Gamification Journey

Narrative Gamification
Framework for Education

Narrative Gamification Framework for Education Documentation

This documentation is integral part of the Ph.D. project of **Paula Toledo Palomino** in Computer Science at ICMC/USP, entitled **“Gamification of Virtual Learning Environments: A Narrative and User Experience Approach”.**

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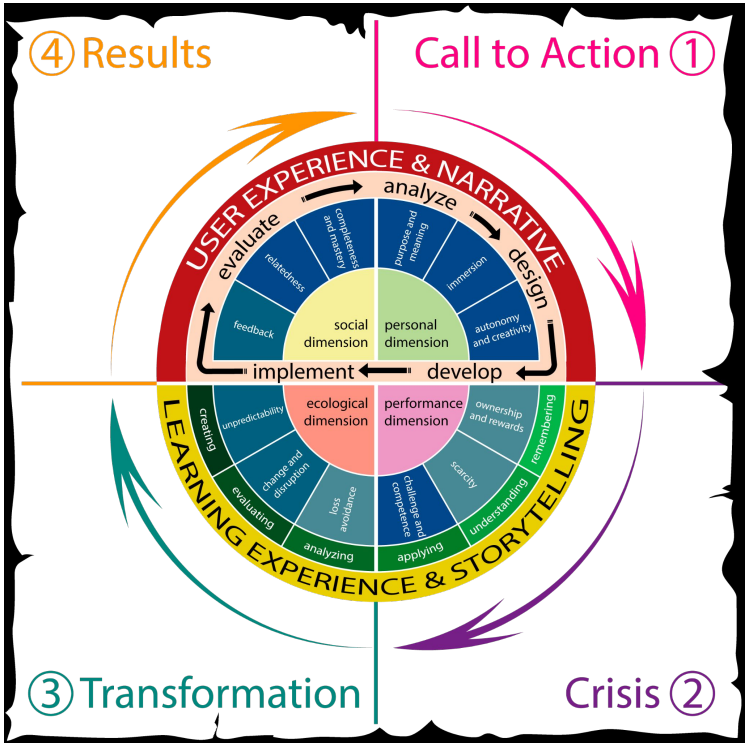
Project Overview

Description:

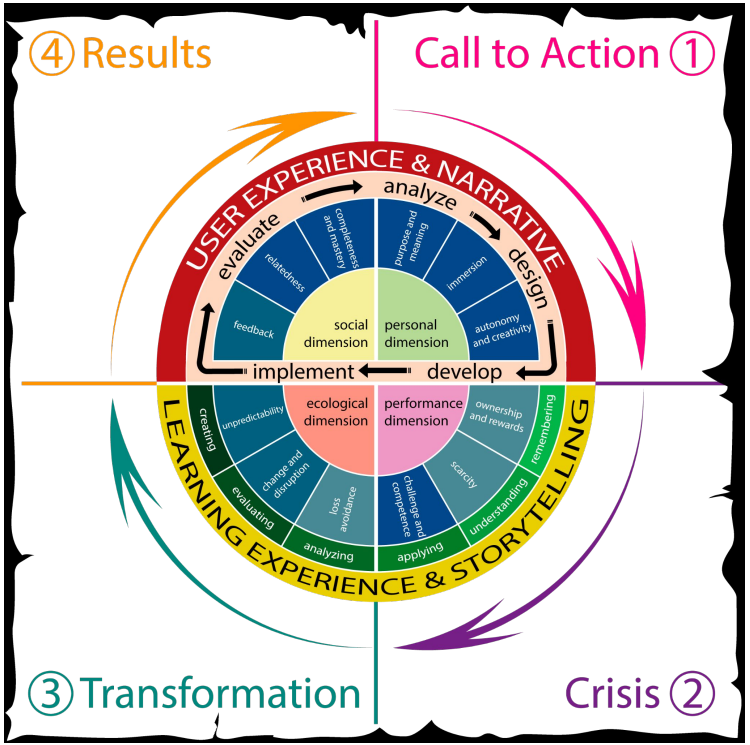
The Narrative Gamification Framework for Education **Gamification Journey** is a model created by **Paula Toledo Palomino** to help teachers gamify classes and digital learning environments, with the main objective of promoting student motivation and engagement with the learning process.



Project Overview

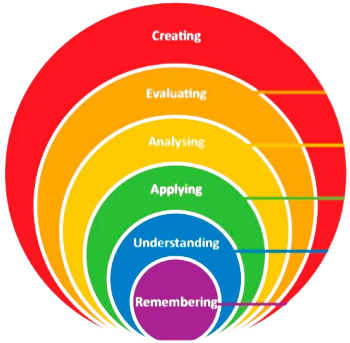
Description:

By Gamification we mean the **use of game elements and concepts outside the context of games** (1), i.e., these characteristics that constitute what a game is are mapped and these elements are isolated, so that they can be applied in systems and situations external to the games themselves, to achieve specific goals.



1 Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011, September). From game design elements to gamefulness: defining" gamification". In Proceedings of the 15th international academic MindTrek conference: Envisioning future media environments (pp. 9-15).

Design



Conceptual Design:

The framework was developed based on several theories in the areas of psychology, anthropology, education and HCI, being its pillars: "The Hero's Journey" (2), "Bloom's Taxonomy" (3) and "TGEEE" (4) (taxonomy of game elements for use in educational contexts).

2 VOGLER, Christopher. The Writer's journey. Michael Wiese Productions Studio City, 2007.

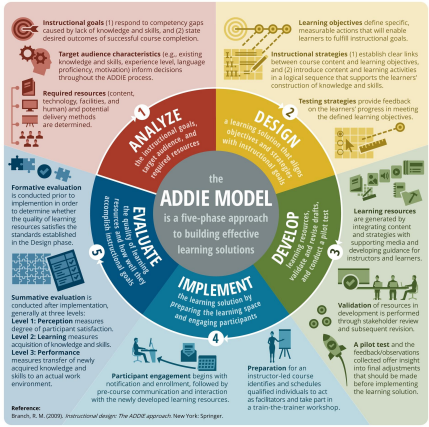
3 ANDERSON, Lorin W. et al. A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives. Longman,, 2001.

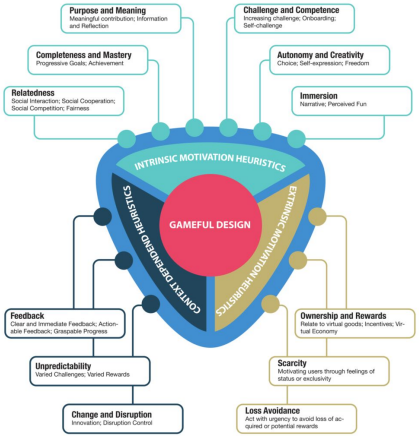
4 Toda, A. M., Klock, A. C., Oliveira, W., Palomino, P. T., Rodrigues, L., Shi, L., ... & Cristea, A. I. (2019). Analysing gamification elements in educational environments using an existing Gamification taxonomy. Smart Learning Environments, 6(1), 1-14.

Design

Conceptual Design:

In addition, we used the heuristics for gamified designs "Gameful Design Heuristics" (5) as general principles for the design of classes and materials, and as a framework for the instructional design, we used the ADDIE model (6); although the framework also supports the use of any another thinking model and design cycle, such as Design Thinking, for example.





5 TONDELLO, Gustavo F. et al. Gameful Design Heuristics: A Gamification Inspection Tool. In: International Conference on Human-Computer Interaction. Springer, Cham, 2019. p. 224-244.

6 Morrison, Gary R. Designing Effective Instruction, 6th Edition. John Wiley & Sons, 2010.

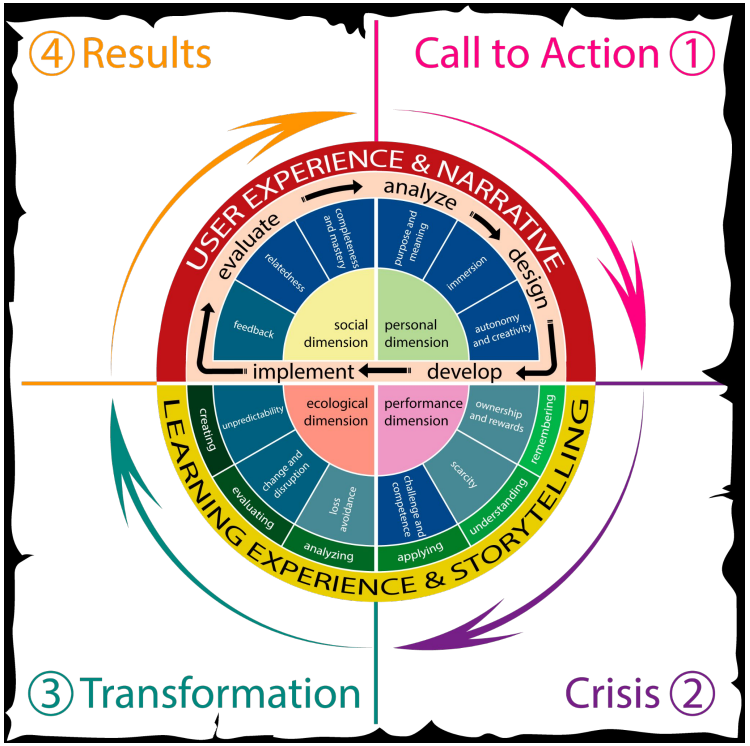
Using the Framework

- Details
- Step-by-Step

Framework Detail

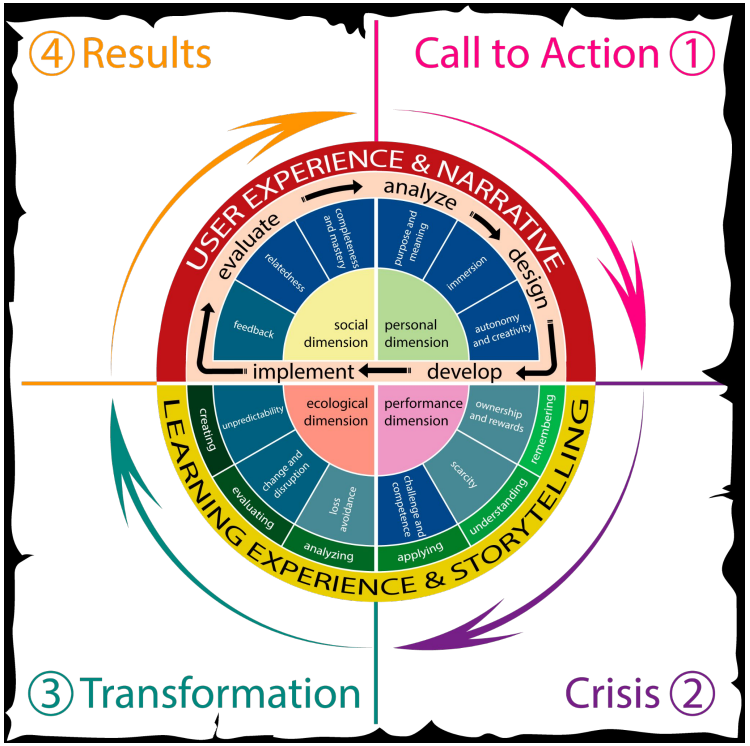
The model on the side has a double representation:

1. The student's journey in the learning process (the 4 acts and Bloom's taxonomy)
2. The guidelines that the teacher must follow to implement the strategies (heuristics, instructional design and dimensions)



Framework Detail

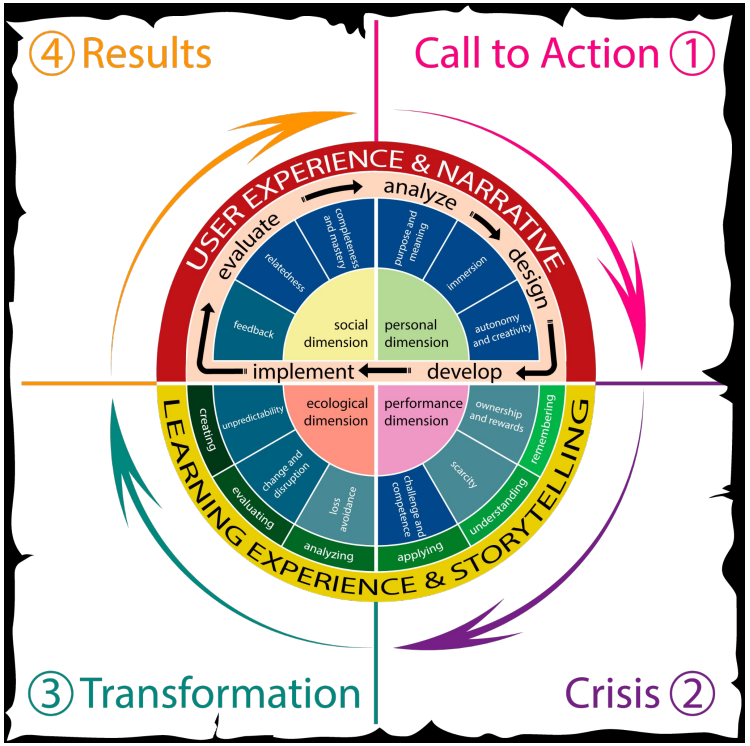
The framework works iteratively and incrementally, i.e., the educational gamification strategy can be implemented by blocks (or modules) in several different cycles, or it can be considered as a journey for an entire discipline, implementing the content progressively accordingly.



