SERIOUS GAMES FOR CREATIVITY AND SOCIAL COHESION IN TEACHER EDUCATION (EDUGAME)

UNIVERSITY OF SOUSSE
جامعة سوسة
Socially Responsible University

Gamified Open Collaborative Assessment Environment

Dr. Lilia Cheniti & Dr. Asma Hadyaoui & Mrs Ameny Rjiba

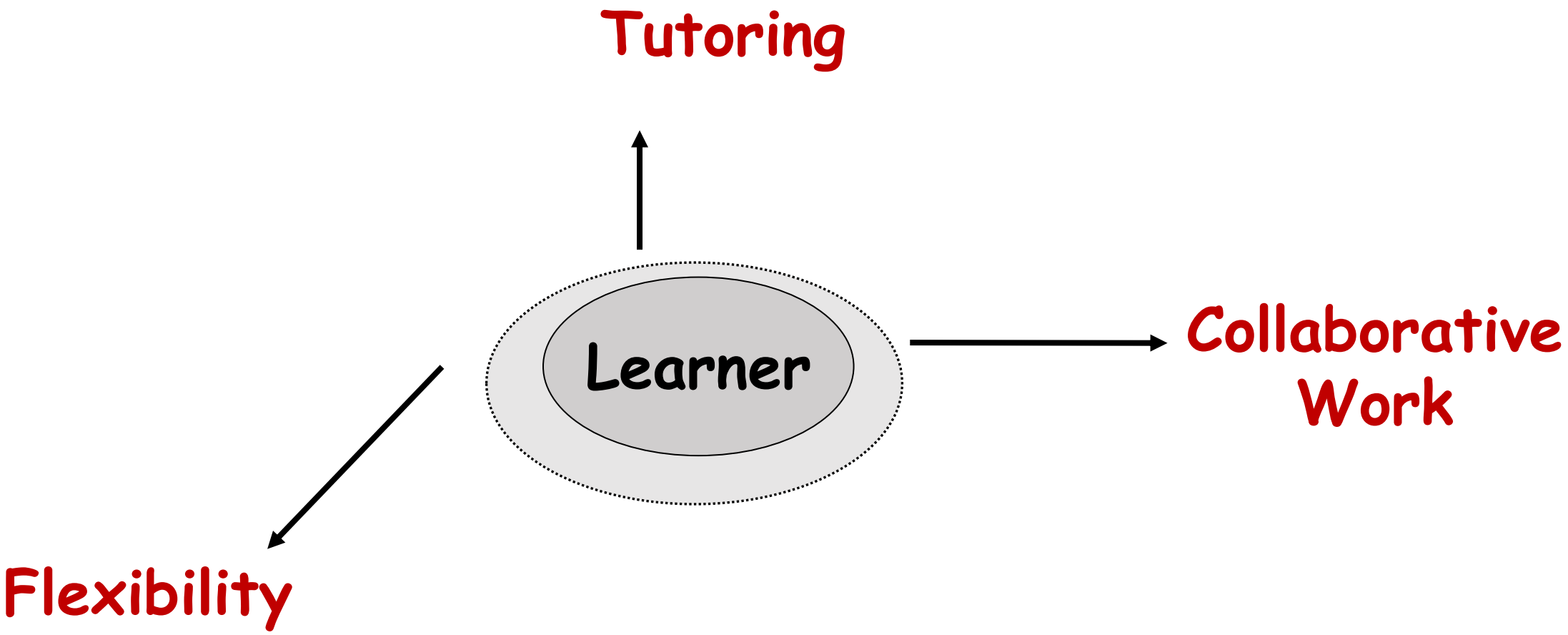
September 22, 2025

Agenda

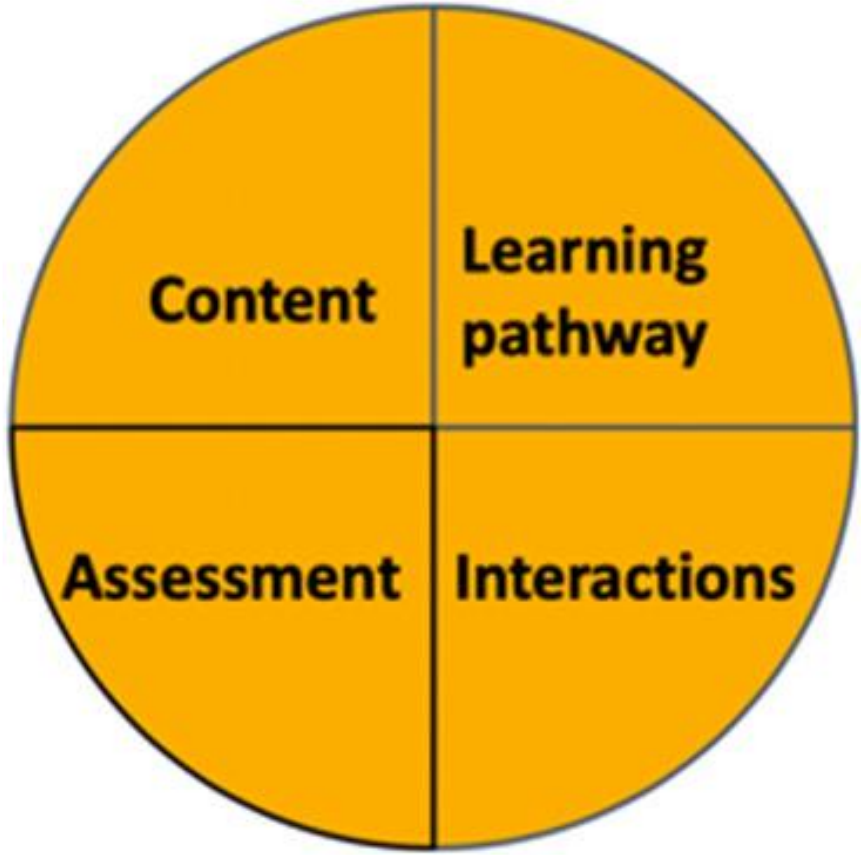
1. Digital Education: Gamification & Open Education
2. Collaborative Environment
3. Stealth assessment in collaborative elearning environment

