knowledge and skills** (2)
  - **Epistemic learning**
    - Take care and nurture simulated persons (**small-scale parenting**?)
    - Think like an administrator of social systems
    - Think like an urban administrator
    - Think like a “politician” (how to build a carreer?)



Gaming and the scientific mind

The Sims

- **Look and feel**

Gaming and the scientific mind

The Sims

- **Look and feel**

Gaming and the scientific mind

The Sims

- **Look and feel**

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Gaming and the scientific mind

World of Warcraft

- **Massive multiplayer on-line role-playing game, published & developed by Blizzard Entertainment**
  - **More than 11.5MLN subscribers worldwide (2008)**
  - **US & EU peak concurrency: over 800.000**
  - **China peak concurrency: over 1MLN shortly after launch**
- **Setting based on a fantasy world (medieval mythological world)**
- **Goal: solve quests**
- **Meta-goal: create and develop character(s)**

Gaming and the scientific mind

World of Warcraft

- **Massive-multiplayer role-playing game** (1)
  - **Players have to create and control simulated characters**
    - Characters based on archetypes characterized by properties
    - Properties developed over time through achievement
  - **Development allows facing quests of increasing difficulty**
    - “Interesting” quests require carefully organized team effort
    - Quests can be generated by intelligent agents, or by players themselves
  - **Game requires resources management processes, originating in-game trading, and true off-game business models**

Gaming and the scientific mind

World of Warcraft

- **Massive-multiplayer role-playing game** (2)
  - **Players have to face opposition**
    - Both computer and player-controlled characters and parties of characters
      - Conflicts for territory and resources
  - **Players have means of communicating with each other, within the game**

Gaming and the scientific mind
World of Warcraft

- **Some relevant knowledge and skills**
  - **Tactic/strategic thinking, planning and project management**
    - Manage organized parties
    - Manage career
  - **Inner workings and usage of artifacts**
    - E.g. all the artifacts required to act and interact
  - **Social skills**
    - E.g. interactions to form parties or to be accepted in a party
  - **Economics**
    - E.g. buy/sell buildings, commodities and artifacts
      - Request & offer, macro & micro-economics, etc.

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Conclusions

- **Very many elements and learning processes related to the scientific mindset are fundamental to all videogaming activities**
- **Videogaming can be key to the development of the scientific mind, since:**
  - **Players learn & develop scientific mindset skills both in order to play & through gaming**
  - **Videogames can be "fish tanks of real worlds": realities are oceans, and games are fish tanks**
  - **Knowledge and skills required to play could be transferred to other contexts**

Conclusions

- **What about the future?**
  - **"Ages of SimsCraft" co-developed by students under the tutoring of professionals, and played by thousands of players, all over the world…**

"*Be the change that you wish to see in the world*"
Mahatma Gandhi