Framework Detail

The 4 Acts of the Hero's Journey:

The model describes in its macro form the Hero's Journey adapted for learning. So in the first quadrant, we have the “Call to Action”, in the second one, the "Crisis", or conflicts, in the third, the "Transformation" arc and finally, in the fourth and last one, the "Results" arc.



Framework Detail

Narrative and User Experience | Storytelling and Learning Experience

As a framework that considers the use of Narrative and Storytelling game elements a priority, both permeate the entire process and relate to the user experience (whether the student's experience with a gamified system or with the classroom itself), and the learning experience, which differs from the first in that it focus on learning itself.

Definitions

1

Narrative

It's the order of events as they happen in a game, through the user experience. This experience is influenced by the implicit choices made by the user. (4)

2

Storytelling

It is how the story (and context) of the environment is told and presented, which can be through text, voice or even sensory. (4)

3

UX

User Experience is the set of elements and factors related to the user's interaction with a product, system or service whose result generates a positive or negative perception (7).

4

LX

Learning Experience deals with methods that focus on user learning, making the student protagonist of this process.

4 Toda, A. M., Klock, A. C., Oliveira, W., Palomino, P. T., Rodrigues, L., Shi, L., ... & Cristea, A. I. (2019). Analysing gamification elements in educational environments using an existing Gamification taxonomy. Smart Learning Environments, 6(1), 1-14.

7 Norman, D. (2013). The design of everyday things: Revised and expanded edition. Basic books.

Framework Detail

Narrative & UX

The key to using Narrative and relating it to UX is to guide students so they can create their own learning experiences (as a result of their personal choices and understanding of the learning process, as well as their decisions when doing the activities), with freedom of choice but with a clear goal in mind.

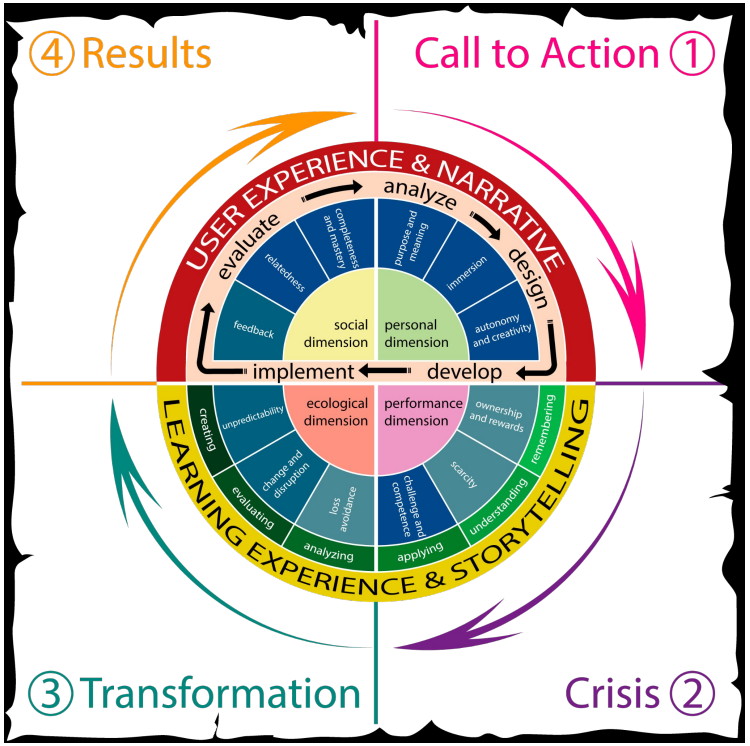
Storytelling & LX

The Storytelling game element supports the narrative approach by providing resources to guide the learning experience and strengthen the context, thus strengthening the purpose of why something should be studied.

Framework Detail

Differences between Instructional Frameworks and Bloom's Taxonomy

The framework supports the use of different frameworks for instructional design (such as ADDIE and Design Thinking) and Bloom's taxonomy, considered in some cases also as an instructional framework.



Framework Detail

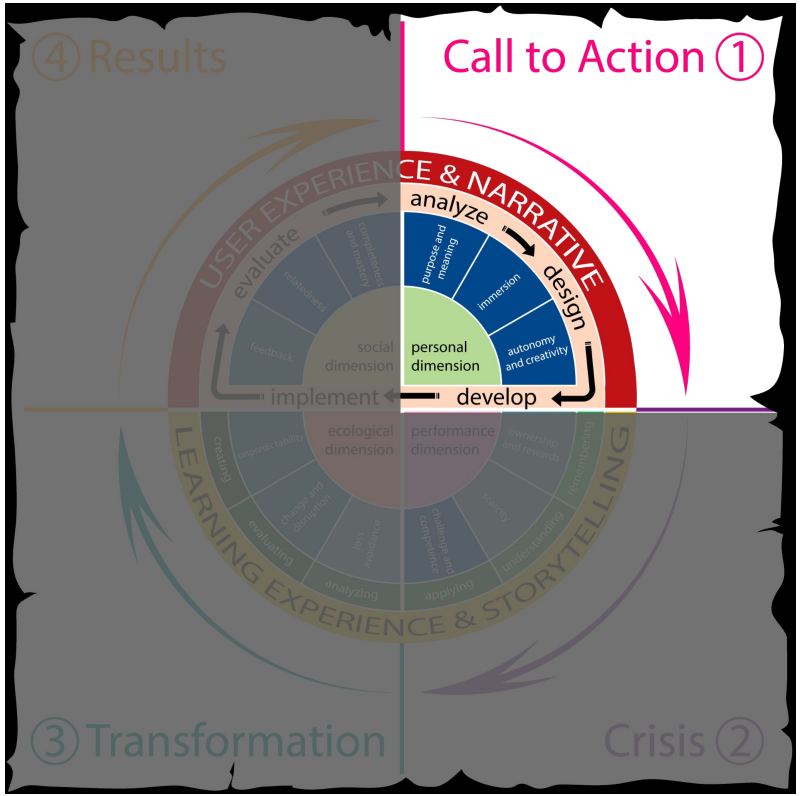
Differences between Instructional Frameworks and Bloom's Taxonomy

In this case, however, what we call frameworks for instructional design (represented in the model in the upper area of the circle with ADDIE model steps: **Analyze, Design, Develop, Implement and Evaluate**) define how the **design cycle should be worked,** while Bloom's Taxonomy, represented in the model at the bottom of the circle, in gradients of green (**Remembering, Understanding, Applying, Analyzing, Evaluating and Creating**), represents the **student's learning stages during the learning journey.**

Step by Step

Act 1: Call to Action

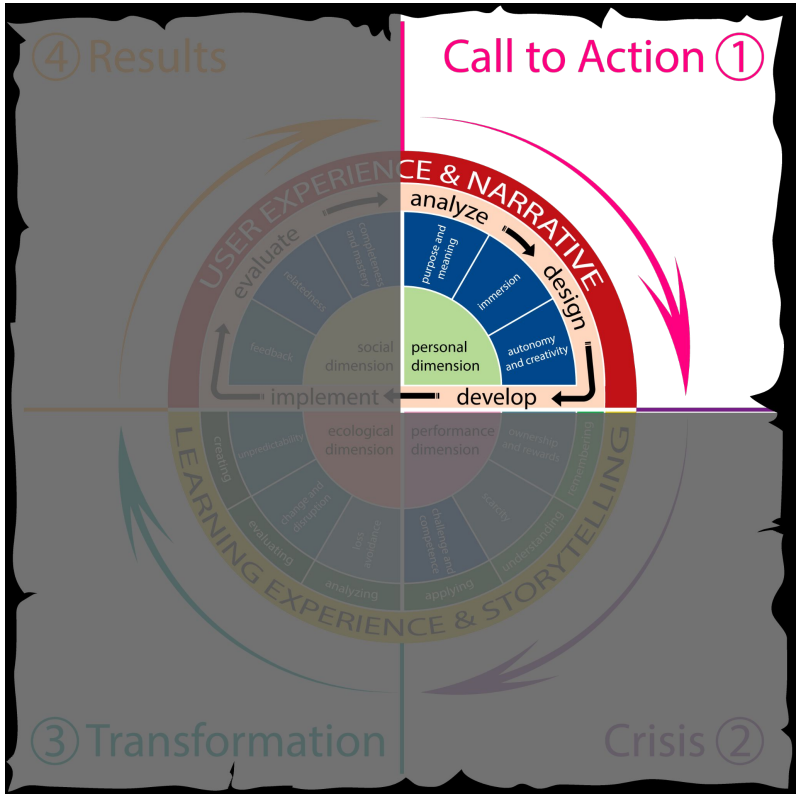
In this first quadrant, we have the **beginning of the student's learning journey.** Either the student is being introduced to the content by the teacher in the classroom, or they are having their first interactions with the learning environment.



Step By Step

Act 1: Call to Action

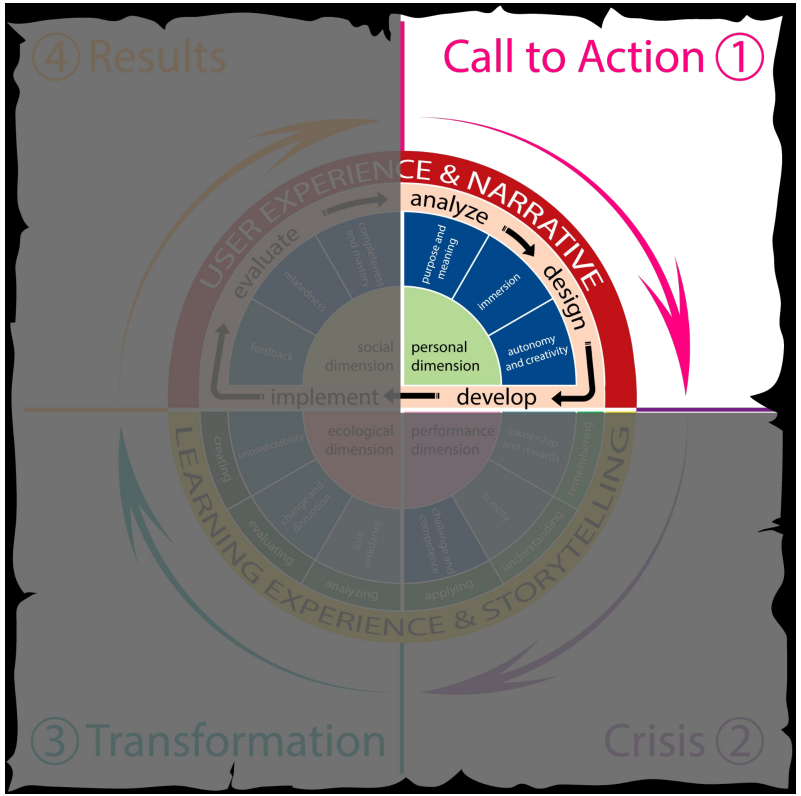
From the teacher's point of view (or the system design), they should put together this introduction considering that it should have at least:



Step by Step

Purpose and Meaning

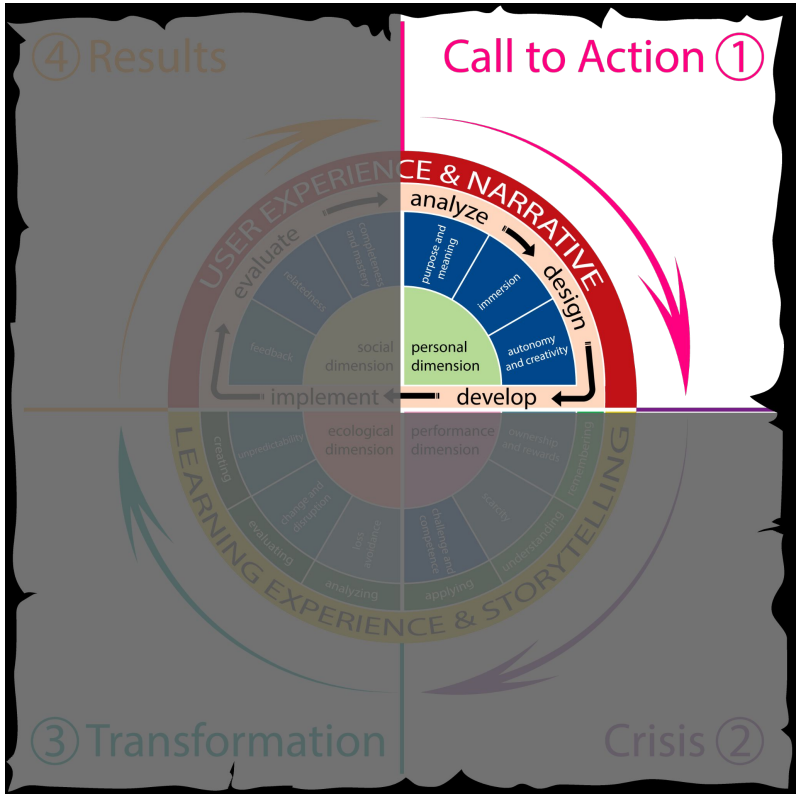
The content presented needs to be close to the student's daily life, to their 'common world'; and they need to see a significant contribution that, by studying this content, they will 'earn' something, that is, **that learning a particular subject can enrich their life experience.**