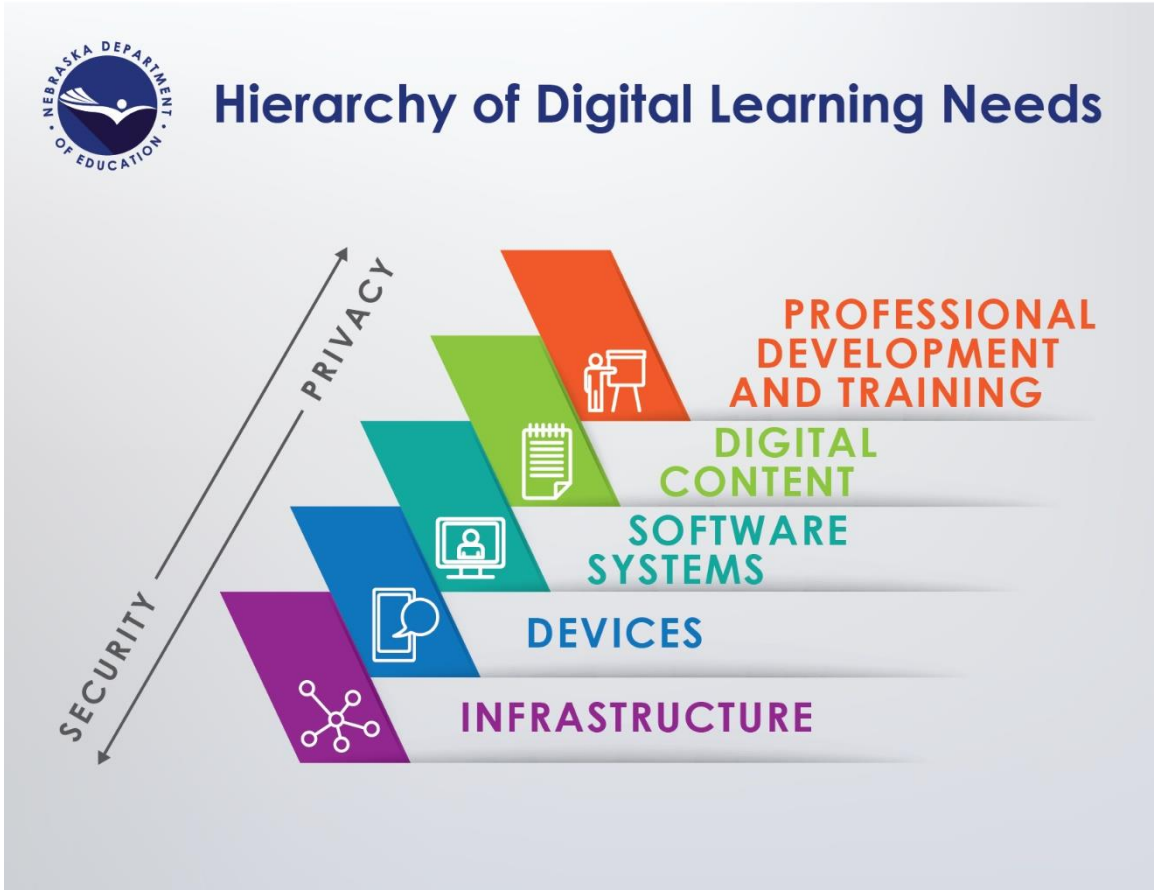
Digital Education: Gamification & Open Education

