

Serious Games Design Guidelines

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Introduction

To successfully develop a serious game, it is imperative to integrate the game and learning aspects, and obtain the support of the trainers who will use it. The collaborative design of serious games by teachers, game designers, educational engineers, graphic designers and computer scientists is recognized as a key success factor. A major challenge is thus to foster the collaboration within this multidisciplinary team and establish a common vision for the current project.

We developed the co.LAB approach for this purpose. This co.LAB approach integrates a visual model and a web platform intended to facilitate the collaborative design of serious games. The web platform accessible on https://colab.albasim.ch/ reproduces the co.LAB model and provides tips and examples for each design element. This platform allows collaborative serious game design work.

The co.LAB Framework

By grouping design building blocks into five categories, the co.LAB framework aims at providing a structured view of the game design. This view enables all members of the development team to focus on the building blocks on which they are working (pedagogical engineers may focus on learning design, while graphic designers on user interfaces) while simultaneously providing an overview of the project and of the relationships between the building blocks. 23 serious games design building blocks have been grouped into five categories: (1) Context and objectives, (2) Game design, (3) Learning design, (4) Mechanics and (5) Assessment. (FIg. 1).



Visual Organization of the Framework

The Game and Learning Vision

Traditionally, serious game design is viewed as a blend of learning and game design. In Figure 2, the left side of the framework corresponds to the Learning design and the right side to the Game design. This vision emphasizes the inclusion of game and learning design in serious game design. The Mechanics category can be seen as linking them together.

The Project Vision

The upper section defines the problem and the overall objectives of the project. The middle section defines the solution: the game and the associated learning concept. The lower section defines how the solution will be evaluated both from the game and learning perspectives.



Fig. 2. Organization of the co.LAB framework

Context and Objectives

The "Context & Objectives" cards must make it possible to identify the problem to be solved and give a first idea of the solution.



Context

What it is

Description of the environment in which the serious game will be used, as well as all the initial constraints to take into account.

Why

The context of use influences design choices, both in terms of play and pedagogy. For example, using the serious game in a class of 15 students or with an audience of 500 students will influence the pedagogical aspects of its implementation.

How to

Break down the context along the following dimensions

- Pedagogic
 - Fixed or flexible course objectives
 - Study plan: fixed or flexible
 - Existing Serious games, course exercises
- Students
 - Profile of students, participants
 - Computer knowledge
 - Interest, motivation for training
 - Number of students
- Technology and infrastructure
 - Do all students have a personal computer?
 - WiFi access
 - Rooms available: auditoriums, group rooms, etc.
- Social
 - Support from department and school management
 - Support, involvement of teachers, teaching assistants
- Financial
 - Funding sources
 - Other existing aid

Examples

Patients' Rights Game

The Patients' Rights Game game will be used as a practical exercise during the "Patients' Rights" course for nurses or medical doctors.

It can be played under the following conditions:

- individually or in a team
- used in face-to-face learning situation
- number of students: 100 to 150 students
- possibly further used, without a trainer, by health professionals

Project Management Game

The Project Management Game will be used as a practical application case, in complement to the theoretical project management course.

The Project Management Game will be used in bachelor's, master's, postgraduate and professional training courses.

- Students
 - Computer knowledge, games: yes
 - Interest, motivation for training: mostly yes
 - Number of students: 15 to 300
- Technology and infrastructure
 - All students have a personal computer
 - Wifi access : OK
 - Rooms available: classrooms, auditoriums and group rooms
- Social
 - Department management support: yes in principle, but not financially
- Financial
 - Main source of funding: a research fund has been accepted
 - Others: teaching assistants can participate in development

Learning Goals

What it is

Learning goals correspond to a general definition, in one sentence, of the skills that students or participants will develop in the course or the game.

Why

"Learning goals" is the sentence that can be used to pitch the serious game to all stakeholders on the "education" side.

How to

Breakdown learning goals into levels.

- Training program
 - The general objectives of the training in which the course will take place (e.g. graduate profile)
- Course
 - In a short sentence, show what skills the course seeks to develop in students. Generally like "the course aims to..."
- Serious game
 - In one sentence, describe the expected contribution of the serious game to achieving the learning goals of the course.
 - If the serious game is used as a "standalone", not integrated into training: merger of the two points "Course and serious game"

Tips and tricks

• Stay at the general level. The Learning Goals will subsequently be broken down into educational objectives.

Examples

Patients' Rights Game

The Patients' Rights Game game aims to raise awareness and provide participants with the knowledge and methods necessary to establish a quality and safe therapeutic relationship, including clinical, environmental elements and respecting patients' rights.

Project Management Game

Course objectives

The course aims to develop the ability to coherently implement project management tools and methods, integrating technical and human dimensions.

Serious game objectives

As part of this course, the Project Management Game aims to develop the ability to:

- implement project management tools, work in a team, communicate about the project.
- approach the problem of project management from a global point of view, integrating soft and hard skills.

Game Outline

What it is

Most serious games (and games) can be described with a sentence such as:

The	player	takes	the	role	of	а		who	finds	himself	in	а	
(conte	ext/situa [.]	tion/envi	ironm	ent). Its	s obje	ectiv	ves are to		. For thi	s, he mus	t		

Why

Among everything you are going to write about your game, this is one of the sentences that will be used and read.

You will be able to use the "game outline" when:

- a new member joins the project team,
- you present the game to the students,
- a colleague asks you "actually, what is your serious game?"
- a journalist interviews you about the developed game.

The game outline does not need to be perfect as from the first draw. It will evolve during the project. But defining it from the start provides a guideline for the entire design and development team.

How to

To complete the last part of the sentence "For this, he must ______"

- stay at a general level ("make the right decisions" vs "plan, monitor the project and manage internal resources and discussions with clients")
- focus on the "game" aspects (e.g. find a way to escape without being caught) rather than on the "learning" aspects (e.g. solving the physics problems that will allow him to escape).

Examples

Patients' Rights Game

The player takes the role of a <u>caregiver</u> working in <u>a care environment</u>. Its objectives are to <u>meet</u> <u>the medical needs of the patient while respecting his rights</u>. For this, he must <u>understand the</u> <u>elements of the situation (clinical, legal, representation, etc.), adopt the right behavior and make</u> <u>the right decisions</u>.

Project Management-Game

The player takes the role of a <u>Project Manager</u> working in <u>an organization</u>. Its objectives are to <u>successfully launch and then carry out a project</u>. For this, he must <u>make the right management</u> <u>decisions</u>.

Learning Design

Learning Design aims to define and design the learning aspects linked to serious games.



Learner's profiles

What it is

Definition of the profile of learners, as future users of the game.

Why

Ensure that the game developed will be in accordance with the profile of the users of this game.