Step by Step

Immersion

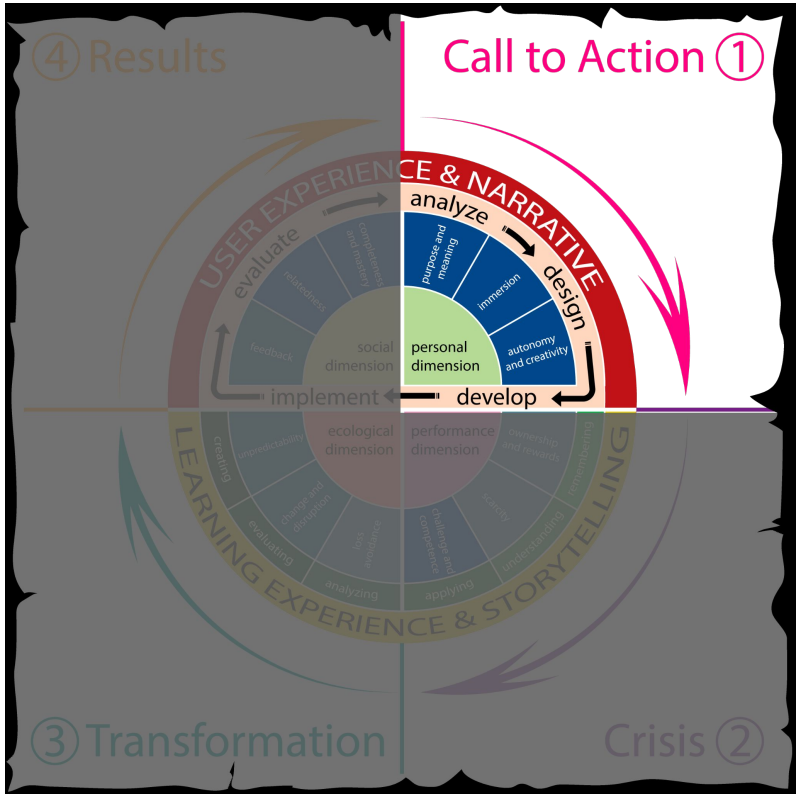
The beginning of a subject or discipline must consider that you are bringing someone from an 'outside' world to a new world, and thus, **immerse the student in this new universe.** The student needs to be aware that this journey that is about to begin will be fun.



Step by Step

Autonomy and Creativity

The teacher (or the system) needs to give the student the feeling that they have the **autonomy to learn and do the tasks as they see fit,** that they can apply their creativity and **experience the journey in the best way they want to.**



Step by Step

Personal Dimension

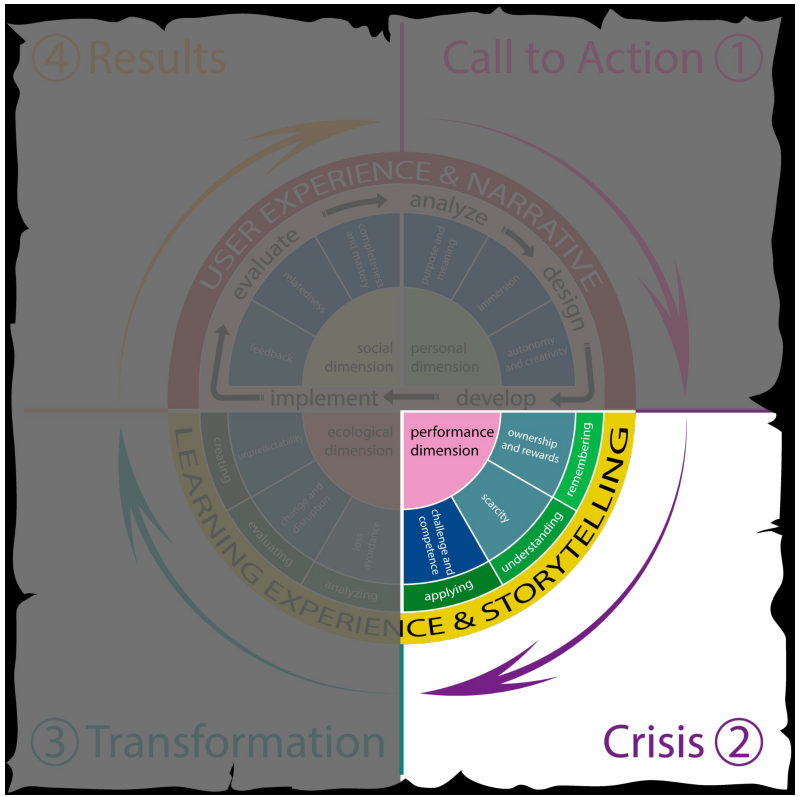
Optionally, other game elements might be used to enrich the experience. In the case of the call to action arc, the student will be more susceptible to game elements that work with their perception of things.

Additionally, the elements of the **performance dimension** can also be worked on in the background.

Step by Step

Act 2: Crisis (Conflict)

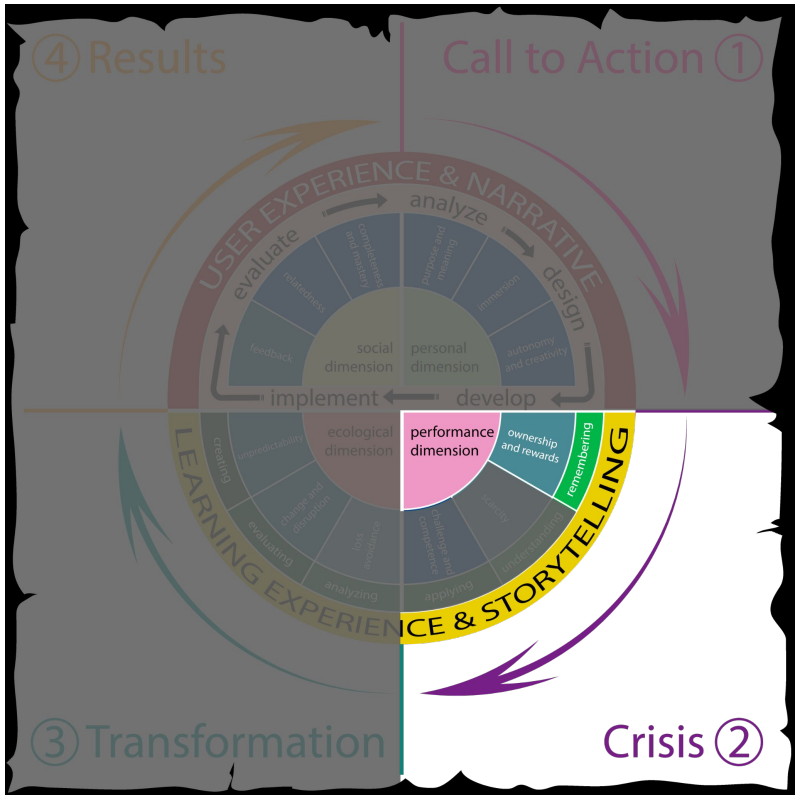
Once the student is motivated and comfortable with the beginning of the journey, it is time to start presenting the pedagogical content. The purpose of this act is to **take the student out of their 'comfort zone',** introduce them to the new and **challenge them to grow.**



Step By Step

Learning Objective: Remembering

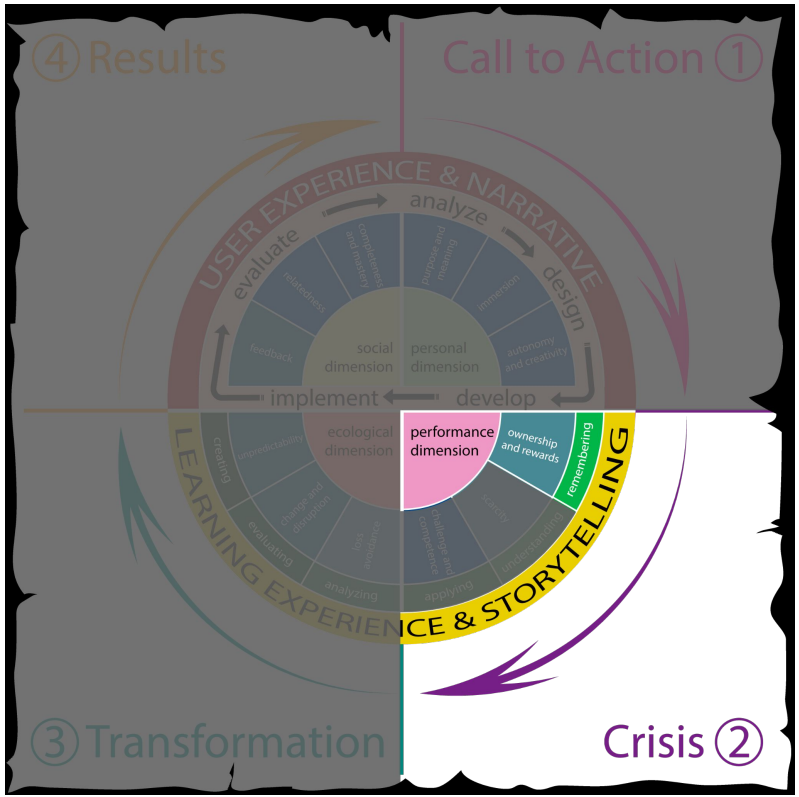
In this step, design learning activities to assess if students can **define, duplicate, list** or **memorize** the content.



Step by Step

Ownership and Rewards

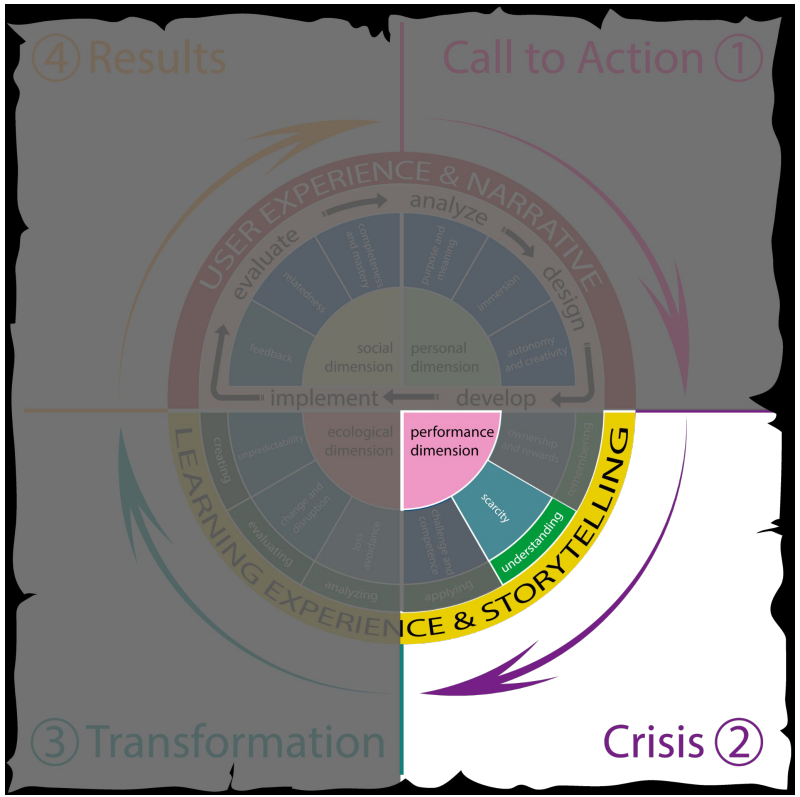
As we are introducing challenges and taking the student out of their 'comfort zone', in this step we can work on external motivational affordances, that is, whose result or value is separate from the activity itself. Here we can work with **virtual goods, incentives** or some kind of **virtual economy.**



Step by Step

Learning Objective: Understanding

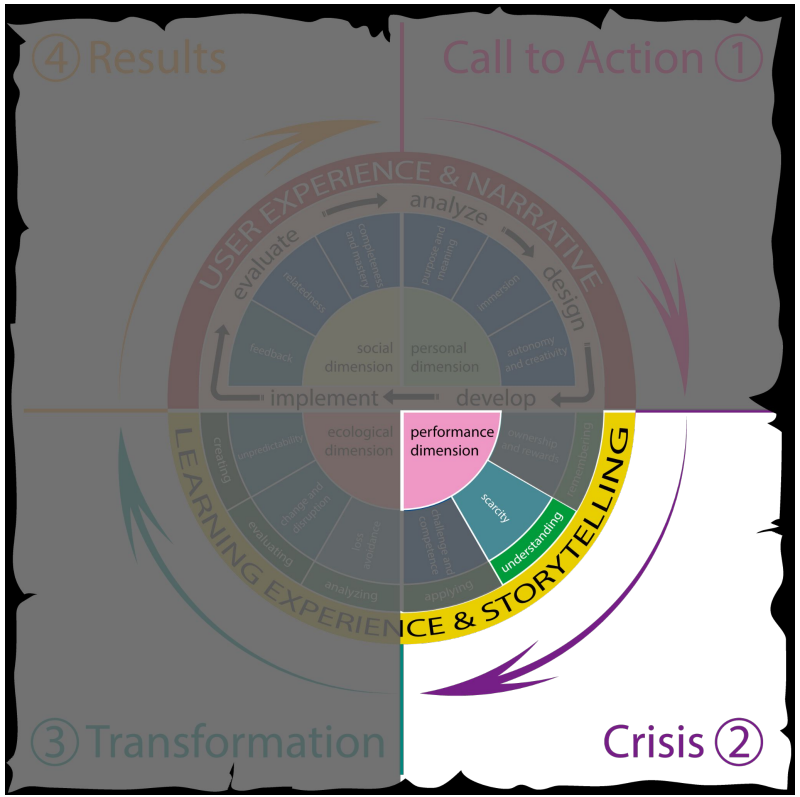
In this step, design learning activities to assess if students can **describe, discuss, explain** or **recognize** the content.