Digital Education Principles



Orientations

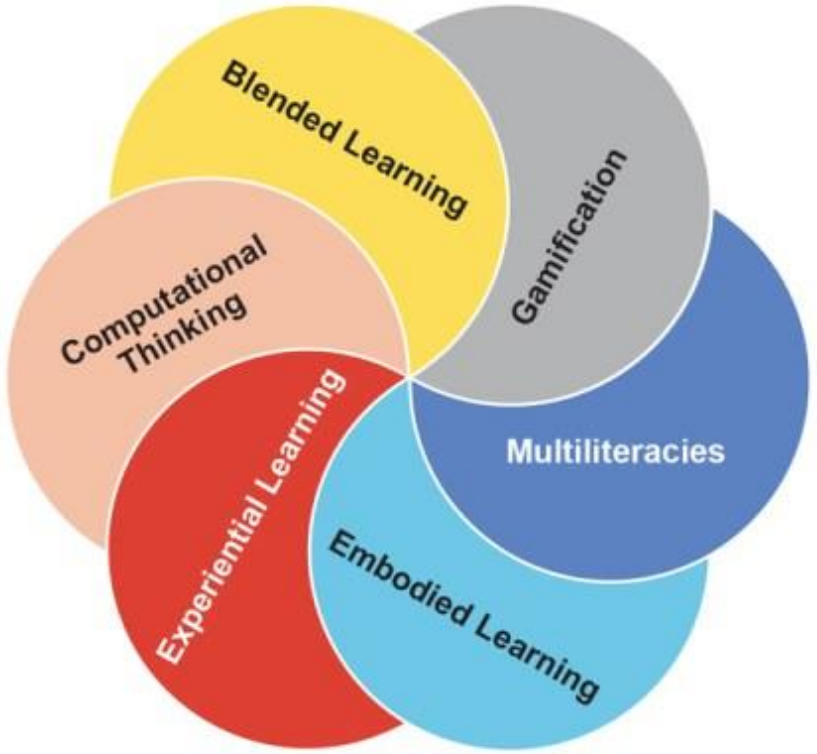


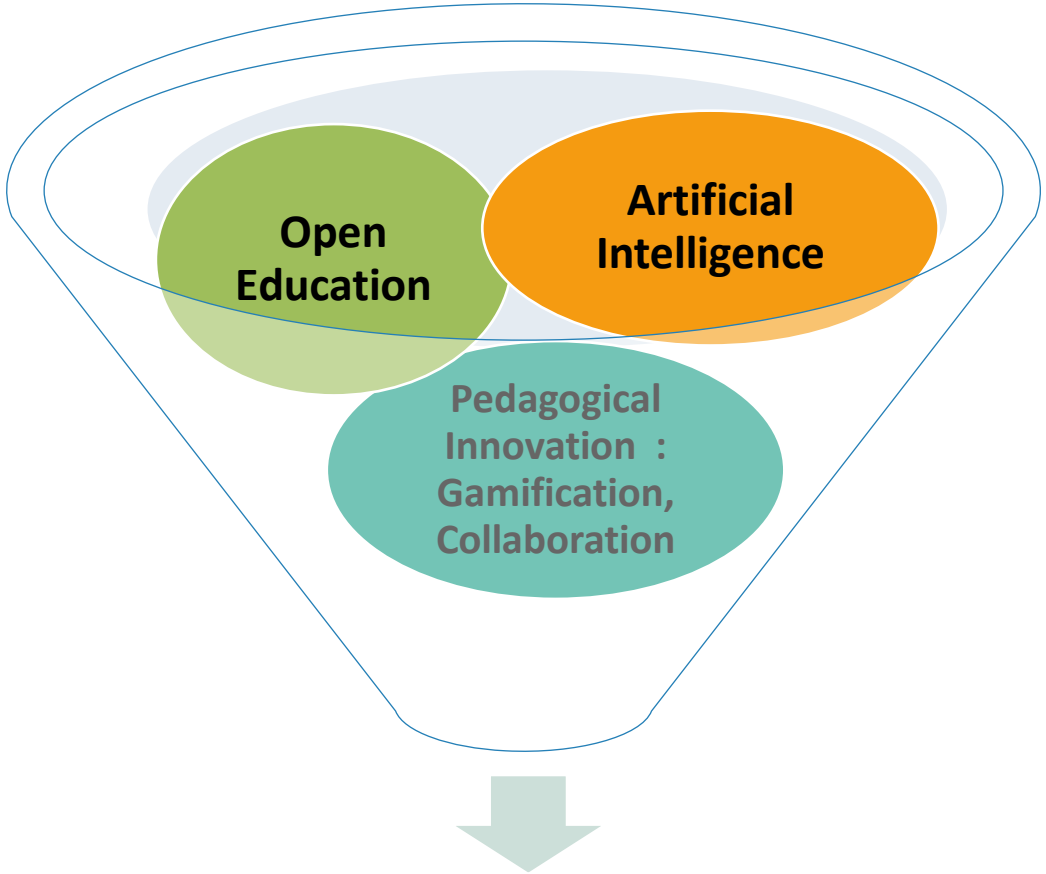


Jacqmot, C., DEVILLE, Y., & DOCQ, F. (2020). A Framework to Understand, Analyse and Describe Online and Open Education in Higher Education.

Pedagogical innovation

The Six Clusters of Innovative Pedagogies





Intelligent Open Collaborative Learning Environments

Gamification: Definition

- Gamification involves applying **game-design elements and game principles** in **non-game contexts** to engage users and solve problems.
- In education, it leverages **motivational psychology** to enhance **learning experiences** by making them more **interactive** and **rewarding**.

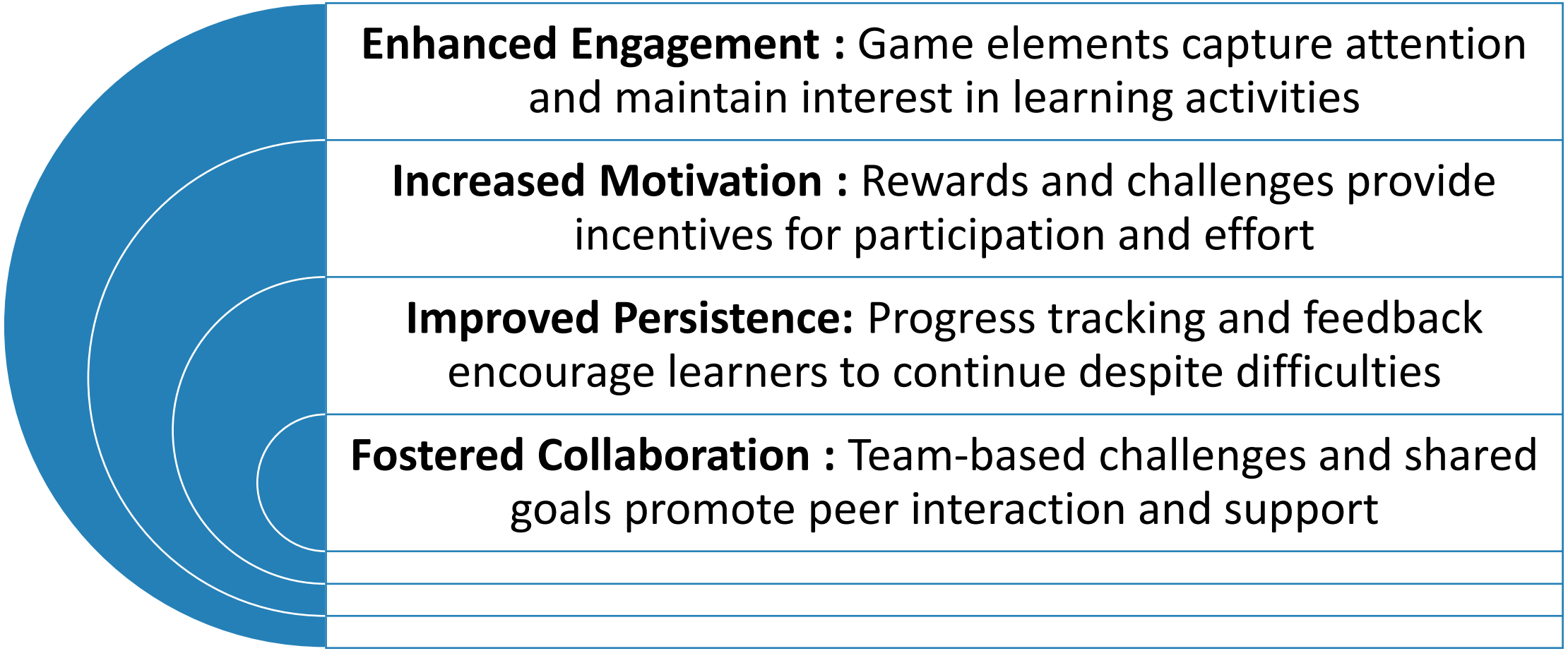
Gamification: Foundations

A key academic foundation for gamification is Self-Determination Theory (SDT)

➔ Individuals are driven by innate psychological needs:

- **Autonomy**
- **Competence**
- **Relatedness**

Gamification: Benefits



Gamification: Key Design Elements

Level-up and progression system

Badges and achievements

Leaderboard and competition

Progression scale

Timed events

User rewards

Game Design

- Games are created by designers and development teams, and consumed by players.
- They are purchased, used, and subsequently discarded like most other consumable products.