How to

Define learner profiles on topics such as:

- interest in learning the subject matter
- digital literacy
- experience of games and simulation

Example

Patients' Rights Game

Propaedeutic (preparatory) and bachelor students:

- Basic interest in the subject: a priori limited, issues not recognized.
- Interest manifests itself during or at the end of the course.
- More desire for practice than theoretical courses on this subject.
- Comfortable with IT tools: No. But they will have to use them in their professional future anyway.

Project Management Game

Bachelor and master students

- Not necessarily interested in project management (at least for students from other fields than economics)
- Interested in fun teaching methods
- Comfortable with computers

Participants in postgraduate training and professional training

- Generally interested in project management (practical experience)
- Interested in active teaching, practical approaches, sharing experiences between participants
- Level of mastery of IT tools: heterogeneous

Learning Functions

What it is

Learning Functions describe the reasons for using the serious game in the learning context.

Why

The serious game has no meaning in itself. It is its use for learning purposes that gives it meaning. The definition of Learning Functions will guide the rest of the design.

How to

- 1. Write one or more "user stories" about the use of simulation in training situation
- 2. Complete the Learning Functions table and evaluate the importance of each function

User story

On 0.5 to 1 page, tell the story of the use of the simulation.

For example: Maria, a history teacher, often has difficulty... For this, she... The simulation will be used for...

Table of learning functions

In a table such as below, for each of the learning functions

- decide if this feature will be integrated into the game
- describe how it will be integrated
- assess its importance.

Function	Description of the use odf this function in the serious game	Intensity (importance)
Application		
Acquisition of new knowledge (hard skills)		
Development of soft skills		

Tips and tricks

Please note: the more we wish to achieve a large number of objectives (of different functions) with the same serious game, the higher the level of expertise of the design team must be.

Without good expertise, wanting to pursue too many objectives risks leading to a confusing result.

Examples

Exemple user story

User story for a serious game which will be used for training paramedics.

Context of use

Pierre is a trainer, specializing in training paramedics in the management of major disasters. He conducts training as part of the basic training of paramedics as well as in continuing training.

In his training, he alternates theoretical contributions, of the ex cathedra type, with simulation exercises in the field. The use of serious games allows him to better make the link between theory and field exercises.

After the theoretical course and before an exercise, Pierre organizes a half-day of training with the serious game.

Game usage

Students work in groups of 2 or 3. In the simulation, each group takes on the role of a paramedic arriving at the site of a disaster. Each group works independently.

Pierre can configure the simulation according to the conditions of use and the educational objectives pursued:

- individual or team
- with or without "time pressure"
 - The first uses are intended to acquire knowledge and Pierre removes the pressure of time to encourage discussions between students.
 - Once the knowledge has been acquired, to develop the "reflex" side, Pierre adds time pressure.

From his trainer dashboard, Pierre can follow the work of participants and interact with them.

Debriefing

An analysis support tool allows it to detect examples of situations or decisions that may be interesting to discuss in plenary during feedback (groups that have done well, made a big mistake).

Examples

Patients' Rights Game

Learning Function	Description	Intensity (importance)
Application	Ability to apply principles and methods in a concrete situation	XXXXX
Acquisition of new knowledge	Set of patient rights and principles of application	XXXXX
Development of soft skills	Reflexivity, decision-making capacity Ethics and professional conduct	X
Preparation for future courses (common example)	Common example for Leadership, interprofessionality courses	XX

Project Management Game

Learning function	Description	Intensity (importance)
Application	Develop the ability to apply basic project management tools (initiation, planning, implementation, closing)	XXXXX

Acquisition of new knowledge	Motivate to seek, delve deeper to solve problems in the simulation	XX
Development of soft skills	 PM specific Project communication Present a project convincingly General Solve a global, complex problem Develop a systemic vision The ability to work in a team PBL: developing the ability to learn 	XX
Preparation for future courses (common example)	Sometimes the PMG is used as a basis for discussion on the contributions and limits of project management tools and methods.	XX

Theoretical foundations

Plass, Handbook of game-based learning

Learning Objectives

What it is

Learning Objectives correspond to a breakdown of Learning Goals into measurable sub-elements. The result must show what the students will be able to do at the end of the course or use of the serious game.

Why

Without goals, there is a risk of getting lost.

The learning objectives will serve as a basis to:

- define appropriate teaching methods
- check the overall coherence between the course, the game and the objectives sought
- inform students of what they will learn
- define the assessment of knowledge and skills

How to

Define the Learning Objectives in the form of short statements of the measurable skills that students will have acquired at the end of the game.

- Start with Learning goals
- Break down Learning goals into sub-elements
 - necessary and sufficient to achieve the Learning goals
 - for which the acquisition of knowledge and skills is measurable
- Identify prerequisites (previously necessary knowledge)
- State the Learning objectives in the form of "at the end of the game, students will be able to..."

Tips and tricks

Stay realistic about what can be acquired according on the length of the game.

Breakdown Learning objective into three categories:

- knowledge (cognitive)
- know-how (psychomotor)
- interpersonal skills (affective)

For each of these categories, there are lists of typical verbs to use.

- cognitive
 - https://moocs.unige.ch/files/8514/6720/2844/objectifs_pedagogiques.pdf
 - https://www.enseigner.ulaval.ca/system/files/taxonomie_cognitif.pdf

- o or Bloom with Evaluate-Create instead of Synthesis-Evaluate
- emotional
 - Krathwohl, Bloom, Masia
 - <u>https://www.enseigner.ulaval.ca/system/files/taxonomie_affectif.pdf</u>
- psychomotor
 - Jewett
 - <u>https://www.enseigner.ulaval.ca/system/files/taxonomie_psychomoteur.pdf</u>

Examples

Patient's Rights Game

At the end of the game, participants will be able to:

- list all the rights of patients
- identify the central legal theme of a concrete situation
- seek legal information to resolve a concrete situation
- establish a decision-making algorithm for the specific situation
- explain their choices in accordance with the patient's rights
- identify their strengths/weaknesses regarding each of the components of patients' rights

Project Management Game

At the end of the game, participants will be able to:

- Develop a project proposal
- Perform a project economic analysis
- Perform a risk management process
- Prepare a project presentation
- Create an activities diagram
- Optimize project planning based on costs, quality or deadlines
- Monitor a project with different monitoring tools (Monitoring Gantt, EVM)
- Implement project monitoring
- Lead a steering committee session
- Prepare a project closure report

Terminology

There is not complete agreement on the name, but the idea remains the same. Here are some synonyms for Learning objectives.

Intermediate Objectives / Operational Pedagogical Objectives

In the form "Students will be able to..." Marcolino, Trainer, Eyrolles, 2008

Learning outcomes

Students are able to...

Parmentier, Vicens, Teaching in higher education, Dunod, 2019

Specific objectives

"Short statement, one to three lines, formulated from the student's point of view. What the student should be able to do to achieve the general objectives. At the end of the course, the student must be able to..."