Step by Step

Scarcity

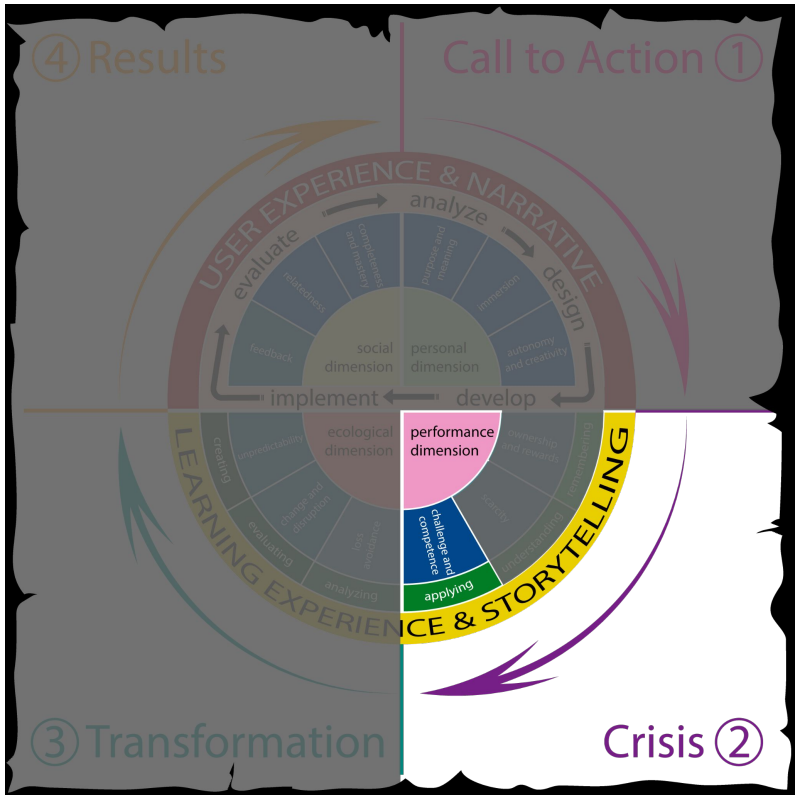
At this moment, when the student is understanding the content and not just memorizing, the teacher (or system) should work with external motivational affordances related to **exclusivity** and **status** to give the student **confidence** and **satisfaction** to continue on the journey.



Step by Step

Learning Objective: Applying

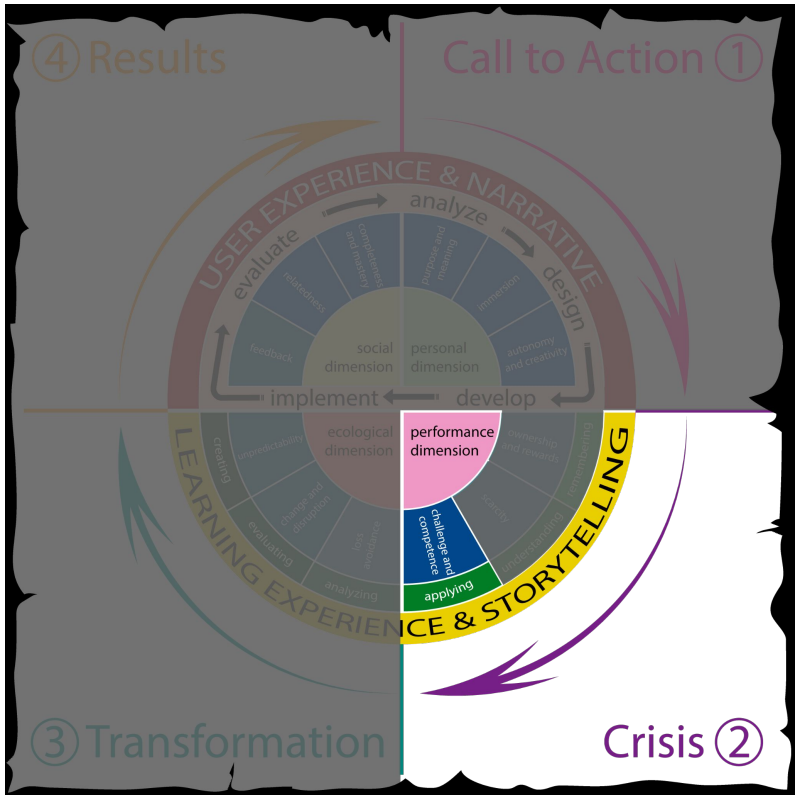
In this step, design learning activities to assess if students can **employ, sketch, solve** or **demonstrate** the content.



Step by Step

Challenge and Competence

At this stage, the student already remembers and understands the content, and prepares to apply it. Again, we shall increase the complexity of the challenges based on the fact that in the previous step they were rewarded and felt confident. At this point, the idea is to work with intrinsic motivational affordances, **integrating knowledge** and working so that the student wants to **challenge themselves to test their skills.**

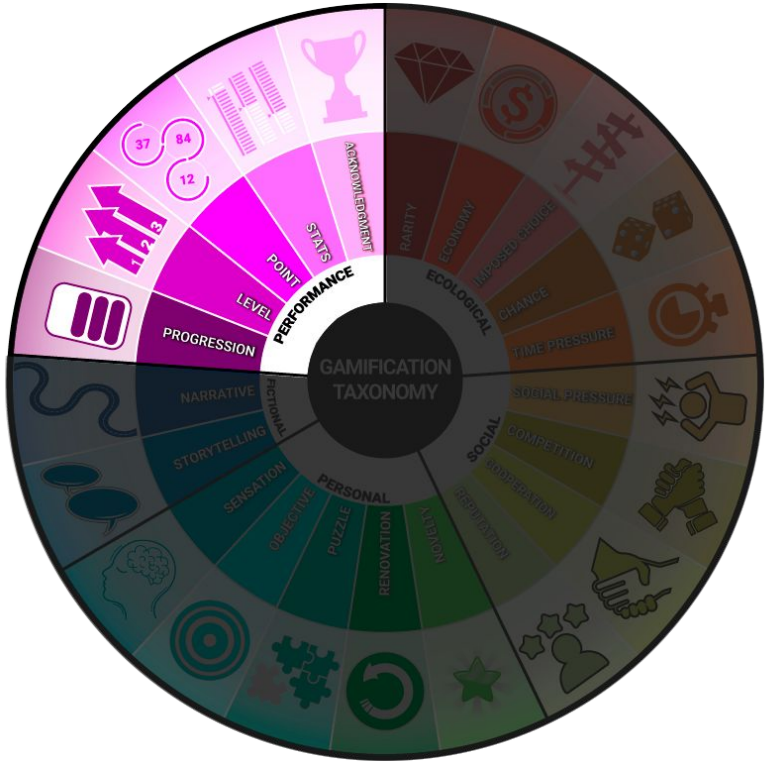


Step by Step

Performance Dimension

Optionally, other game elements might be used to enrich the experience. In the case of the crisis arc, the student will be more susceptible to game elements that work with their performance and feedback from the ambient.

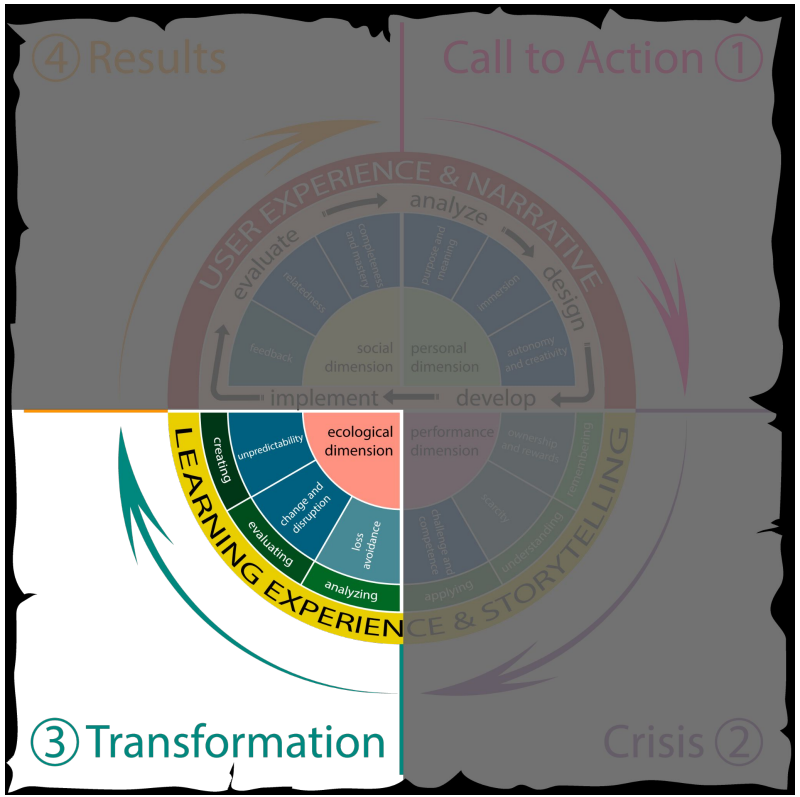
Additionally, the elements of the **ecological dimension** can also be worked on in the background.



Step by Step

Act 3: Transformation

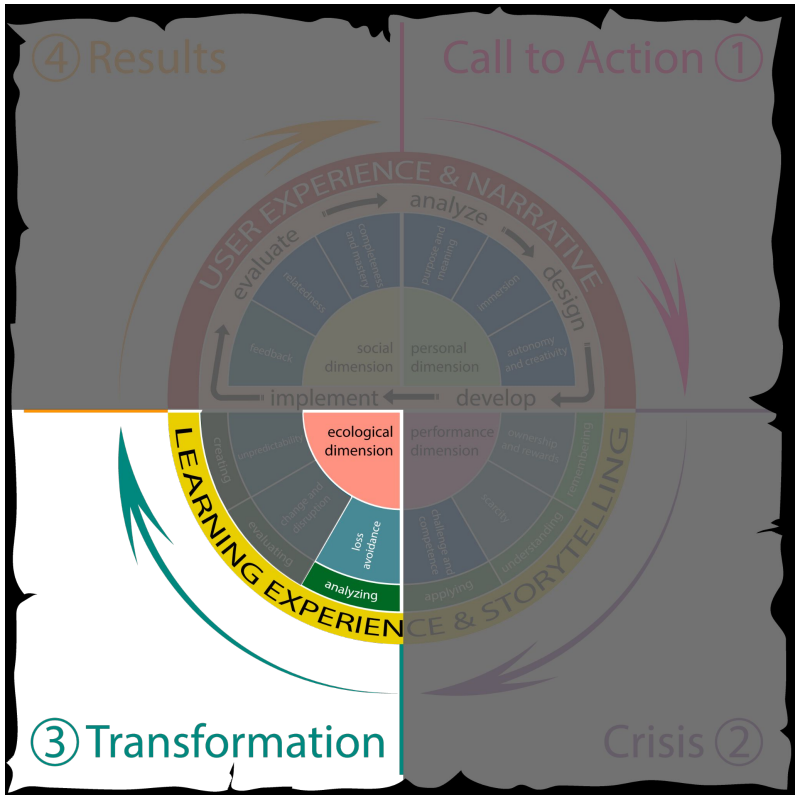
In this act, the student has already covered half the journey. They continue with their experience, but thanks to the challenges and learning from the previous act the student now is ready for their transformation, their growth. At this stage the teacher (or system) should seek to bring this transformation to light, **through challenges** and **ultimate experiences** (like the game challenge **'boss fight')**.