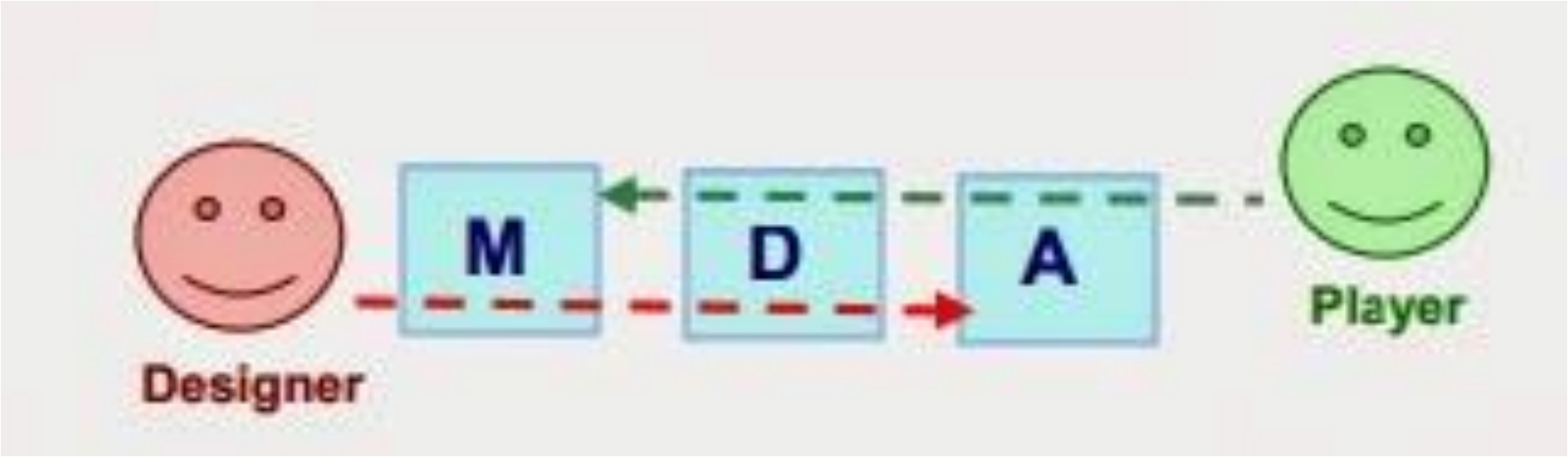
MDA Framework

- The difference between games and other entertainment products (such as books, music, movies, and plays) is that their **consumption is relatively unpredictable**.
- The chain of events that occurs during the play of the game and the outcome of those events are unknown at the time the product is completed.

- The MDA framework formalizes and segments game consumption into distinct elements...

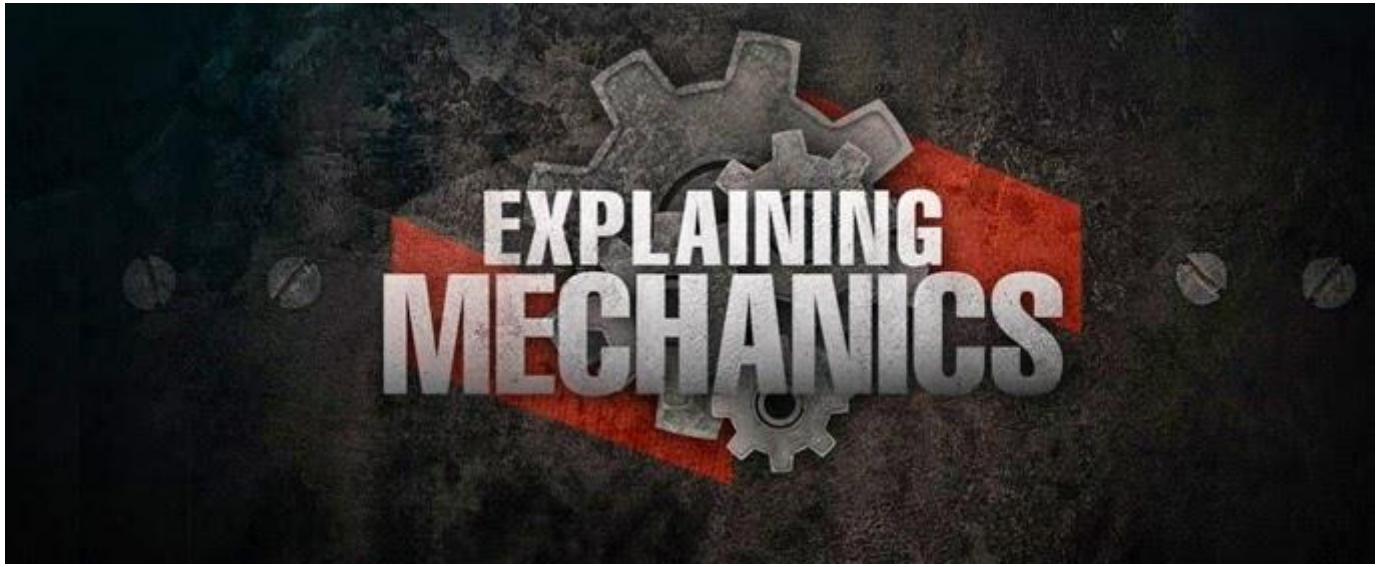
MDA Framework description

- **From the designer's perspective**, mechanics trigger the system's dynamic behavior, which in turn leads to particular aesthetic experiences.
- **From the player's perspective**, aesthetics set the tone, which derives from observable dynamics and, possibly, the mechanics used.



Mechanics

Mechanics describe the **specific components of the game**, at the level of **data representation and algorithms**.