Richard Prégent, Preparing a course, Ecole Polytechnique Montréal 1990

Laval University

Learning objectives

Learning objectives are the specific, measurable competencies which you would assess in order to decide whether your goals had been met. Example: "By the end of this course, students should be able to write an essay that explains one major theory of state formation and makes an argument about how well it describes the historical experience of a relevant country.")

https://bokcenter.harvard.edu/learning-goals-and-learning-objectives

Learning Foundation

What it is

Depending on the educational objectives, the appropriate learning theory may be behaviorist, constructivist or social-constructivist.

The consistency between learning theory and learning objectives is a sine qua non condition for achieving educational objectives. For example, if the learning objective is to develop practical palpation skills for clinical assessment and the pedagogical approach is "learning through observation," there is an inconsistency.

Why

Teaching methods are the foundations of learning.

The choice of appropriate teaching methods is a sine qua non condition for achieving educational objectives.

How to

Based on Learning goals and Learning objectives:

- 1. Define which Learning theories will be used
- 2. Define Learning events and activities
- 3. Define educational approaches (experiential learning, situated learning, problem-based learning)

1) Define Learning theories

For each of the learning theories (behaviorism, constructivism, socio-constructivism), ask the question if and how it will be integrated into the SG or activities around SG.

Learning theory	Integrated?	Intensity
Behaviorism		
Constructivism		
Socio-constructivism		

Behaviorism

Behaviors are induced by a reward/punishment system. Reinforcements can be continuous (after each success) or intermittent (after the completion of a certain number of successes, passing a stage).

Behaviorism explains a large part of the attraction to video games.

From a learning point of view, learning corresponds to a modification of behavior, induced by training. Positive reinforcements given after each sequence may induce correct behavior.

This approach can be interesting for rote learning or the development of reflex behaviors. The Game is then developed as sequence of questions, situations, with a positive reinforcement of correct choices (points, praise, sounds, etc.)

The main risks are to develop an **extrinsic** motivation for learning. Behaviorism may lead to the development of a serious game such as during the 80s-90s, where the game is used as a reward for work done, with a dissociation of work and play (serious - game). Learners may understand the mechanism and focus on the fun part to the detriment of learning.

Constructivism

Knowledge is constructed through experiences and discoveries. Knowledge is developed by learners themselves rather than "copied" into their brains by the trainer. Learners are driven to seek meaning, adapting their mental models to match experiences.

Constructivism pushes for the development of an **intrinsic** game, which merged the notions of learning and play (we can no longer separate one from the other). To successfully advance in the game, the student/player must acquire the knowledge, skills (serious).

Socio-constructivism

Knowledge is constructed through experience and discovery. The construction of knowledge is personal, but integrated into interactions with others, in a social framework.

Socio-cognitive conflict "is the confrontation between divergent opinions which is constructive in social interaction."

Applications in serious games involve playing in teams, encouraging choices that must be made by the team, encouraging discussions between members before making the choice (do not put time under stress. Trainer may confront teams who have made different decisions, and classroom discussion may be used to rebuild common knowledge

2) Define Learning events

Learning events correspond to small pieces of learning activities. A good serious game requires the combination of the right learning events a t the right time.

Explain how and where learning objectives will be achieved.

- When learning event will occur
- Which learning event

For defining learning events, one may use the "8 Learning Events Model"

- Imitation
 - Observation, impregnation. Implicit knowledge learning
- Reception of information
 - structured intentional communication (courses, books, etc.)
- Practice
 - procedural learning, automation, routines
 - trial and error to interpret effects (feedback)
- Exploration
 - voluntary exploration of the possibilities offered (data, books, references, etc.)

- Experimentation (simulation)
 - manipulation of an environment to observe the effects of different types of actions (causes)
- Creation
 - create something new for the learner (objects, concept,
- Debate
 - social interactions
 - argument, judgment, analysis, defend-modify one's point of view
- Meta reflection
 - Stop and reflect on what we are learning, the meaning, the chances of success, feedback from an expert

Use a table to synthesis learning events occurring at different time:

Educational object At the end of the	ctive 1. simulation, particip	ants will be able to		
When => Learning event	Independent activities (lectures,)	Course	Serious Game	Activities around simulation (role playing, debriefing, discussions, etc.)
Imitation				
Reception information				
Practice (exercises)				
Exploration				
Experimentation				
Creation				
Debate				
Meta-reflexion				

Examples

Patients' Rights Game: Learning Theory

Learning theory	Integrated?	Intensity
Behaviorism	Perhaps a part for learning "by heart" the themes of patient rights	*
Constructivism	For systemic consideration of care	****

Socio-constructi	perhaps if we organize debates between students	**
vism	following the simulation	

Patients' Rights Game: Educational objective links - Activities

Learning objective	At the end of the	simulation, students	will be able to list al	l patient rights
When => Learning event	Independent activities (lectures,)	Course	Software simulation Promised	Activities around simulation (role playing, debriefing, discussions, etc.)
imitation				
reception information	preparatory reading	introductory course		legal resources accessible in the game
Practice (exercisation)			reinforcement through practice in simulation	reinforcement in the recapitulation exercises following simulation
Exploration				
Experimentation				
Creation				
Debate				
Meta-reflexion				

Pedagogical scenario

What it is

The serious game is integrated into an overall usage scenario. The pedagogical scenario defines the learning sequences and associated activities that should enable students to achieve educational objectives.

Why

What happens around the game is as much (or more) important as the game itself.

The pedagogical scenario should:

- ensure consistency in the order of activities
- let the teacher knows where he is going
- provide students with a structured framework

How to

Start by defining the general structure of the course and the succession of sequences: game, theoretical contributions, personal work, feedback, etc.

Then, define the specific scenario of the sequences dedicated to the game. A typical scenario for using a serious game includes three phases:

- Before: Briefing
- During: Orchestration, use of simulation, games
- After: Debriefing

These three phases can be iterated.

Briefing

The way the game is presented to students greatly influences acceptance, involvement and learning.

The activities carried out before the game include the acquisition of the prerequisites knowledge, the general briefing to the serious game and the specific case briefing (for simulation-type serious games).

References and theoretical foundations

The proposed structure is adapted in particular from (Diekmann P. 2009, Rudolph 2014). The structure is recommended for training using simulation-type games, in university-level or postgraduate training. But the structure can be used and adapted for other types of games and contexts.

Prerequisites

Objectives: acquisition of theoretical knowledge and skills necessary to start in serious games.

- identify the necessary prerequisites to enter the game
- possibly, create a self-assessment test allowing participants to validate that they have the prerequisites
- allow the acquisition of prerequisites: theoretical course (in the module or previous courses), provide references allowing individual learning

General briefing

Goals:

- provide general information,
- create a climate of trust and psychological safety

Content:

The trainer presents to the participants the principles and objectives of using the serious game. The presentation is done before the start of the game and lasts approximately 5' to 10'.