Step by Step

Learning Objective: Analyzing

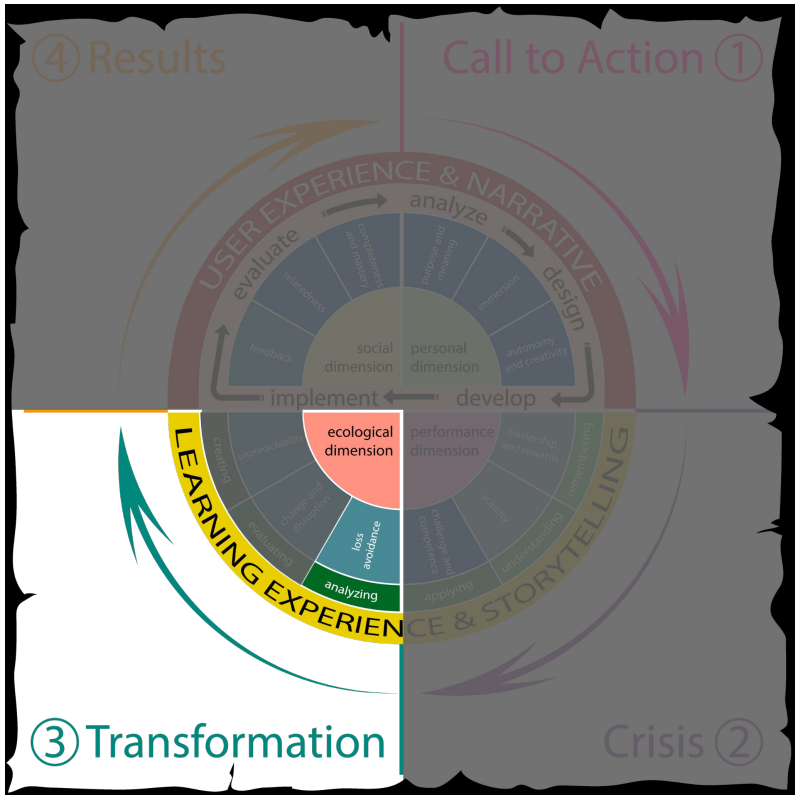
In this step, design learning activities to assess if students can **compare, criticize, examine** or **question** the content.



Step by Step

Loss Avoidance

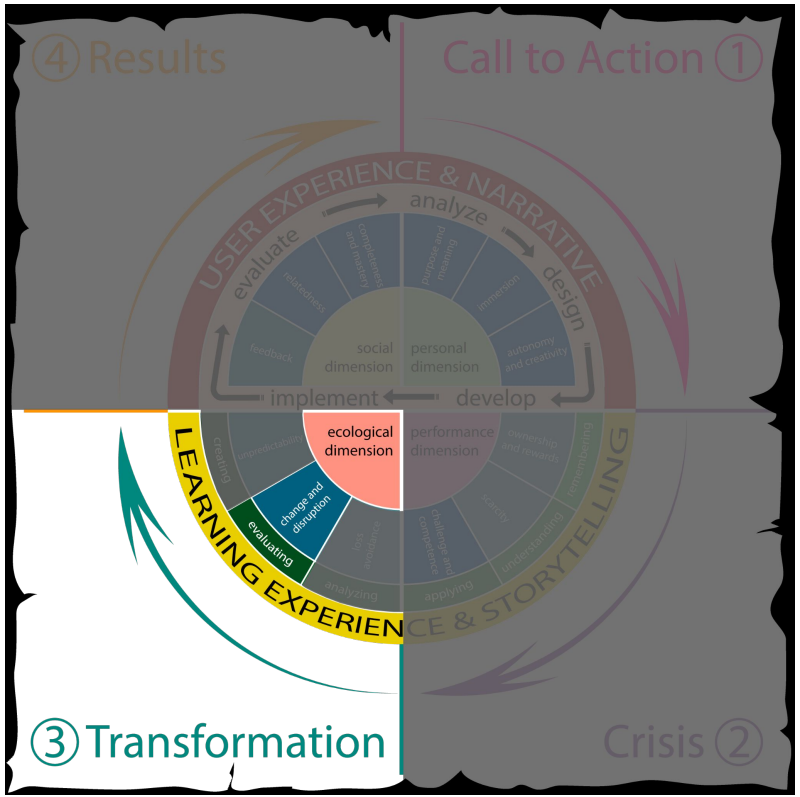
At this point, the student can apply the knowledge and now learns to analyze it to begin a learning transfer process. Here we can apply pressure by working with motivational affordances that deal with **urgency** and **loss of previously acquired rewards.**



Step by Step

Learning Objective: Evaluating

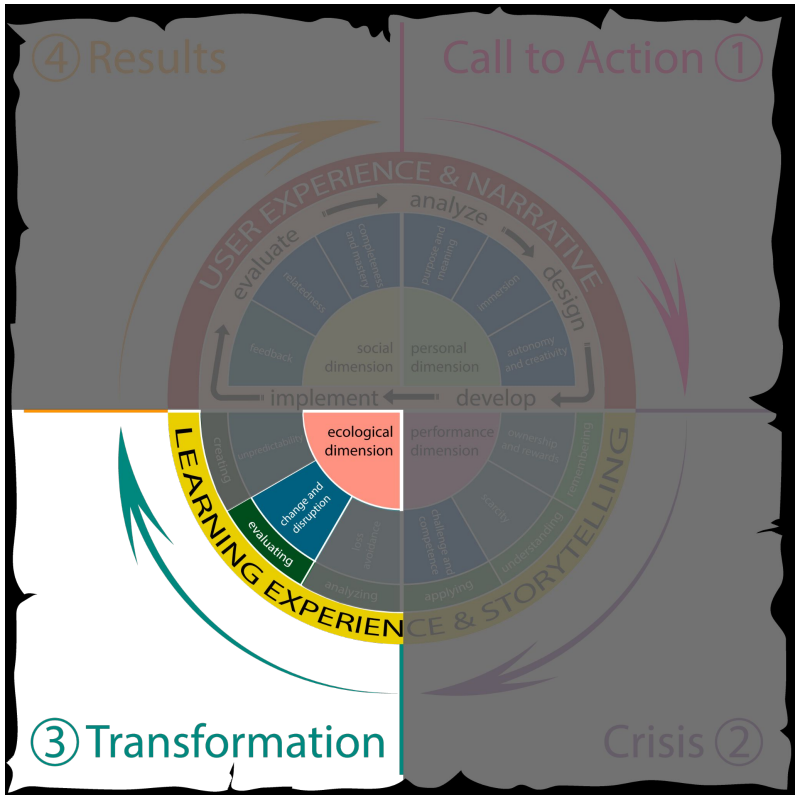
In this step, design learning activities to assess if students can **appraise, defend** or **select** the content.



Step by Step

Change and Disruption

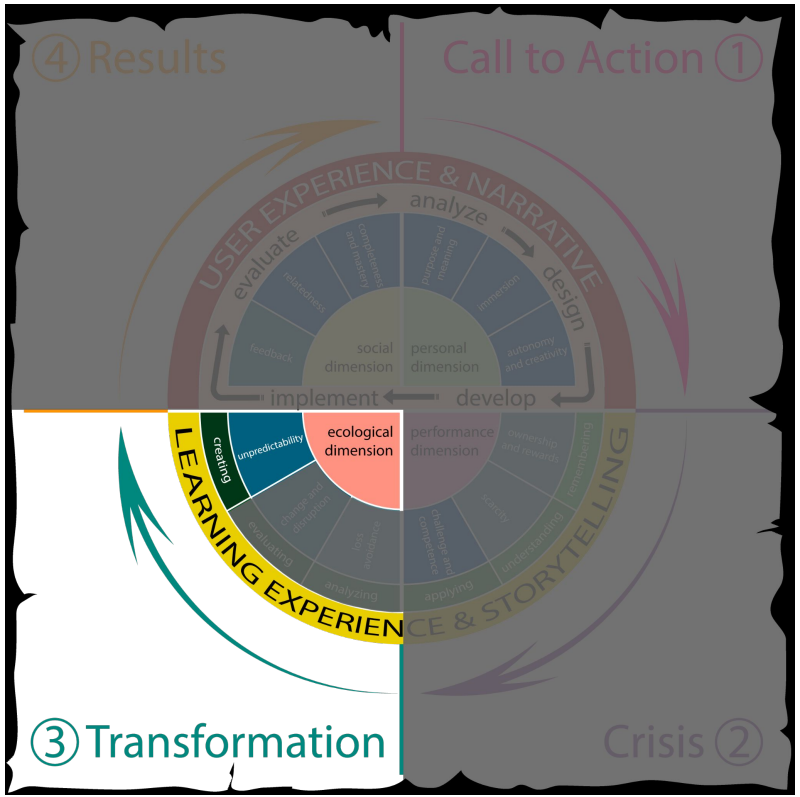
Here the student already has a basis to argue and defend their point of view, and the teacher (or system) must work so that they obtain mastery of the content taught. In this sense, proposing **innovations** and dealing with affordances that work with **disruption control**, such as debates for example, is a great start for this step of the transformative arc.



Step by Step

Learning Objective: Creating

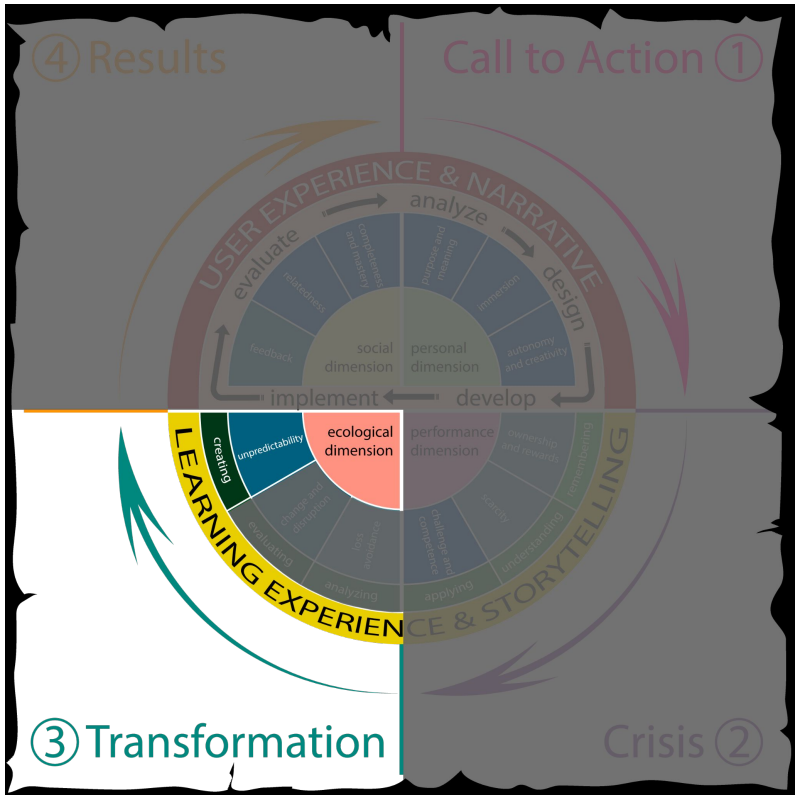
In this step, design learning activities to assess if students can **assemble, create** or **develop** new content.



Step by Step

Unpredictability

In the last stage of the transformative arc, the teacher (or the system) must introduce the student to unpredictability, with **varied challenges** and **rewards**, to stimulate their creativity and adaptive capacity. And so the student must be able to create something new on top of the acquired knowledge.

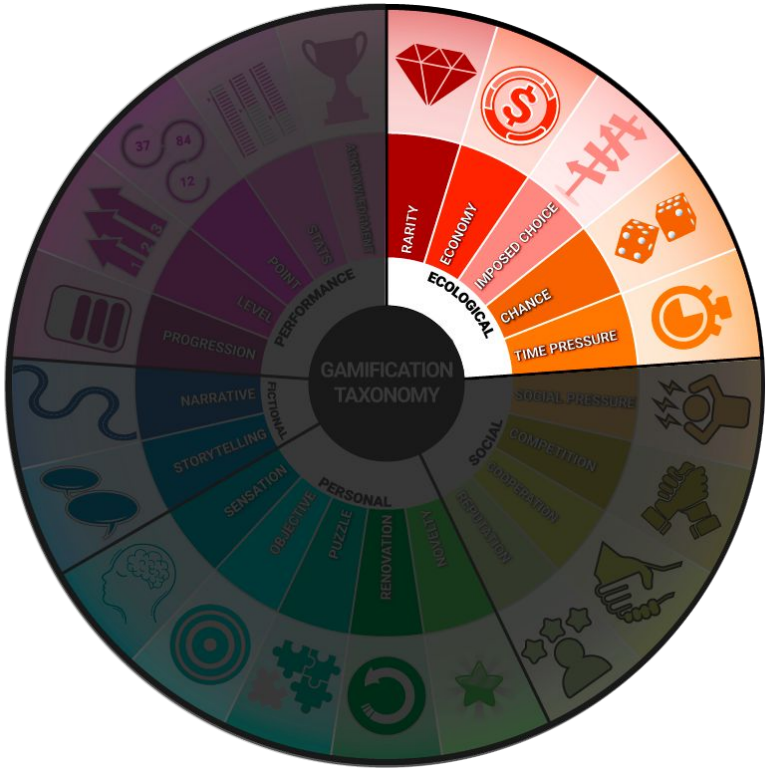


Step by Step

Ecological Dimension

Optionally, other game elements might be used to enrich the experience. In the case of the transformation arc, the student will be more susceptible to game elements that work with the context and environment around them.