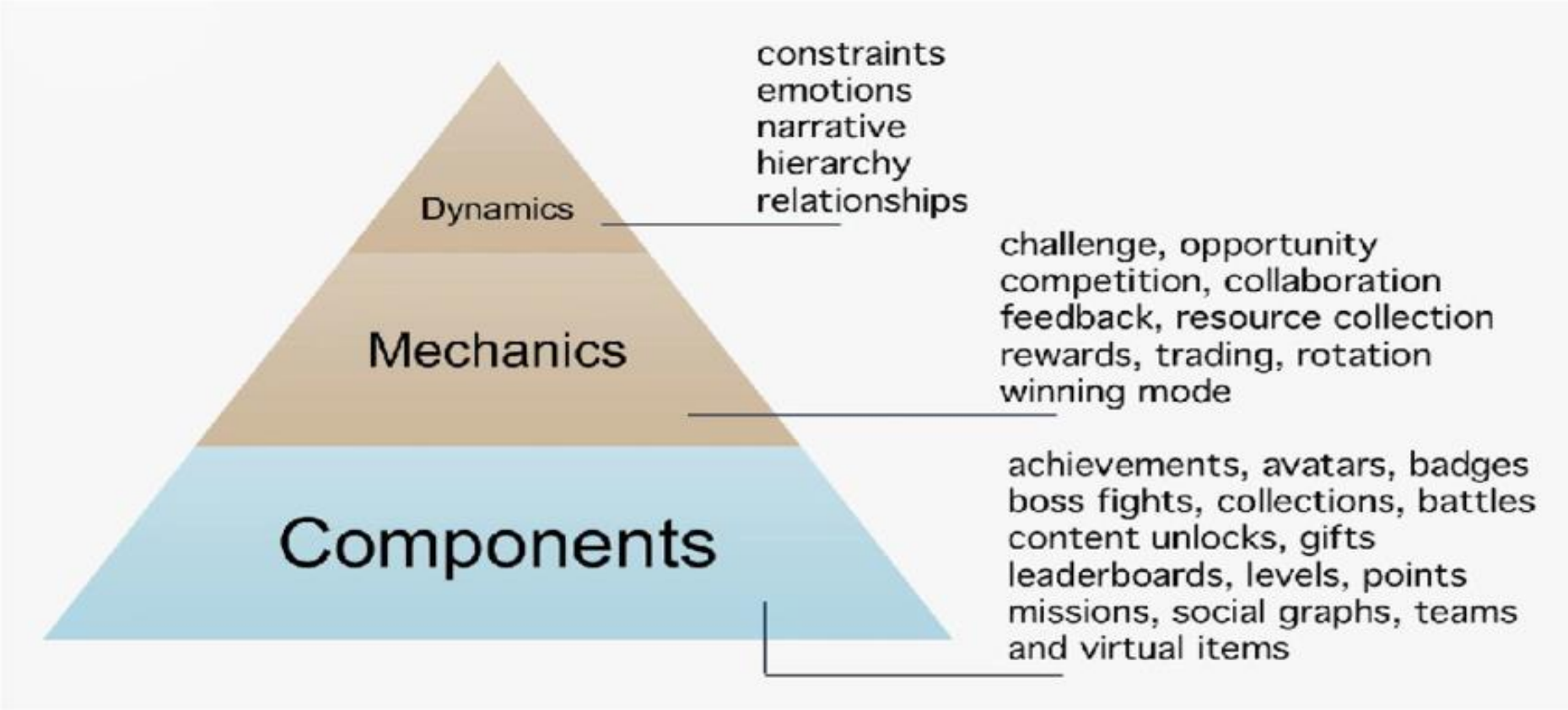
Dynamics

Dynamics describe **the execution behavior of mechanics**, **acting** on the player's data **inputs** and **outputs** (actions) over game time

Aesthetics

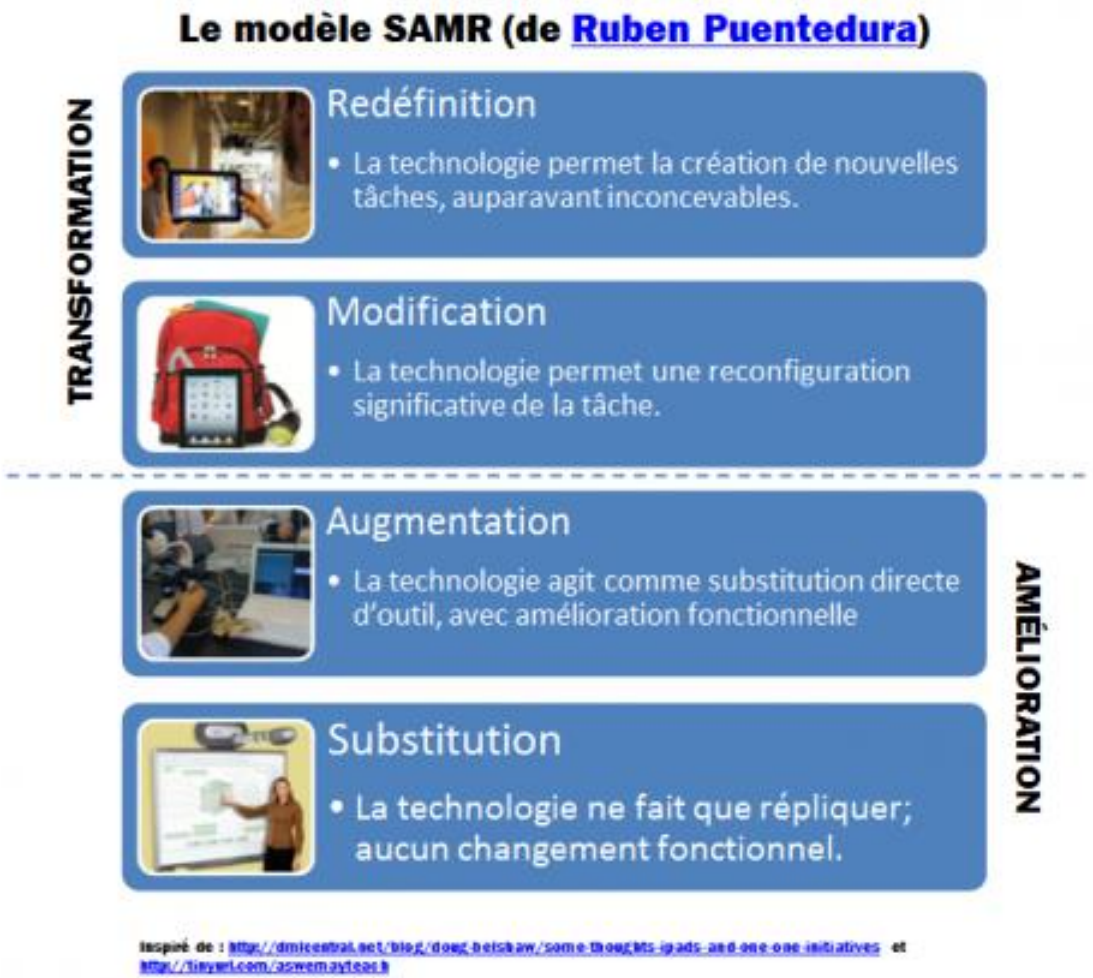
- Aesthetics describes **the desired emotional reactions** evoked by the player when **interacting with the game system.**

Gamification : Core Elements



"Well-designed gamification integrates these elements thoughtfully to create engaging learning experiences that maintain educational integrity while enhancing motivation.

Gamification: Instructional Design Frameworks ADDIE Model & SAMR Model



Gamification : Key Implementation Considerations

Alignment: Ensure game **elements** align with **learning objectives**.

Balance: Maintain balance between **gameplay** and **educational content**.

Accessibility: Design for diverse learning **needs**.