Elements of the presentation:

- Basic principles: confidentiality, right to error, respect
- Objectives of using the serious game: link between the serious game, the course, the exam
- Learning objectives and prerequisite knowledge
- Evaluation
 - Inform if there will be a summative or formative evaluation
 - If evaluation: based on what? How will the grading be done (weight of the serious game, other exams, individual or group grades)
- Logistical aspects: duration of the serious game, location
- Establish a fiction contract (at least for simulations)
 - Simulation as similarity with reality, but recognize limitations
 - The players will act "as if..."
 - The trainer will take the role of...

Specific Briefing of a session

- Explanation of how the hardware, software, and rules of the game work
- Explanation of roles (students, teacher/facilitator differentiation)
- Presentation of the scenario

Orchestration : usage of the serious game

Symbolic entry and exit from the serious game

It is necessary to mark a symbolic entry into the game or simulation. This should allow participants to understand that they are leaving their role as students to take on a specific role in the serious game. A symbolic exit must signal the return to the roles of trainers and students.

Symbolic entry and exit also make it possible to differentiate the roles of teacher or serious game facilitator. The exit marks the return to the role of teacher during the debriefing.

If for example in the serious game, during a role play the teacher takes the role of an aggressive customer, the students must understand that it is not the teacher who is aggressive, but that he plays the role of an aggressive person.

The symbolic entrance and exit can be marked by physical accessories (for example passing through a door, putting on a cap).

Debriefing

The debriefing must allow participants to assimilate, integrate and construct knowledge based on what was experienced in the serious game, in order to allow transfer to practice or other areas of study.

In the medical field, it is the development of debriefing methods that has led to an increase in the effectiveness of the use of simulations for training. We can extend this result to the field of serious games in general.

Tips and tricks

- Signal a symbolic exit from the simulation, from the game. Clearly mark the difference between simulation and debriefing
- If possible, conduct the debriefing in a different room
- Debriefing means exchanges between participants and trainer. It is not an unidirectional feedback (trainer-centered)
- Do not focus only on results obtain in the serious game
 - but ask questions that help identify
 - the actions that led to the result
 - the mental models that generated the actions
 - Seek to understand the reasons which pushed the participants to take an action by questioning: At this moment, I saw that... and I have the feeling that..., For what reasons did you...?
- Use the advocacy-inquiry approach
 - $\circ\,$ advocacy: the trainer presents his opinion, his assumptions about what happened
 - inquiry: the trainer questions, seeks to get people talking (based on what was presented in the advocacy phase)

Structure of the debriefing

The debriefing is generally organized in 3 phases.

• Reaction phase: release of emotions and tensions (2' - 5')

- learners express themselves on what they felt and experienced
- Understanding phase (10' 30')
 - learners and trainers/teachers analyze what happened
 - search for the causes of successes, failures, knowledge implementation
 - learners reflect on what they can take from the session for future practice
- Summary phase (5-10')
 - The trainer wrap-up main findings of the understanding phase

References

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Example(s)

Patients' Rights Game

Briefing

- The objectives of using the serious game are
 - Confront students with practical situations such as those they may encounter in their professional activity
 - Build knowledge based on the basis of experiences in the serious game
 - \circ $\;$ Allow mistakes to be made in the serious game rather than in reality
- Evaluation
 - The serious game is not rated
 - The exam will cover the knowledge acquired in the entire course, including in the serious game.
- Goals and rules
 - Objective: to establish a quality patient relationship, including the safety of care and respect for the law.
 - \circ $\;$ As in reality: no going back, "what is said is said" $\;$
 - Not as in reality: you can take the time to think, discuss, consult documents before responding to the patient.

• Demo of the game

Orchestration during usage of the Serious game

- In class
- Students divided into groups of 2
- Objectives given to students:
 - Establish the therapeutic relationship with Mr. Henrioud
 - Prepare a presentation
 - how did you experience the relationship with Mr. Henrioud, what did you learn, to take with you for practice?

Debriefing

- Presentation of 2-3 groups (5' per group)
- Plenum discussion after each presentation
- Teacher: Summary of debriefing and discussion
- Teacher: additional theoretical contribution on the right to refuse care, presentation of specific real cases.

Knowledge Foundation

What it is

The "Knowledge Foundations" aim to identify and validate the sources of content related to learning which will be integrated into the serious game (knowledge and skills).

Why

The aim is, on the one hand, to enable participants to agree on the sources of content and, on the other, to provide references and traceability to justify the content implemented in the serious game.

How to

The identification of content sources must be defined in collaboration with experts, through literature reviews or based on professional standards.

Examples

Patients' Rights Game

The "professional" content of the game will be based on:

- Swiss law (will therefore not be compatible with the law of other countries)
- the manual "The essentials on patients' rights"
- State of vaud website on patients' rights

Project Management Game

Content will be based on the following references, without any being normative:

- PMBOK
- Wisocki; Effective Project Management, Wiley and Sons, 2014
- Gray, Larson; Project management, Dunod, 2014
- Verzuh; The Fast Forward MBA in Project Management, Wiley, 2016

Mechanics

Mechanics are at the heart of the co.LAB model. They make it possible to link Learning Design to Game Design.



Learning Mechanics (LM)

What it is

"Learning mechanics are patterns of behavior or building blocks of learner interactivity, which may be a single action or a set of interrelated actions that form the essential learning activity that is repeated throughout a game." (Plass 2011, learning mechanics).

Learning mechanisms may include activities such as remembering, understanding, applying, analyzing, evaluating, or creating. Learning effectiveness increases when learning and game mechanics are aligned with learning objectives. This forces participants to develop their skills in order to achieve the game's goal.

How to

Learning is facilitated when game and learning mechanics are aligned with educational objectives (Plass, Homer, and Kinzer 2015).

In the list below:

- Define the learning mechanics that will be used in the game
- Validate that the learning mechanics are consistent with the Games Mechanics and the taxonomic level of the defined educational objectives
- Ask the question: Do the learning mechanics allow us to achieve the desired learning objectives?

Non-exhaustive list of Learning Mechanics

- Read
- Listen
- Summarize, reformulate
- Explain a concept to someone
- Solve a problem by applying a rule
- Group problem solving
- Ordering objects (process)
- Group, prioritize objects (by domain, relationships, right/wrong, etc.)
- Connecting concepts
- Generate and test a hypothesis
- Collection and synthesis of data, information
- Solve a complex problem by defining a global strategy
- Find solutions to a complex problem as a group
- Participate in a contradictory debate
- Participate in a simulation
- Perform a role play

Examples

Patients' Rights Game

The serious game must allow the implementation of the following Learning Mechanics.