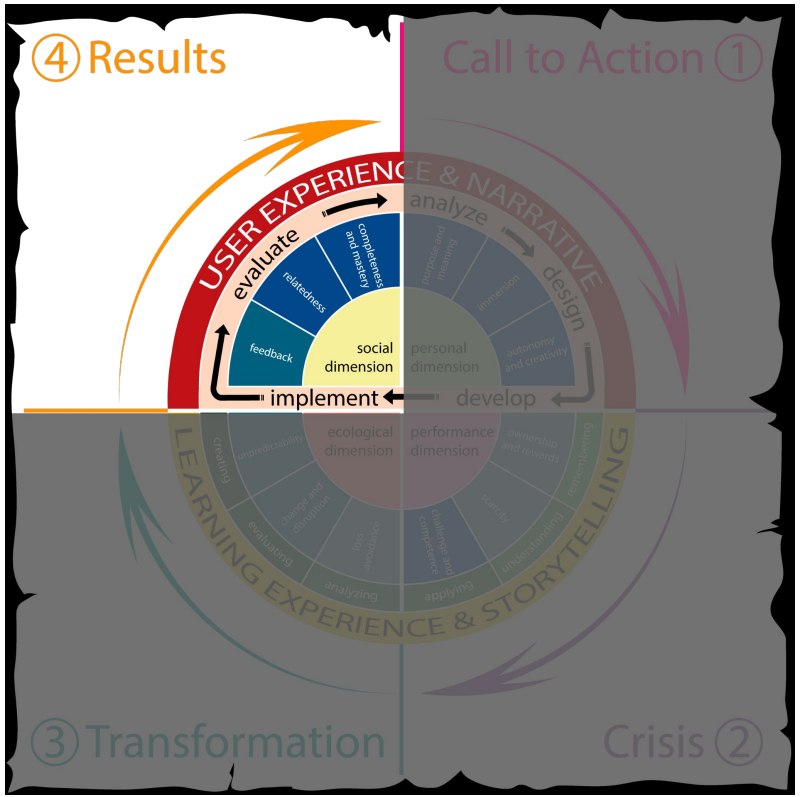
Additionally, the elements of the **social dimension** can also be worked on in the background supporting the knowledge transfer.



Step by Step

Act 4: Results

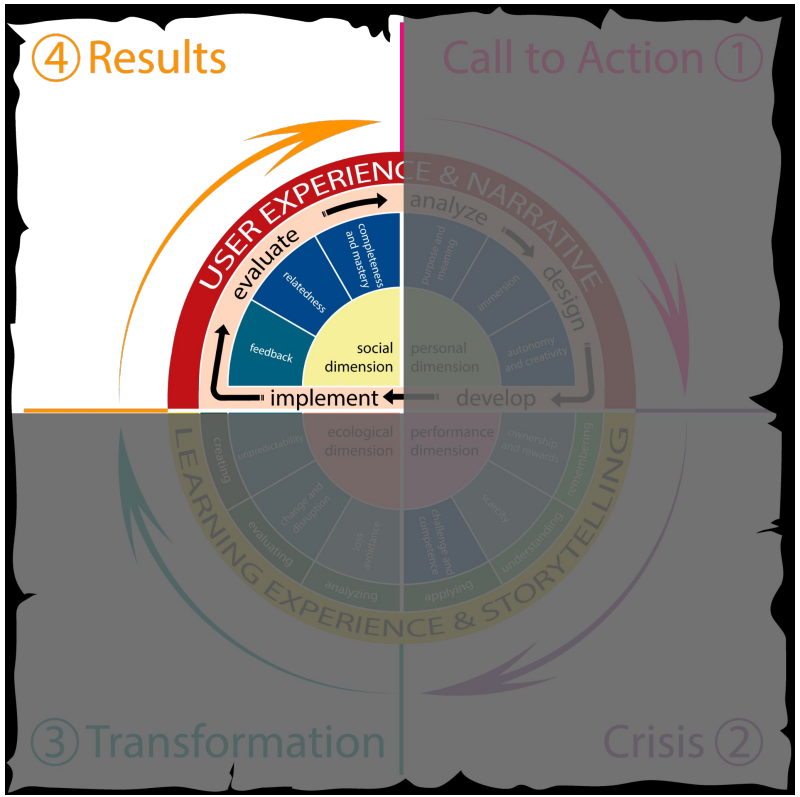
The last arc of the learning journey closes a cycle and because of this, must be seen as a moment of reflection and experiences sharing. In this arc, the teacher (or system) must provide the student with a **suitable environment so that they can express themselves** about their experience and through this expression, see the closing of the cycle with the idea that something new is about to happen (a new journey).



Step by Step

Feedback

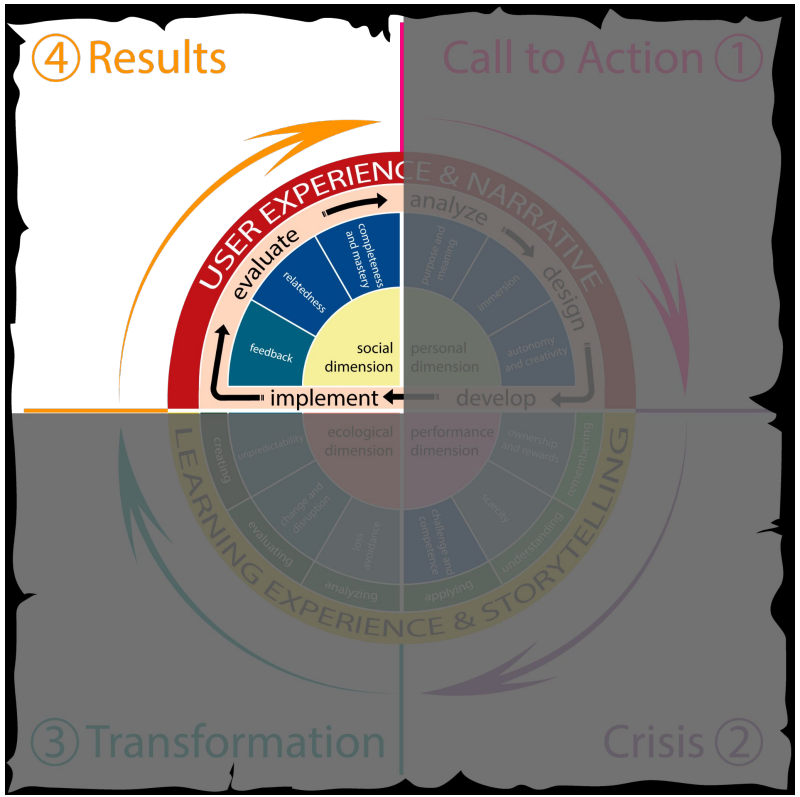
Although this heuristic must be present in the background of any system (so that the user understands what is happening), at this moment the teacher (or the system) especially needs to provide elements for the student to **understand the process they have undergone** through so far.



Step by Step

Relatedness

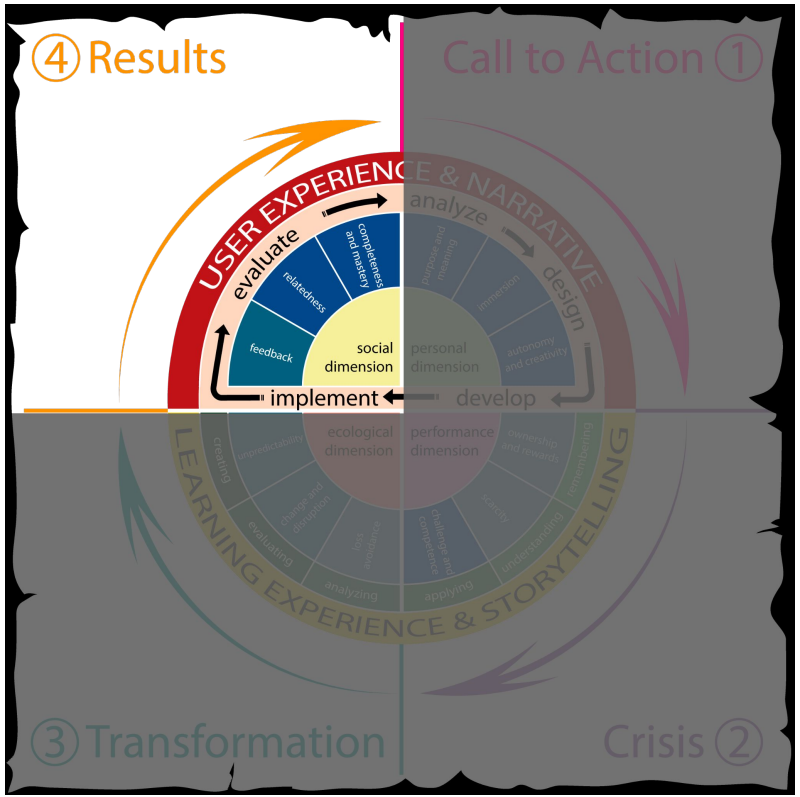
As a final result of the journey, it is important that the student feels like part of the process, as a transformative agent, the hero of their journey. And at this point, the teacher (or the system) must make sure that this feeling has been reached and consolidate it, mainly through **social ties** (collaboration, competition, etc.).



Step by Step

Completeness and Mastery

Finally, the student needs to understand where they started on this journey and where they are ending it. The motivational affordance for this can deal with progressive goals and achievement. Here the teacher (or system) must d**emonstrate the outcome of the journey.**

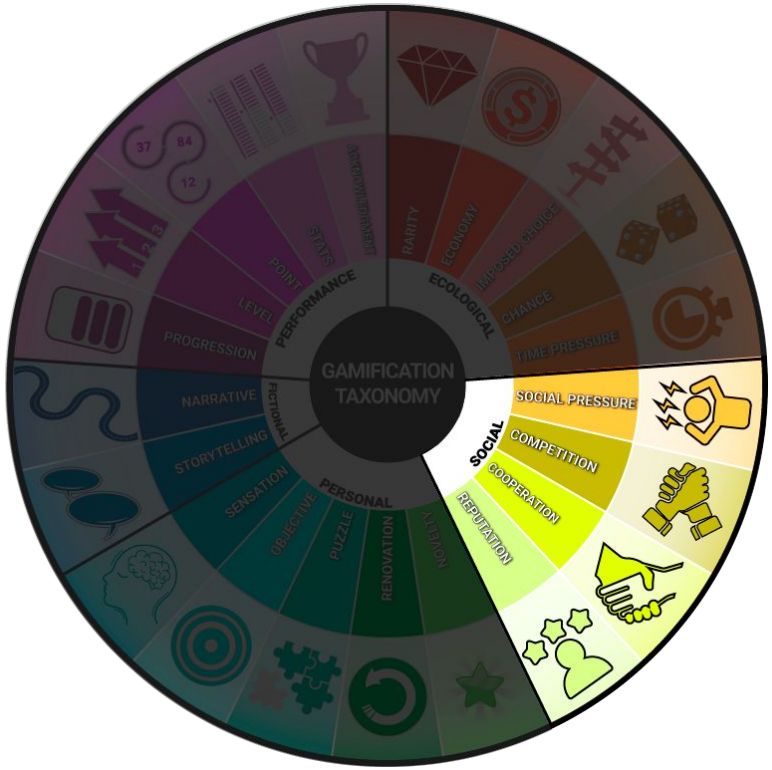


Step by Step

Social Dimension

Optionally, other game elements might be used to enrich the experience. In the case of the results arc, the student will be more susceptible to game elements that work with social ties.

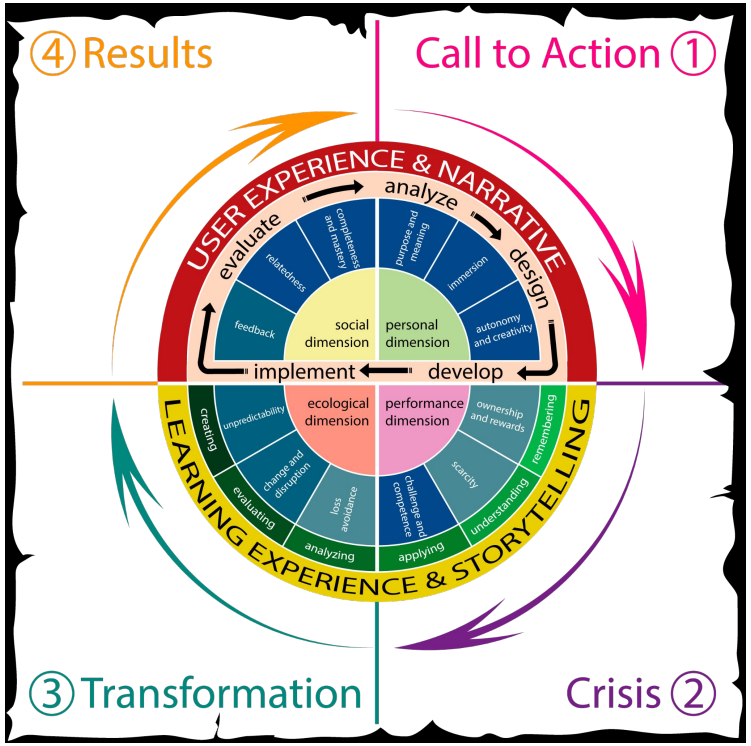
Additionally, the elements of the **personal dimension** can also be worked on in the background.