Gamification : Research Directions

Personalized Adaptive Gamification

- **Adapting challenge levels** based on learner performance,
- Providing **dynamic feedback** and personalized learning paths
- Creating **intelligent agent tutors** that respond to individual learning styles

VR/AR Integration

- Creating **more experiential and engaging learning environments**
- Facilitating deeper understanding through **immersion**
- Supporting **collaborative learning** in virtual spaces

Longitudinal Research

- Examining sustained **intrinsic motivation** beyond short-term engagement
- Studying **knowledge retention** over extended periods
- Tracking **long-term skill** development and learning outcomes

Open education: The 5COE Model

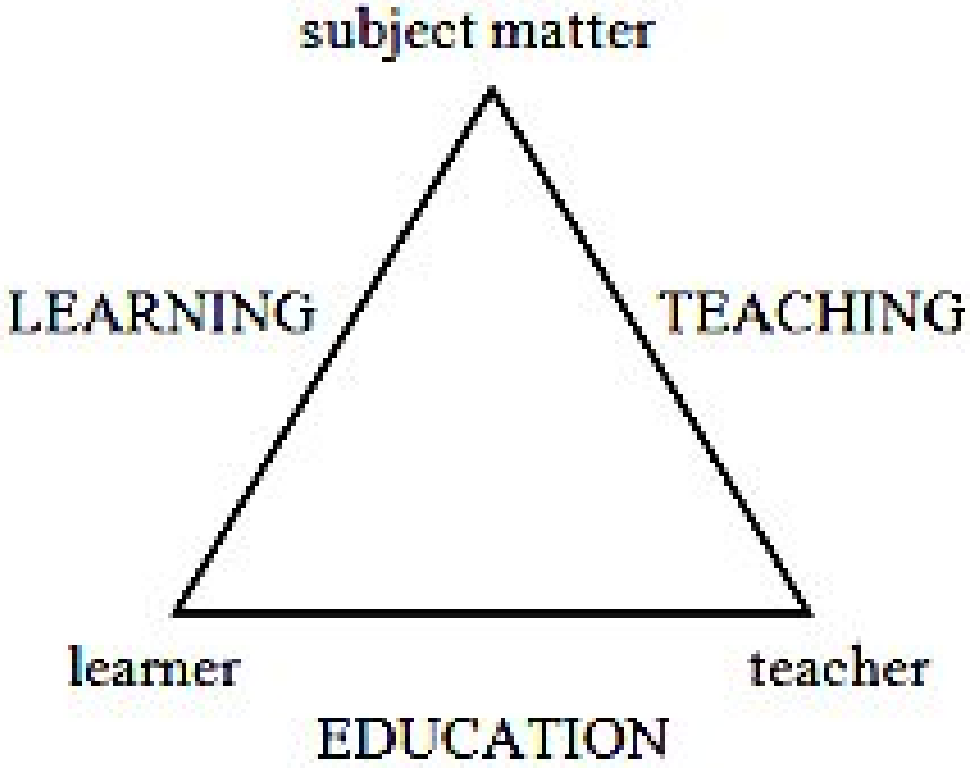
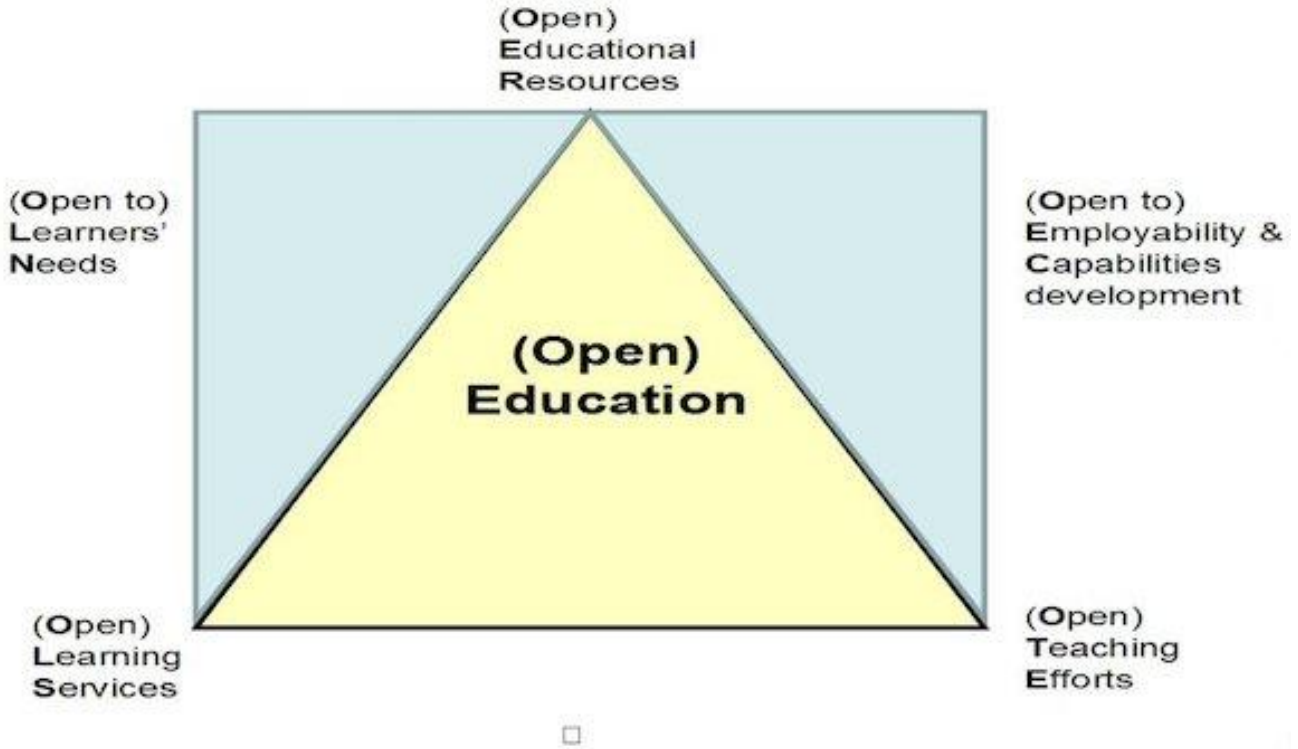


Diagram of the educational triangle of Jean Houssaye (1988)



Mulder, F. (2015). Open(ing up) Education for all…Boosted by MOOCs?. In C. J. Bonk, M.M. Lee, T.C. Reeves, & T.H. Reynolds (Eds.), *MOOCs and open education around the world* (pp. xviii---- xxvii). London: Routledge.