- Simulation/role playing
 - take on the role of a caregiver
 - simulation of discussions with patients
- Read the theory, Apply to a concrete situation
 - in the dialogues
- Make summaries, answer questions
 - in the sections "questions asked by training practitioner, doctor, lawyer"
- Exchanges between students, students-teachers
 - decide in a team
 - Controversial debate between groups who have made different choices
 - plenum discussion during debriefings

Validation

The Learning Mechanics are:

- Related to Games Mechanics (dialogues, answering questions)
- Consistent with the taxonomic levels of the objectives
 - application: application in simulation
 - analysis, synthesis, evaluation: synthesis for answers to questions, plenum discussion

Project Management Game

The serious game must allow the implementation of the following Learning Mechanics.

- Simulation/role playing
 - take the role of a project manager
 - simulation of discussions with the team and stakeholders
- Apply to a concrete situation
 - to prepare the project proposal, planning
- Answer questions
 - in decision-making on the choices proposed
- Exchanges between students, students-teachers
 - decide as a team
 - plenum discussion during debriefings

Validation

The Learning Mechanics are:

- Related to Games Mechanics (dialogues, answering questions, planning the project and managing resources)
- Consistent with the taxonomic levels of the objectives

- application: application in simulation
- analysis, synthesis, evaluation: synthesis for answers to questions, plenum discussion

Theoretical foundations

Rabbit 2015, Plass, Homer, and Kinzer 2015, Arnab, Nicholson,

Game Mechanics (GM)

What it is

Game Mechanics are the fundamental elements of players' interaction with the game.

GMs correspond to the actions repeated by the player during the game (Sallen and Zimmermann).

A game may include a single Game Mechanic, such as jumping (or shooting, answering questions), or a set of Game Mechanics (moving, answering questions, and collecting items).

Game Mechanics determine the patterns of behavior in the game, which themselves determine the gaming experience.

Game Mechanics are the heart of the game. They must allow players to make choices that allow them to achieve the goal of the game.

Why

An error in the choice of game mechanics is a guarantee of failure.

In any game, game mechanics correspond to what the player will repeat throughout the game. But in serious games, game mechanics have a double objective (and constraints)

- build the gaming experience
- be consistent with the learning mechanics

How to

It is essential to define Game Mechanics from the beginning, even if they may evolve during design iterations.

Think about the mechanics and interactions so that they are integrated and discernible (Salen and Zimmerman 2004):

- Integrated into the game logic
 - the actions allow the player to achieve the goal of the game
- Discernible
 - actions cause system feedback
 - based on the feedback, the player understand the effect of his action and decide on the next action

Tips and tricks

Divide into Core and Secondary Mechanics

- Core mechanics
 - "the essential play activity players perform again and again in a game (...) however, in many games, the core mechanic is a compound activity composed of a suite of actions" (Salen and Zimmerman, 2004, p. 316).
 - Sicart define core mechanics as the game mechanics (repeatedly) used by agents to achieve a systemically rewarded end-game state.
- Secondary mechanics
 - "are either available occasionally or require their combination with a primary mechanic" (Sicart 2008)

Examples

Patients' Rights Game

Core Mechanic

• Dialogues with patients

Secondary Mechanics

- Answer questions asked by other people
- Search for information in internal and external game resources

Project Management Game

Core Mechanic

• Decision making (choice)

Secondary Mechanics

- Planning activities
- Management of human and financial resources

References

J. L. Plass, R. E. Mayer, and B. D. Homer, Handbook of Game-Based Learning. Mit Press, 2020.

K. Salen, K. S. Tekinbaş, and E. Zimmerman, Rules of play: Game design fundamentals. MIT press, 2004.

Sicart, M. (2008). Defining game mechanics. Game studies, 8(2), 1-14.

GM-LM alignment

What it is

Learning is facilitated when game mechanics are aligned with learning objectives (Plass, Homer, and Kinzer 2015)

Why

Successfully aligning game mechanics and learning mechanics is fundamental.

This is the heart of the successful development of a serious game for educational purposes. It is also one of the main sources of failure, not necessarily because it is difficult to achieve, but because the game was developed focusing mainly on one of the playing or learning aspects.

Theoretical foundations

(Plass 2011, learning mechanics):

- (1) Game Mechanic must not introduce excessive amounts of extraneous cognitive load
- (2) Game Mechanic must not reduce the amount of the required mental effort by too much.

Another requirement related to cognitive load is that game mechanics do not reduce the task demands imposed on the learner too much, i.e., that the mechanic does not provide the results of the processing of the information or problem solving to the learner but instead requires the learner to introduce mental effort to generate a solution.

Incentives

What it is

Incentives are used to support participant engagement and motivation.

How to

Incentives can be intrinsic or extrinsic:

- Intrinsic: related to game play and learning objectives
- Extrinsic: not directly related to game play and learning objectives

Intrinsic incentives are more effective.

Gamification based on rewards and extrinsic motivation may only provide short-term benefits. It can even be counterproductive. Examples of extrinsic incentives are points, badges or trophies.

Intrinsic incentives can arise from 3 sources (Deci and Ryan 2004):

- mastery (learning to the point of feeling mastery of a skill)
- autonomy (being able to choose between several paths)
- relatedness (not feeling alone, feeling connected to other people)

Questions to ask

- Is the activity sufficiently, but not too, challenging (=> flow)
- Are feedback given on actions clear?
- Are positive and negative reinforcements given at the right time?

Example(s)

Patients' Rights Game

We are looking for intrinsic "game and learning incentives" (linked to game play and learning objectives) rather than extrinsic (points, badges, etc.).

Motivational elements (inspired by (Nicholson, 2014)):

- Autonomy (being able to choose between several paths)
 - in dialogues, always offer several choices
 - possibility to partially choose the order of patients to be seen, answers to questions in the exercises
- Mastery (learning to the point of feeling mastery of a skill)
 - the student begins with simple cases, where he learns a first rule,
 - then he can re-apply this rule in the following cases and thus have the feeling of having the beginnings of mastery
 - Then discovery of a new difficulty

- Relatedness (not feeling alone, feeling connected to other people)
 - possibility of introducing relatedness by having students work in groups, discussing to choose the most relevant answer in the dialogues
 - group discussion during the debriefing phases

References

S. Nicholson, "A RECIPE for Meaningful Gamification," in Gamification in Education and Business, Springer., T. Reiners and L. C. Wood, Eds. Cham: Springer International Publishing, 2015. doi: 10.1007/978-3-319-10208-5.

E. L. Deci and R. M. Ryan, Handbook of self-determination research. University Rochester Press, 2004.

Game and Learning Interactions

What it is

It is through interaction with the game and learning mechanics that players will progress in the game and learn.

How to

Define interactions in 2 steps:

- 1. Define Interactions types
- 2. Check that interactions allow for
 - a. meaningful play
 - b. meaningful learning

Interactions types

Define interactions on the following points:

- Place
 - where the interaction takes place (navigation, answering questions, selecting resources, etc.)
- How are the inputs made?
 - with which interface the player interacts with the game: mouse, keyboard, microphone, touch screen, etc.
- How are the outputs made?
 - how system feedback is done: texts, images, sounds, etc.