Final Considerations

Heuristics and Game Elements

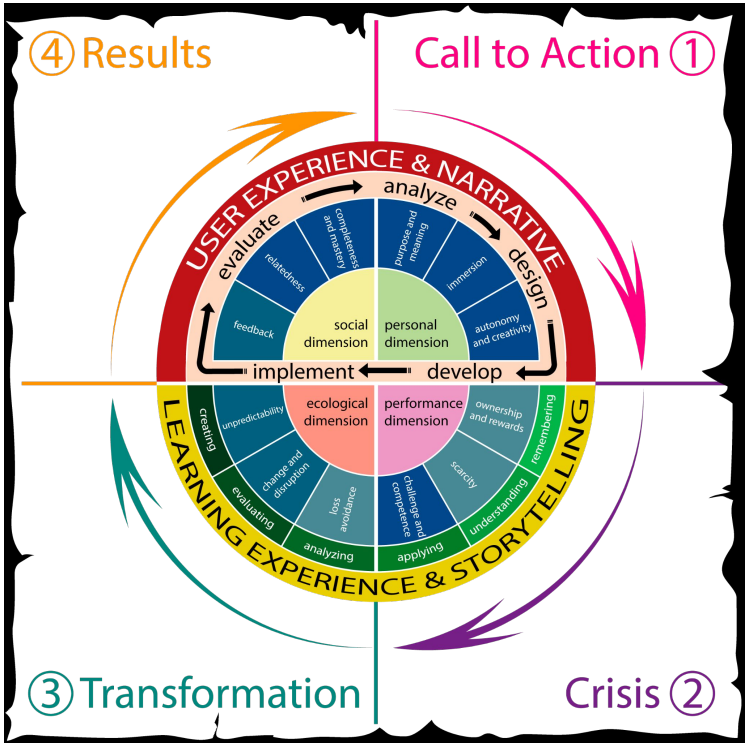
Although the framework suggests the best moments to use a heuristic or another game element, it is possible, following this model, to **prioritize a guideline, but work with others as a background.** For example, the entire journey must be immersive, but especially at the beginning of it, the student MUST be immersed in the process so that everything else goes smoothly.



Final Considerations

Heuristics and Game Elements

Some heuristics and game elements may be similar in their nomenclature, however, their goals are different. Heuristics should be seen as guidelines for the creation of pedagogical content and user experience and/or learning, while complimentary game elements (dimensions) **may or may not** be used in specific ways to **enrich the experience.**



Application Example

- Step by Step - Classroom

Application Example in a Classroom

1

We present in this section an example of a gamified strategy created following the Gamification Journey Framework, for the **unplugged environment**, in a face-to-face classroom lesson.

The content is a real introductory module on web programing, based on HTML and CSS *(frontend development)*, whose lessons were recreated according to the framework.

Introductory Module - HTML and CSS

1

Main Instructional Goal:
Explain each language and their roles in web applications

Secondary Instructional Goal:
Make the student understand the difference between languages;
Teach the basic structure of each language and how they relate to each other.

Link to the original content:
https://docs.google.com/document/d/1QrD0dG47ZemN1c4Ko-VOVDQUPJf7pC4hcTH7WvHH_j8/edit?usp=sharing (in portuguese)

Using Instructional Framework ADDIE

1

Analyze

Identify the problem and the learning requirement

(remain the same as in the traditional module)

2

Design

Define the learning objectives and the instructional strategies

(based on the framework and Bloom's Taxonomy, as detailed in the last section)

3

Development

Develop and validade the learning resources

(using the Narrative Gamification Framework, as detailed in the last section)

Using Instructional Framework ADDIE

4

Implementation

Prepare the learning environment and implement the learning solution

(choose the virtual or unplugged environment and prepare for applying the framework accordinly)

5

Evaluation

Assess the effectiveness of the course instructions

(if system-based, through learning analytics, if unplugged, through student feedback)

Call to Action

Game Elements & Heuristics

Narrative

Purpose and Meaning

Immersion | Narrative

Application Example

Start questioning if the students know how to design web applications.

Explain why this is important.

Use the analogy of housing construction and site construction and let them give examples from their lives.

Call to Action

Game Elements & Heuristics	Application Example
Autonomy and Creativity	Use their own examples to encourage them to learn.
Personal Dimension	Optionally mainly use the game elements of Sensation, Objective, Puzzles, Renovation and Novelty.
Performance Dimension	Optionally use the game elements of Progression, Level, Point, Stats and Acknowledgement secondarily.

Crisis (Conflict)

Game Elements & Heuristics	Application Example
Learning Objective: Remembering	Design learning activities to assess if students can compare, criticize, examine or question the content.
Storytelling	Explain the story of HTML and CSS, their differences and roles in web application development in a ludic way.
Ownership and Rewards	Give rewards and items according to their performance and participation.

(7) http://www.csszengarden.com/

Crisis (Conflict)

Game Elements & Heuristics	Application Example
Learning Objective: Understanding	Design learning activities to assess if students can describe, discuss, explain or recognize the content.
Storytelling	Use the site CSS ZEN GARDEN (7) to show pratical examples of how CSS and HTML can be used together.
Scarcity	Give exclusive items according to their performance and participation (like in a contest among students).

Crisis (Conflict)

Game Elements & Heuristics	Application Example
Learning Objective: Applying	Design learning activities to assess if students can employ, sketch, solve or demonstrate the content.
Storytelling	Explain the basic structure of HTML and CSS using the visuals from CSS ZEN GARDEN (7).
Challenge and Competence	Based on the CSS ZEN GARDEN (7) premise, design a simpler but similar challenge.

Crisis (Conflict)

Game Elements & Heuristics

Performance Dimension

Ecological Dimension

Application Example

Optionally mainly use the game elements of Progression, Level, Point, Stats and Acknowledgement.

Optionally use the game elements of Rarity, Economy, Imposed Choice, Chance and Time Pressure secondarily.

Transformation

Game Elements & Heuristics

Learning Objective: Analyzing

Loss Avoidance

Application Example

Design learning activities to assess if students can compare, criticize, examine, question the content.

Ask the students to present their work from previous assigment and let they discuss their findings.

Transformation

Game Elements & Heuristics

Learning Objective: Evaluating

Change and Disruption

Application Example

Design learning activities to assess if students can appraise, defend or select the content.

Ask students to choose the designs that are most likely to be improved and ask them to justify the decision.

Transformation

Game Elements & Heuristics	Application Example
Learning Objective: Creating	Design learning activities to assess if students can assemble, create or develop new content.
Unpredictability	Ask the students to create a final design with all they have learned, for a site of their choice.
Storytelling	Ask the students to justify and tell the story of the final design.

Transformation

Game Elements & Heuristics	Application Example
Ecological Dimension	Optionally mainly use the game elements of Rarity, Economy, Imposed Choice, Chance and Time Pressure.
Social Dimension	Optionally use the game elements of Social Pressure, Competition, Cooperation and Reputation secondarily.

Results

Game Elements & Heuristics	Application Example
Feedback	Let students provide feedback on the related activity, become aware of progress, from the beginning of the course until now .
Relatedness	This process must be in groups, and the teacher must foster cooperation and competition among students.
Narrative	At the end of the class, check if everyone has an exact notion of their choices, decisions and achievements.

Results

Game Elements & Heuristics	Application Example
Completeness and Mastery	Encourage a final round of improvement on the site or generate a list of what could be improved in new iterations.
Feedback	Check which students had the most difficulty in which moments of the activities, and what were the individual goals of each one at the beginning of the module.
Narrative	Change the assigments, to stimulate other skills.

Results

Game Elements & Heuristics

Social Dimension

Personal Dimension

Application Example

Optionally mainly use the game elements of Social Pressure, Competition, Cooperation and Reputation.

Optionally use the game elements of Sensation, Objective, Puzzles, Renovation and Novelty secondarily.

Final Remarks

- Related Artifacts

Final Remarks

The **framework** presented can be used as a stand alone tool for **gamified educational systems** and **unplugged gamification**. However, it includes two more artifacts that complement the design of the gamification strategy.

Gamification Journey User Type (8)

This approach to personalization based on behavioral and personality user types was created using **Pierce's semiotic triad (9)** and **Jung's 12 Archetypes (10)** theories.

Through this approach, it is possible to identify a profile for the initial presentation of pedagogical content, either by an intelligent tutoring system (ITS) or by a teacher, based solely on the choice of symbolic images. Once with the initial profile, the learning journey described in this documentation is **presented adaptatively,** dinamicaly changing the content presentation and activities according to the **user type** of the student at that **particular moment.**

8 PALOMINO, P. T., Toda, A. M., Oliveira, W., Rodrigues, L., & Isotani, S. (2019). Gamification journey: A Novel approach for classifying gamer types for gamified educational systems. *Simpósio Brasileiro de Jogos e Entretenimento Digital*, *2019*.
9 PEIRCE, C. S., Peirce on signs: Writings on semiotic. UNC Press Books,1991
10 JUNG, C. G.,The archetypes and the collective unconscious. Routledge,2014

Gamification Journey Ontology (11)

To assist in building **intelligent semantic systems** that support the use of this **framework automatically,** a computational ontology was developed to categorize, connect and define the various concepts and terms used in the process as a whole, from user types and their relationships to game elements, to the different learning objectives and their respective activities, with resources on how to build pedagogical content. This ontology c**an be further extended** to any gamification taxonomy and usery type/gamer types approaches.

11 PALOMINO et. al. (in development).

Let's Talk

If you have any questions, please contact me via email paulatpalomino@usp.br or Whatsapp +55 16 98829.9169

Thank you!

Glossary

- Theories
- Game Elements

Theories

Bloom's Taxonomy

It is a framework that **classifies the process of thinking and learning,** and organizes in a hierarchical way learning objectives and learning activities, relating them to two cognitive dimensions: Cognitive Process (divided into the stages of Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating) and Knowledge (divided into Factual, Conceptual, Procedural, and Meta-Cognitive knowledge).

3 ANDERSON, Lorin W. et al. A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives. Longman,, 2001.

Theories

Hero's Journey

Also called **monomyth**, it is one of the most commonly used storytelling structures in myths, legends, novels, and narrative works in general, presenting a cyclical form of storytelling, in which the protagonist overcomes various challenges to become a hero.

2 CAMPBELL, Joseph. The hero with a thousand faces. New World Library, 2008.

Theories

TGEEE

It is a taxonomy of game elements developed using data-mining resources, validated by experts. It has the **specific purpose of categorizing and defining the existing game elements with a focus on their use in education,** consisting of five dimensions (Fictional, Personal, Performance, Ecological and Social) and 21 game elements.

4 Toda, A. M., Klock, A. C., Oliveira, W., Palomino, P. T., Rodrigues, L., Shi, L., ... & Cristea, A. I. (2019). Analysing gamification elements in educational environments using an existing Gamification taxonomy. Smart Learning Environments, 6(1), 1-14.

Theories

Gameful Design Heuristics

The Gameful Design Heuristics is a **set of guidelines for heuristic evaluation of game design in interactive systems.** It is the first tool of its kind focused specifically on evaluating game design through the lens of intrinsic and extrinsic motivational resources.

5 TONDELLO, Gustavo F. et al. Gameful Design Heuristics: A Gamification Inspection Tool. In: International Conference on Human-Computer Interaction. Springer, Cham, 2019. p. 224-244.

Theories

ADDIE Instructional Design Framework

ADDIE is a **framework for instructional systems design (ISD)** that many instructional designers and training developers use to develop their courses. It is considered one of the most famous pedagogical models of nowdays and there are many other frameworks derived from it, because it presents a simple and complete process for creating educational content.

6 Morrison, Gary R. Designing Effective Instruction, 6th Edition. John Wiley & Sons, 2010.

TGEEE - Dimensions

Performance Dimension

These are elements related to the environment response, which can be used to provide feedback to the learner.

Ecological Dimension

This context is related to the environment that the gamification is being implemented.These elements can be represented as properties.

4 Toda, A. M., Klock, A. C., Oliveira, W., Palomino, P. T., Rodrigues, L., Shi, L., ... & Cristea, A. I. (2019). Analysing gamification elements in educational environments using an existing Gamification taxonomy. Smart Learning Environments, 6(1), 1-14.

TGEEE - Dimensions

Social Dimension

This dimension is related to the interactions between the learners presented in the environment.

Personal Dimension

This dimension is related to the learner that is using the environment.

4 Toda, A. M., Klock, A. C., Oliveira, W., Palomino, P. T., Rodrigues, L., Shi, L., ... & Cristea, A. I. (2019). Analysing gamification elements in educational environments using an existing Gamification taxonomy. Smart Learning Environments, 6(1), 1-14.

TGEEE - Dimensions

Fictional Dimension

It is the mixed dimension that is related to the user (through Narrative) and the environment (through Storytelling), tying their experience with the context.