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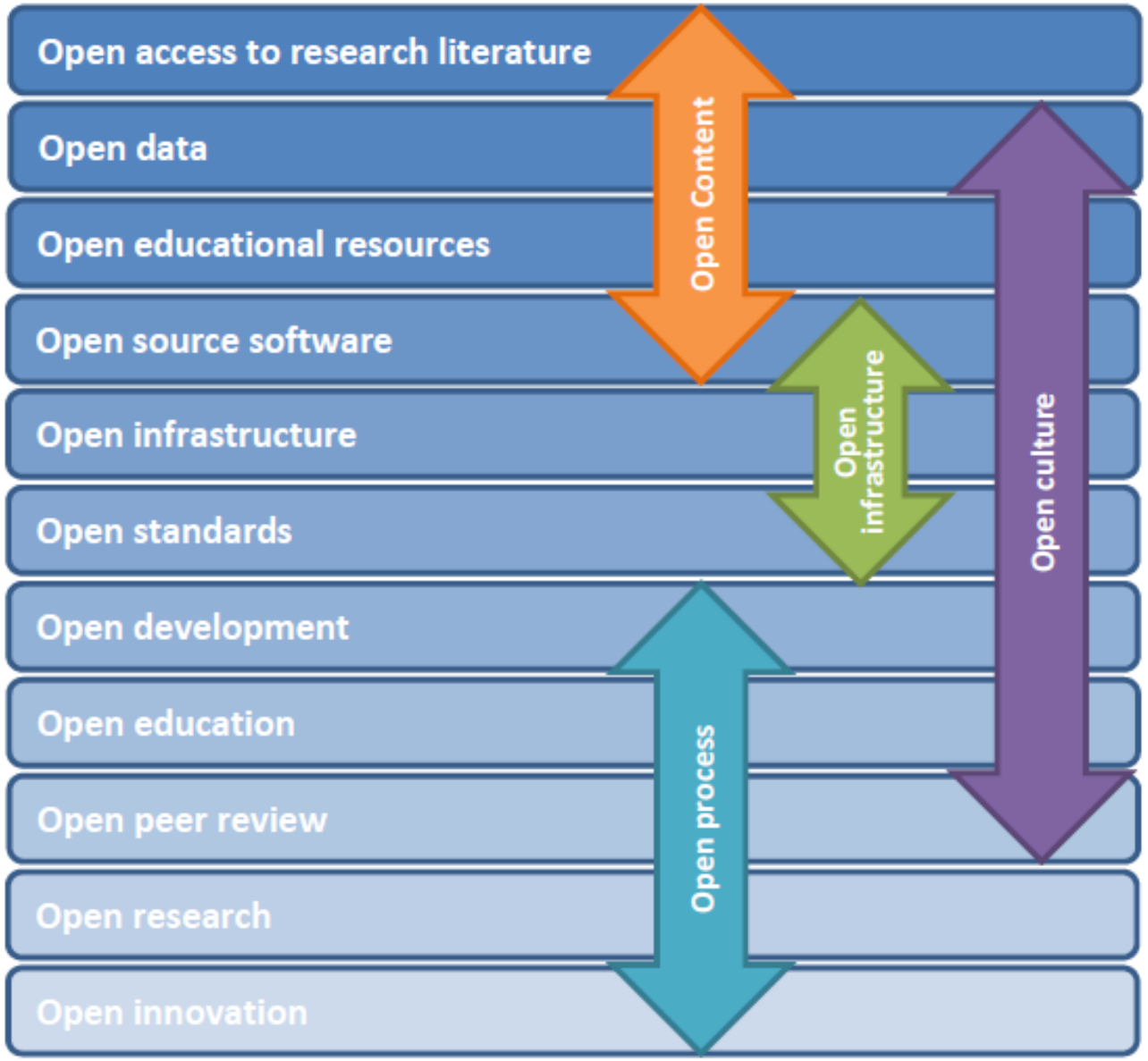
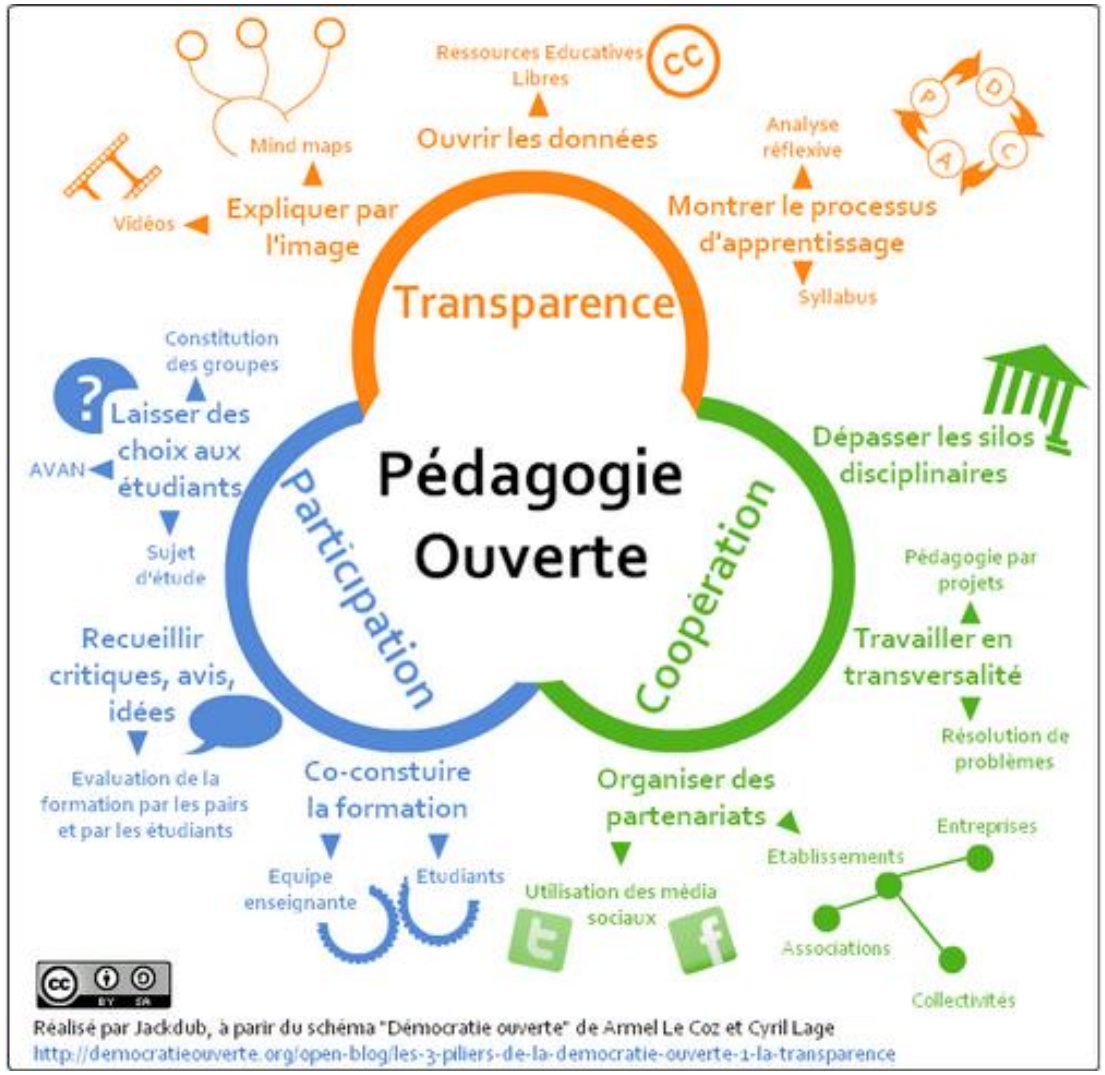