Meaningful Play

(Salen, 2004) defines meaningful play as emerging from the actions of players who are

- discernible (the player receives feedback)
- integrated into the context of the game play (the player understands how the effect of his action influences the rest of the game).

Meaningful Learning

Meaningful learning, as opposed to rote learning, is achieved when the learner is actively involved in the learning process and the newly learned information is linked to prior knowledge. According to Mayer (Mayer 2002), meaningful learning occurs when learners construct knowledge to successfully solve problems.

Implementation

In serious games, meaningful learning can be achieved when participants must acquire new knowledge to solve the problem present in the game. Learning can occur either inside the game or outside the game, for example during the debriefing phase.

The successful implementation of meaningful play and meaningful learning makes it possible to obtain what we could call meaningful serious gamification.

Questions to ask

- Is the activity sufficiently, but not too, challenging (=> flow)
- Is the feedback given on actions clear?
- Can the player understand the effect of his actions, how they bring him closer or not to the goal?

References

K. Salen, K. S. Tekinbaş, and E. Zimmerman, (2004). Rules of play: Game design fundamentals. MIT press.

Mayer, R. E. (2002). Rote versus meaningful learning. Theory into practice, 41(4), 226-232.

Example(s)

Patients' Rights Game

Interactions types

- Locations of interactions
 - Choice
 - possible answers in the dialogues
 - answers in the questions
 - Navigation
 - between patients
 - between dialogues and exercises
- Inputs
 - All interactions are done with the mouse (left click only).
 - \circ $\;$ Use of the keyboard only for answers to open questions.
- Outputs
 - feedback in the form of texts (dialogues, exercise corrections).

Meaningful play

Do the interactions allow for Meaningful play (discernible and integrated)?

Discernable ?

- Players receive feedback
 - Non Player Character responses during speeches
 - Corrected questions in the exercises
- All feedback is given directly after the actions and linked to previous actions (usually to the previous action, sometimes to what was decided earlier in the relationship with the patient).

Integrated?

In the speeches, the NPC's reactions should allow the player to understand whether they are getting closer to the objective set for this specific encounter with the patient. This should make

it possible to understand how previous actions (what was said to the patient) influence the rest of the game (patient reactions).

Meaningful learning

Does the player need to acquire new knowledge to solve the problem posed in the game?

- The situations present in dialogues with patients must raise legal issues.
- Players can access documentation on patient rights to obtain the knowledge to make the right choices in the game.

Game Design

Game design includes the detailed description of all the elements that make up the game. It is based on Game Mechanics, which makes it possible to make the link with Learning Design.



Goal and Rules

Goal

What it is

A game is a conflict to be resolved by the player: how to achieve an objective (goal of the game) with the possible interactions (rules of the game)? The goal is therefore one of the elements of the conflict to be resolved. Goal is an essential part of the enjoyment of the game.

Why

If there is no goal, there is no game. It is a fundamental element of any game, because the goal allows for the player to know if his actions bring him closer to or further from the goal, and therefore to have a Meaningful Play. And the Goal defines the end of the game (because the goal is reached)

How to

The aim of the game must be:

- Understandable (simple, clear)
- Achievable (players must feel like it's possible)
- Rewarding if achieved

Example(s)

- Reach a place, achieve something
- Solving a problem, finding the answer
- Win a race
- Reach a number of points

Rules

What it is

Rules correspond to the formal, internal structure of the game. A game is defined by its rules. Rules limit players' actions in achieving the goal of the game. It is the limitations given by the rules that give meaning to the game.

Why

A game **is** its rules. What else to say?

How to

Begin by defining what do players need to know to start playing?

Rules' characteristics::

- Limit player actions
- Explicit
- Shared and accepted by all players
- Mandatory
- Fixed (does not change during the game)

Characteristics of good rules:

- players focus on the gaming experience rather than understanding the rules
- the rules are simple but generate complex playing possibilities

Questions to ask

- Is the goal clear?
- Are the rules clear?
- Are the rules of the game simplified as much as possible?

Example(s)

Patients' Rights Game

Goals

Succeed in conducting dialogues with different patients while taking into account both the quality of care and respect for patient rights.

Rules

In dialogues, the player can choose possible response options

It is not possible to go back: "what is said is said"

It is possible to exit the dialogues to consult the theory

The notion of "real time" is not taken into account (no time pressure, no timing)

Project Management Game

Goals

Succeed in completing your project, while respecting the pre-defined objectives, costs and deadlines

Rules

It is not possible to go back: "what is decided and decided"

The notion of "real time" is not taken into account (no time pressure, no timing)

Game universe and type

Universe

The game universe corresponds to the world in which the game will be played. It can be a fictional world or a simulation of the real world.

Game Type

Define the type of game that will be played in this universe:

- Categories of play
 - Competitive or collaborative
 - Chance-based
 - Role play, simulation
 - Physical sensation

Example(s)

Patients' Rights Game

Game Universe

The player takes the role of a caregiver. He evolves in the world of care, meeting patients in hospitals, EMS or home care.

Game type

- Collaborative within each group, possibly small competition between groups
- No notion of luck or chance
- Based on simulation, "act as if"

Project Management Game

Game Universe

The player takes the role of a project manager. He evolves in the world of a company.

Game type

- Collaborative within each group, possibly small competition between groups
- No notion of luck or chance
- Based on simulation, "act as if"

Simulation model

Serious games may include a simulation. If it does not include a simulation, just move to the next chapter.

A simulation is a simplified representation of reality, that seeks to achieve fidelity. It is necessary to define

- the type of fidelity sought
- the type of simulation model.

Why

If the model is wrong, the simulation will "sound false" and students will not get into the game, will not act "as if..."

Students will discuss the fact that the simulation sounds wrong, justifying their mistakes on this basis rather than seeking to learn from their experience in the simulation.

How to

Answer to the questions

- What element of the reality that we wish to represent (i.e. what is the essence of the experience that students must live to learn)?
- What are the possible and necessary simplifications? We must simplify (otherwise the simulation becomes too difficult to develop and we lose the focus of attention during the game). But we must not over-simplify about essential elements.
- What type of fidelity is sought ? Different types of fidelity are possible (cf next §), some are more appropriate depending on objectives.

Develop the simulation model

Validate the simulation model

- by showing them the model
- by having them test the implementation of the model in the game

Define type of fidelity

A simulation can seek to achieve several types of fidelity or realism (Ye 2019, Ronney 2012):

- Sensory fidelity
 - Audio-visual (images, videos, sounds) or physical sensation (accelerations, force feedback) are similar to reality.
- Narrative fidelity

- The content of what the characters say, the story, the narrative context are similar to reality.
- Cognitive fidelity
 - Reflexions and decisions players have to make in the simulation correspond to reflexions and decisions made in real life.