4 Toda, A. M., Klock, A. C., Oliveira, W., Palomino, P. T., Rodrigues, L., Shi, L., ... & Cristea, A. I. (2019). Analysing gamification elements in educational environments using an existing Gamification taxonomy. Smart Learning Environments, 6(1), 1-14.

TGEEE - Performance Dimension

Acknowledgement

Also known as **badges, medals, trophies and achievements**.It is a kind of extrinsic feedback that praises the players'specific set of actions, e.g. completing a certain number of problems may lead them to earn a 'Solver' badge; finishing a task in a predefined time limit may earn them a 'Flash' trophy and so on.

4 Toda, A. M., Klock, A. C., Oliveira, W., Palomino, P. T., Rodrigues, L., Shi, L., ... & Cristea, A. I. (2019). Analysing gamification elements in educational environments using an existing Gamification taxonomy. Smart Learning Environments, 6(1), 1-14.

TGEEE - Performance Dimension

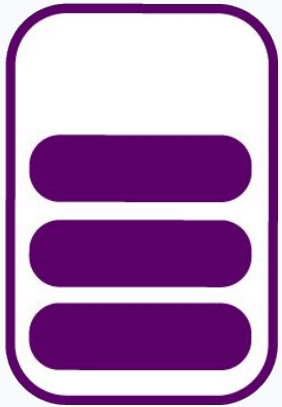
Level

Also known as **skill level, character level** etc. This is related to an extrinsic hierarchical layer that provides the user new advantages as they advance in the environment, e.g. the students gain a level every time they complete a certain number of tasks, when they advance their level, they have access to more challenging tasks.

4 Toda, A. M., Klock, A. C., Oliveira, W., Palomino, P. T., Rodrigues, L., Shi, L., ... & Cristea, A. I. (2019). Analysing gamification elements in educational environments using an existing Gamification taxonomy. Smart Learning Environments, 6(1), 1-14.

TGEEE - Performance Dimension

Progression

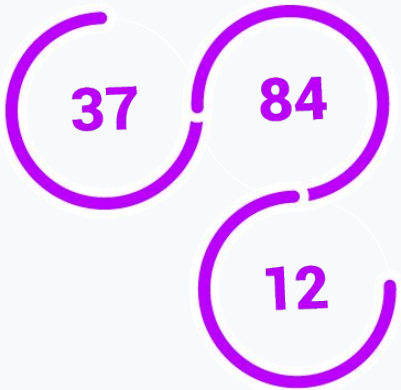


Also known as p**rogress bars, steps, maps.** Provides an extrinsic guidance to the users of their advance in the environment, allowing these users to locate themselves.

4 Toda, A. M., Klock, A. C., Oliveira, W., Palomino, P. T., Rodrigues, L., Shi, L., ... & Cristea, A. I. (2019). Analysing gamification elements in educational environments using an existing Gamification taxonomy. Smart Learning Environments, 6(1), 1-14.

TGEEE - Performance Dimension

Point



Also known as **scores, experience points, skill points**, etc. It is a simple way to provide extrinsic feedback to the users' actions. Point is the most basic concept found in almost all gamified applications.

4 Toda, A. M., Klock, A. C., Oliveira, W., Palomino, P. T., Rodrigues, L., Shi, L., ... & Cristea, A. I. (2019). Analysing gamification elements in educational environments using an existing Gamification taxonomy. Smart Learning Environments, 6(1), 1-14.

TGEEE - Dimensão de Performance

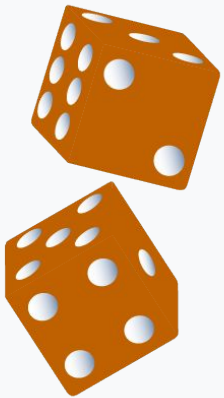
Stats

Also known as **information, Head Up Display (HUD) and data.** It is related to the visual information provided by the environment to the learner (extrinsic), e.g. how many tasks they completed or overall stats on the environment. In virtual environments this can also be dashboards.

4 Toda, A. M., Klock, A. C., Oliveira, W., Palomino, P. T., Rodrigues, L., Shi, L., ... & Cristea, A. I. (2019). Analysing gamification elements in educational environments using an existing Gamification taxonomy. Smart Learning Environments, 6(1), 1-14.

TGEEE - Ecological Dimension

Chance



Also known as **randomness, luck, fortune or probability.** This intrinsic concept is related to the random property of a certain event or outcome, e.g. the student may get a random number of points after completing a task; spinning a roulette that may give the user a bonus; user has a probability of getting a special item based on its luck.

TGEEE - Ecological Dimension

Imposed Choice

Also known as **choice, judgment, and paths.** This extrinsic concept occurs when the player faces an explicit decision that they must make to advance in the environment. An example of this concept is to present the user two different contents and make them choose one or another, blocking their advance if a choice is not to pick.

4 Toda, A. M., Klock, A. C., Oliveira, W., Palomino, P. T., Rodrigues, L., Shi, L., ... & Cristea, A. I. (2019). Analysing gamification elements in educational environments using an existing Gamification taxonomy. Smart Learning Environments, 6(1), 1-14.

TGEEE - Ecological Dimension

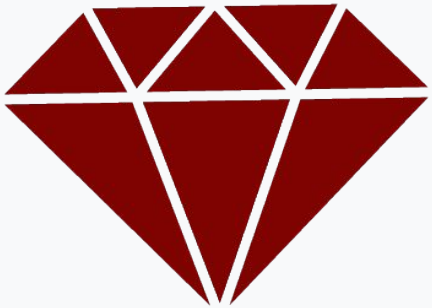
Economy

Also known as **transactions, market, exchange.** This concept is extrinsically related to any transaction that may occur in the environment. Examples are trading points for advantages within the environment and related to the content.

4 Toda, A. M., Klock, A. C., Oliveira, W., Palomino, P. T., Rodrigues, L., Shi, L., ... & Cristea, A. I. (2019). Analysing gamification elements in educational environments using an existing Gamification taxonomy. Smart Learning Environments, 6(1), 1-14.

TGEEE - Ecological Dimension

Rarity



Also known as **limited items, collection, exclusivity.** It is related to extrinsically limited resources within the environment which can stimulate the learners through a specific goal.

4 Toda, A. M., Klock, A. C., Oliveira, W., Palomino, P. T., Rodrigues, L., Shi, L., ... & Cristea, A. I. (2019). Analysing gamification elements in educational environments using an existing Gamification taxonomy. Smart Learning Environments, 6(1), 1-14.

TGEEE - Ecological Dimension

Time Pressure

Also represented as **countdown timers or clocks.** It is related to time itself used to pressure the learners' actions (extrinsic). In learning environments, this can also be represented as deadlines.

4 Toda, A. M., Klock, A. C., Oliveira, W., Palomino, P. T., Rodrigues, L., Shi, L., ... & Cristea, A. I. (2019). Analysing gamification elements in educational environments using an existing Gamification taxonomy. Smart Learning Environments, 6(1), 1-14.

TGEEE - Social Dimension

Competition

Also known as **conflict, leader boards, scoreboards, player vs player**, etc. It's an intrinsic concept, tied to a challenge where the user faces another user to achieve a common goal, e.g. using scoreboards based on the number of points, badges, levels, etc.

4 Toda, A. M., Klock, A. C., Oliveira, W., Palomino, P. T., Rodrigues, L., Shi, L., ... & Cristea, A. I. (2019). Analysing gamification elements in educational environments using an existing Gamification taxonomy. Smart Learning Environments, 6(1), 1-14.

TGEEE - Social Dimension

Cooperation

Also known as **teamwork, co-op, groups,** etc. It is also an intrinsic concept (related to a task) where the users must collaborate to achieve a common goal, can be considered the opposite of competition (however, both concepts can be used together).

4 Toda, A. M., Klock, A. C., Oliveira, W., Palomino, P. T., Rodrigues, L., Shi, L., ... & Cristea, A. I. (2019). Analysing gamification elements in educational environments using an existing Gamification taxonomy. Smart Learning Environments, 6(1), 1-14.

TGEEE - Social Dimension

Reputation

Also known as **classification, status**. It is related to titles that the learner may gain and accumulate within the environment (intrinsic). Differing from levels, titles represent more of a social status which does not necessarily reflect on the learners'skills.

TGEEE - Social Dimension

Social Pressure

Also known as **peer pressure or guild missions.** This intrinsic concept is related to social interactions that exert pressure on the learner.

4 Toda, A. M., Klock, A. C., Oliveira, W., Palomino, P. T., Rodrigues, L., Shi, L., ... & Cristea, A. I. (2019). Analysing gamification elements in educational environments using an existing Gamification taxonomy. Smart Learning Environments, 6(1), 1-14.

TGEEE - Personal Dimension

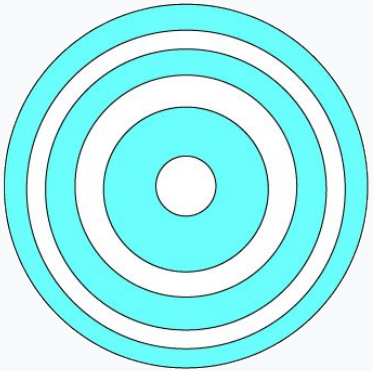
Novelty

Also known as an **update, surprise, changes,** etc. It is intrinsically related to the updates that occur within the environment, by adding new information, content or even new game elements.

4 Toda, A. M., Klock, A. C., Oliveira, W., Palomino, P. T., Rodrigues, L., Shi, L., ... & Cristea, A. I. (2019). Analysing gamification elements in educational environments using an existing Gamification taxonomy. Smart Learning Environments, 6(1), 1-14.

TGEEE - Personal Dimension

Objective



Also known as **missions, side-quests, milestones**, etc. This intrinsic concept is related to goals, it provides the player an end, or a purpose to perform the required tasks. Examples on the use of Objective can be broadened (as getting approved in the course) or more specific (as obtaining a certain score in a task).

4 Toda, A. M., Klock, A. C., Oliveira, W., Palomino, P. T., Rodrigues, L., Shi, L., ... & Cristea, A. I. (2019). Analysing gamification elements in educational environments using an existing Gamification taxonomy. Smart Learning Environments, 6(1), 1-14.

TGEEE - Personal Dimension

Puzzles

Also known as **challenges, cognitive tasks, actual puzzles**, etc. This intrinsic concept is related to the activities that are implemented within the environment, they can be tied or considered as the learning activities since the focus is to provide a cognitive challenge to the learner.

4 Toda, A. M., Klock, A. C., Oliveira, W., Palomino, P. T., Rodrigues, L., Shi, L., ... & Cristea, A. I. (2019). Analysing gamification elements in educational environments using an existing Gamification taxonomy. Smart Learning Environments, 6(1), 1-14.

TGEEE - Personal Dimension

Renovation

Also known as **boosts, extra life, renewal**, etc. This concept is intrinsically related to the property of re-doing a task, event or any of the sorts. It allows the learner a second chance after they fail a task.

4 Toda, A. M., Klock, A. C., Oliveira, W., Palomino, P. T., Rodrigues, L., Shi, L., ... & Cristea, A. I. (2019). Analysing gamification elements in educational environments using an existing Gamification taxonomy. Smart Learning Environments, 6(1), 1-14.

TGEEE - Personal Dimension

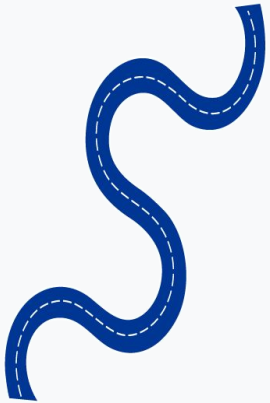
Sensation

This is either v**isual or sound stimulation,** etc. It is related to the use of learners' senses to improve the experience (intrinsic). This can be done through dynamic and gameful interfaces, Virtual Reality (VR) and/or Augmented Reality (AR).

4 Toda, A. M., Klock, A. C., Oliveira, W., Palomino, P. T., Rodrigues, L., Shi, L., ... & Cristea, A. I. (2019). Analysing gamification elements in educational environments using an existing Gamification taxonomy. Smart Learning Environments, 6(1), 1-14.

TGEEE - Fictional Dimension

Narrative



Also known as **karma system, implicit decisions,** etc. This intrinsic concept is the order of events as they happen in the game, through the user experience. This experience is influenced by implicit choices made by the user. Examples of this are providing the content in different ways for the learner to choose by themselves, creating a branch and consequently a different user experience.

4 Toda, A. M., Klock, A. C., Oliveira, W., Palomino, P. T., Rodrigues, L., Shi, L., ... & Cristea, A. I. (2019). Analysing gamification elements in educational environments using an existing Gamification taxonomy. Smart Learning Environments, 6(1), 1-14.

TGEEE - Fictional Dimension

Storytelling

Can be seen as a**udio queues, text stories,** etc. It is the way the story of the environment is told (as a script). It is told through text, voice, or other sensorial resources. It is highly used as a tool to support the narrative within an environment.

4 Toda, A. M., Klock, A. C., Oliveira, W., Palomino, P. T., Rodrigues, L., Shi, L., ... & Cristea, A. I. (2019). Analysing gamification elements in educational environments using an existing Gamification taxonomy. Smart Learning Environments, 6(1), 1-14.