Tips and tricks

- Studies show that narrative and cognitive fidelity are generally more important than audio-visual fidelity (Rooney 2012, Ye 2029)
- Avoid falling into the uncanny valley
 - By increasing audio-visual resemblance of simulated humans with real human beings, the feeling of realism decreases and the rejection of simulation increases.
- Adapt the type of fidelity to the learning objectives
 - knowledge: narrative and cognitive fidelity
 - behavior, gestures, know-how: audio-visual and physical fidelity

For example

- Training for patients triage in a hospital emergency room (questions to ask, examinations to carry out) => narrative and cognitive fidelity
- Learning the gesture of placing an blood perfusion: physical fidelity
- Airline pilots: physical and cognitive fidelity.

Define the simulation type

Different types of simulation and models are possible. Choose the one appropriate for achieving the type of fidelity defined.

- Mathematical model
 - for the simulation of a complicated deterministic system
 - The model allows you to reproduce reality and the reactions of the simulation based on the actions of the players
 - The model would make it possible to make predictions about reality
 - Example: plane, blood circulation
- "Pre-determined paths" model
 - simulation of complex systems (e.g. dialogues with a patient)
 - reality is not deterministic, reducible to equations
 - A simple model, of pre-coded deterministic paths, can generate complex reflections in players
 - The model is not predictive. For example, it will not be able to predict how a patient will effectively answer in real life.

Define the simulation category

The choice of category must take into account the educational objectives and the context (infrastructure, budgets, number of students).

Simulations may be categorized into the following categories (Chiniara, 2013):

- 1. Organic
 - 1.1. Alive (e.g.simulated patients)
 - 1.2. Non-living (e.g. anatomical parts, cadavers)
- 2. Non-organic
 - 2.1. Synthetic (non-predominant computer role)
 - 2.1.1. mannequins (e.g. low or high fidelity mannequin)
 - 2.1.2. procedural simulators (reproduction of a particular technique, repetition of gestures)
 - 2.2. Electronic (predominant computer role)
 - 2.2.1. software played on screen
 - 2.2.2. virtual reality

An overall simulation concept can integrate several categories. For example:

- The week before the face-to-face simulation, the student becomes acquainted with the patient in a software simulation (2.2.1)
- In person, the student continues the simulation that he started on the software, but with a simulated patient (1.1)

Examples(s)

Patient's Rights Game

Fidelity

- Cognitive fidelity
 - The options proposed in the dialogues must generate complex reflections on the trade-off between quality of care and patients' rights.
- Narrative fidelity (necessary for realism and cognitive fidelity)
 - Dialogues must be consistent and correspond to possible professional situations

Simulation model

- No need for a mathematical simulation model
- Simulation model can be simple and deterministic, but must generate complex reflections
- Dialogues in the form of branching stories (finite state machines)
- Dialog choices (several possible answers)

Type of simulation Software, played on screen

References

G. Chiniara et al., "Simulation in healthcare: A taxonomy and a conceptual framework for instructional design and media selection," Med. Teach., vol. 35, no. 8, pp. e1380–e1395, Aug. 2013, doi: 10.3109/0142159X.2012.733451.

X. Ye, P. Backlund, J. Ding, and H. Ning, "Fidelity in Simulation-based Serious Games," IEEE Trans. Learn. Technol., 2019, doi: 10.1109/TLT.2019.2913408.

P. Rooney, "A Theoretical Framework for Serious Game Design," Int. J. Game-Based Learn., vol. 2, no. 4, pp. 41–60, 2012, doi: 10.4018/ijgbl.2012100103.

User Interfaces and UX

What it is

Interfaces correspond to what the player will see. They will have an impact on the feeling of the game and the pleasure. Graphics and sounds must be in line with the game universe and the desired fidelity.

UX (User Experience) relates to the usability of the game and must be considered according to the context of use and learners profiles.

How to

Perform an iterative design

- Start with simple drawings of the main interface
- These first models will subsequently be completed, improved, and implemented in the game.

User tests are the best way to validate that the developed application is understandable by users

- Perform UX tests regularly
- 3 to 5 users per test are generally enough

Examples

1st drawings



1st implmentation

Albert Martin aux urgences Albert Martin à l'hopital Albert Martin à la maison		Albert Mar	
Albert Martin de retour à l'hopital		Le patient souffr	e de
Documents	1/3	Exercices	1/3
Documents	1/3 💬	Exercices Exercice 1	1/3
Documents Document 1 Document 2	1/3 	Exercice 1 Exercice 2	1/:

Developed game

€ Infos du patient		Documents
-		
	Rencontres	Exercices
	lère rencontre à domicile	Consentement libre et éclairé
	Rencontre à l'EMS	Consentement libre et éclairé - bis
M. Henrioud	2ème rencontre à domicile	Assistance suicide
Physiothérapie à domicile		
Monsieur Henrioud (85 ans) et Madame Henrioud (73 ans) vivent dans leur bel appartement. Ils sont mariés depuis 40 ans et ont deux enfants. Ils sont autonomes dans la gestion des activités de la vie quotidienne.		

Game Structure

What it is

The Game Structure describes the overall sequence of game and learning activities.

How to

Divide the Game into Levels and Sublevels. For each Level and sublevel, define the Game and Learning sequences.

Check for consistency:

- Take into account any prerequisite knowledge.
- Progressions that are too difficult or too easy are demotivating factors.
- Think about progression both in terms of games and learning.

Examples

Project Management Game

General verification of the overall structure:

- Difficulty Progression
 - a. OK: only a few features in the first steps, then adding new features at each step
- Learning progress
 - a. OK: at each stage, new learning activities.
 - b. OK: there is no prerequisite knowledge that would be acquired in a following levels
- Consistency with educational objectives
 - a. OK: Sequences cover all of the educational objectives

Sequences:

• Initiation

Software simulation: Choice on options

Role plays: Pitching the project

Learnings objectives: Develop a project proposal, perform a project profitability analysis, perform a risk management process, prepare and produce a project presentation

- Planning
 - a. Software simulation: Choice on options, Gantt and resources
 - b. Role plays: Presentation of planning to the Project Management Office
 - c. Learning: activities network, planning optimization

- Execution
 - a. Software simulation: pèroject monitoring, change management
 - b. Role plays: steering committee
 - c. Learning: Monitor a project with different monitoring tools (Monitoring Gantt, EVM), Implement project control based on monitoring
- Closure
 - a. Software simulation: not used
 - b. Role plays: Presentation of lessons learned
 - c. Learning: Project closure report

Narratives

What it is

Narratives correspond to the story, the dialogues with characters, emails, texts in questions and choices.

How to

To write a narrative, is about creating interactive scenario

- Interactive
 - players will be able to make choices
 - dialogues will adapt according to players' choices
- Scenario: the story will be framed. The player will have limits in the narrative universe.

The quality of the interactivity depends of:

- Number and quality of choices
- Number and quality of intermediate and final feedback

Interactivity involves that we will have:

- always: several paths to reach the ends
- in general: several possible endings.

How to write a screenplay, interactive dialogue

To write a dialogue or interactive scenario, three main approaches are possible:

- 1. Tree structure: all paths are different
- 2. Network with reframing: different paths arrive at the same situation.
- 3. Closed: whatever the path, we arrive at the same result



Which approach to choose?

There is a trade-off to be made between the "variety of possibilities" and the "time required for writing"

- Either you work in a tree structure, the narratives can be very varied and adapted. But the number of texts to produce is exponential. It quickly becomes impossible to manage.
- Either you group the possible paths (several answers/paths lead to the same situation). There are fewer texts to produce, but there is a risk of reducing specificity (the right text based on everything that has been done before), losing the coherence of the dialogue according to the paths followed.

The choice of approach depends on different parameters:

- Will the participants play the game several times?
 - yes: different player choices must lead to different feedback and endings
 - no: students will only see one path. You can group the different paths together.
 You have to give the impression of choice, even if behind the software doesn't really give you any choice. We must be careful that this "no choice" does not become visible to the players.
- Time available for writing the script
- Duration of the dialogue (i.e. how many question/answer steps, with how many choices at each step). The greater the number of steps, the more impossible it becomes to have a purely tree-based approach.

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			temps développement

Tips and tricks

Before writing the dialogues

- Describe the context of the dialogue
 - Location
 - Role taken by the player (normally the same throughout the game)
 - Optionally: conditions, time of appearance of the dialogue
- For serious games that aim to develop professional or practical skills, start by describing in a few lines the expected behavior in the situation:
 - what absolutely must be done?
 - What should you definitely not do?
 - What could we do, but is not essential?
- Translate these behaviors into a dialogue, which offers options of what to do, not to do or indifferent.

Dialogue writing

- Transform our initial idea into a story (sequence of dialogue steps). In general, it is "your story", the one we imagine, the path we would have followed. This will give a first possible ending to the dialogue.
- Define the different possible endings.

- define the possible endings before starting to carry out the dialogues (the paths that allow you to reach the endings).
- for example, start from two main ends (successful and unsuccessful). Then break down into "very successful / moderately successful" and "a little unsuccessful / totally unsuccessful". You thus quickly have 4 possible endings.
- Transform "your" basic story into multiple stories. That is to say, add the other paths, which will lead to the other ends. The work is made easier if you know what goal you need to achieve.

Examples

Narrative context

- Game: Patient Rights
- Location: In the hallway leading to the x-ray room:
- Player role: nurse
- Game Character : Monique

Narrative in text form

You can start by writing a dialogue in text form (with word processing software). But you will quickly be limited and have to move on to writing the dialogue in the form of a network.

Monique: I don't think I need a radio

- Player: So I'll take you out of the hospital
 - Monique: thank you!
 - When you come back, the doctor asks you: how did it go?
 - Player: She said she didn't need a radio and I took her home
 - Player: She said she wanted to go home and I took her home
- The doctor asked for it, we should talk to him about it
 - Monique: I prefer to decide alone
 - Player: you have no choice
 - Monique: then only if you assure me that my parents will not be informed
 - Player: ...
 - Player: ...
- Player: You have no choice,
- Player: you should talk about it with your parents

Narrative in the form of a network

But the best way to describe dialogues is as networks. This is generally how they will be introduced into the simulation.

Below is a dialogue in network form (screenshot of the Wegas dialogue creation system). On the boxes we find the texts said by the Game Character, on the links, the possible player' answers.



Assessment Design

As from the design phase, define how the game and the acquisition of knowledge will be evaluated.

If a research project is being considered, research questions must be defined and research protocols established. This should make it possible to determine which data to collect.

Also ensure compliance with regulations regarding the protection of personal data. Consent mechanisms and the need for validation by an ethics committee must be taken into account.



Learning Assessment

Why

Learning Assessment will validate the contribution of the game to the learning process.

How to

In the design phase, already define how the acquisition of knowledge or skills will be evaluated.

If a research project is being considered, research questions must be defined and research protocols established. This should make it possible to determine the necessary indicator data, as well as how the processing and visualization of the data will be carried out.

Ethics and data protection

Ensure compliance with regulations regarding the protection of personal data. Consent mechanisms and the need for validation by an ethics committee must be taken into account.

Evaluation of learning

The learning assessment may include both an objective assessment of knowledge acquisition, and a subjective evaluation of the contribution of the game to learning

Objective assessment of knowledge acquisition: Pre-test and post-test of knowledge

Subjective evaluation of the contribution of the game, by the students: Students evaluate their perception of the contribution of the game to learning.

Pay attention to "media comparison" type approaches: a group with serious game, a control group with another teaching method. It is difficult to justify the contribution of serious games in this way, because the difference between the two groups depends on the quality of the training that will be given to the control group.

References and resources

For a subjective assessment of learning:

https://doi.org/10.1103/PhysRevLett.108.111103 , Google Scholar Crossref , CAS 10. E. Fokides, P. Atsikpasi, P. Kaimara, and I. Deliyannis, "Factors influencing the subjective learning effectiveness of serious games," J. Inf. Technol. Educ., vol. 18, pp. 101-1 437–466, Oct. 2019, doi:10.28945/4441.

Examples

Patients' Rights Game

Evaluation of learning

The evaluation of learning will be done on the basis of the educational objectives. It will be carried out with a performance test (integrated into the game), including a pre-test and post-test.

Evaluation of subjective learning

The assessment of subjective learning will be carried out with:

- Questionnaire proposed to students
- Based Serious Games Evaluation Scale (SGES) (Forkides et al., 2019)

Référence

• Fokides, E., Atsikpasi, P., Kaimara, P., & Deliyannis, I. (2019). Factors Influencing the Subjective Learning Effectiveness of Serious Games. Journal of Information Technology Education: Research, 18, 437-466. https://doi.org/10.28945/4441

Game Assessment

What it is

Assessment of the quality of the game.

How to

It is preferable to define already in the design phase how and by whom the game will be evaluated.

If a research project is planned

- research questions must be defined and research protocols established. This should make it possible to determine the necessary indicator data, as well as how the processing and visualization of the data will be carried out.
- it may be interesting to refer to validated questionnaires such as complete AttrakDiff or simplified AttrakDiff

Annexes

Questions to ask throughout the process

Player-game-learning interaction

Are we developing a meaningful play? player actions and system feedback are

- discernible (the player perceives that he has done something right or wrong)
- integrated (in the context of the game, the player understands how his action is linked, influences the rest of the game)

Game structure

- Is the goal of the game clear?
- Is the activity sufficiently, but not too, challenging (=> flow)
- Are the rules of the game clear?
- Are the rules of the game simplified as much as possible?
- Is the feedback given on actions clear?
- Can the player understand the effect of his actions, how they bring him closer or not to the goal?
- Are positive and negative reinforcements given at the right time?

Game-learning integration

- Do students understand the connection between the game and the lesson?
- Is the game integrated with the exam?