The range of "Opens"

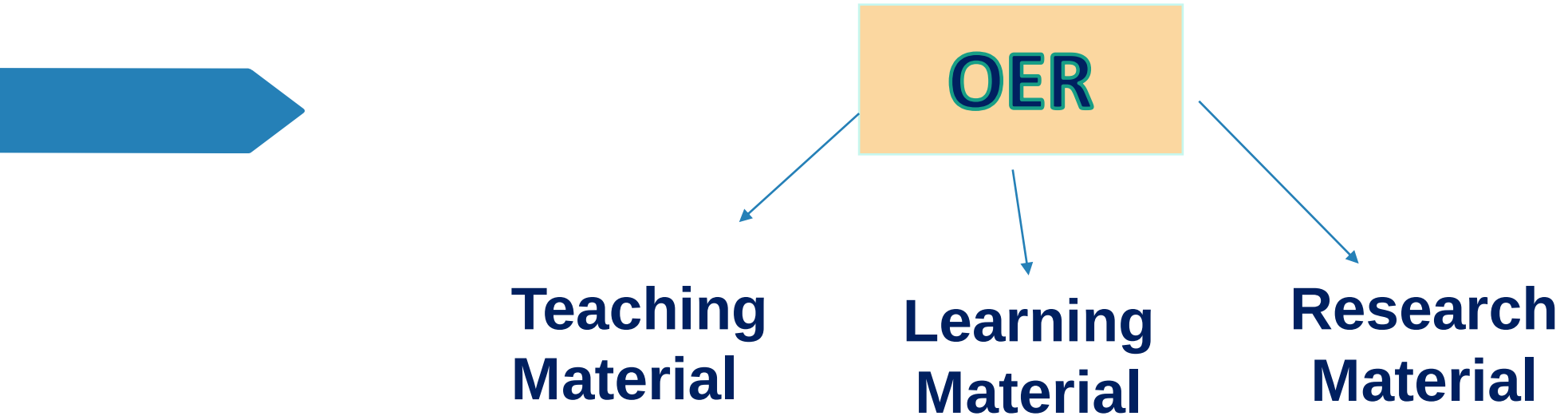
Yves Punie, Future of Learning and Open Education 2030: Towards new modes of learning, teaching and certifying, *VLEVA Seminar, Brussels, June 2014.*

Open Pedagogy



Open pedagogy, (Open educational practices (OEP) : Use of open educational resources (OER) to support learning, or the open sharing of teaching practices with a goal of **improving education and training at the institutional, professional, and individual level**

Learning with technology *rather than* learning for technology



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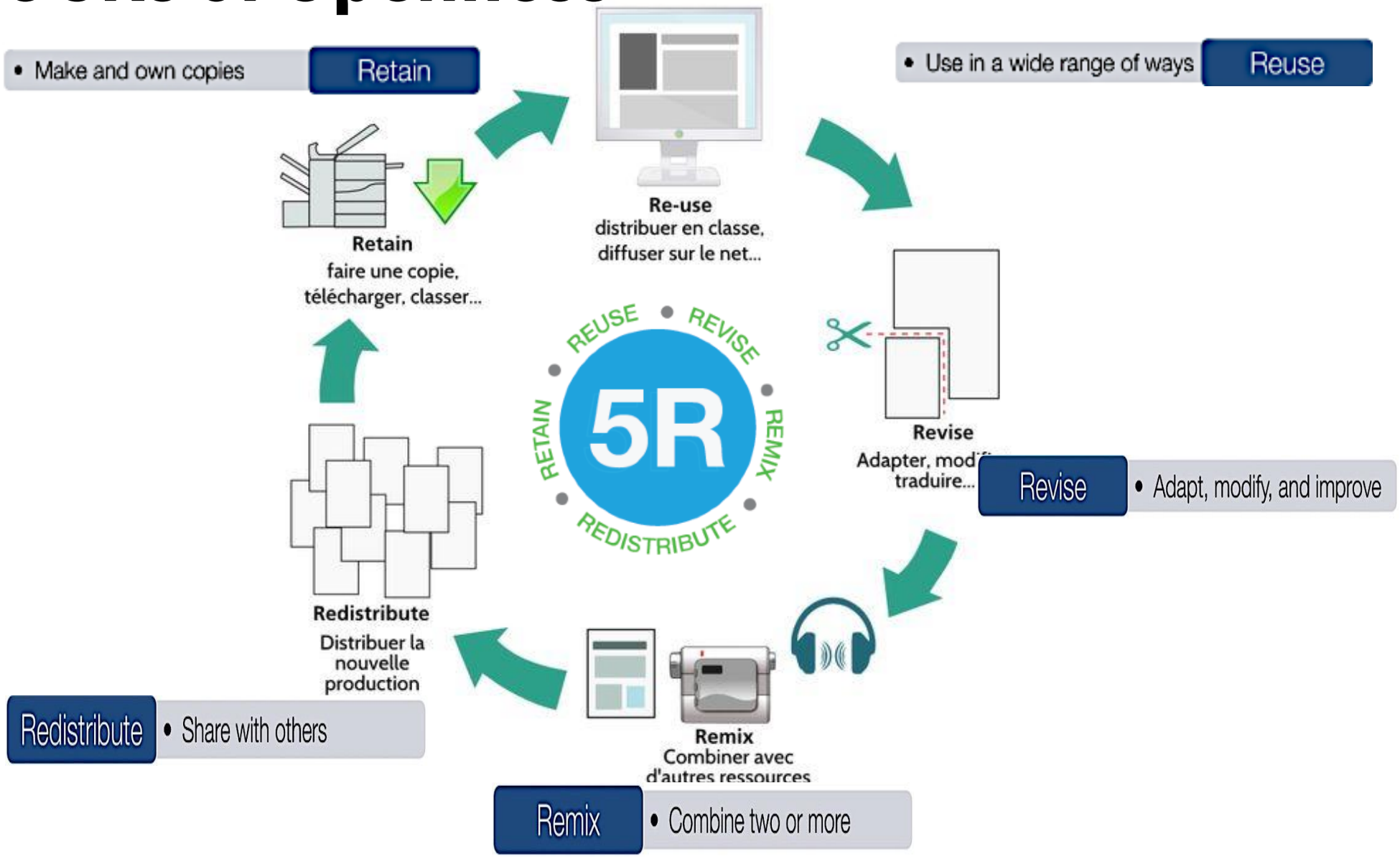

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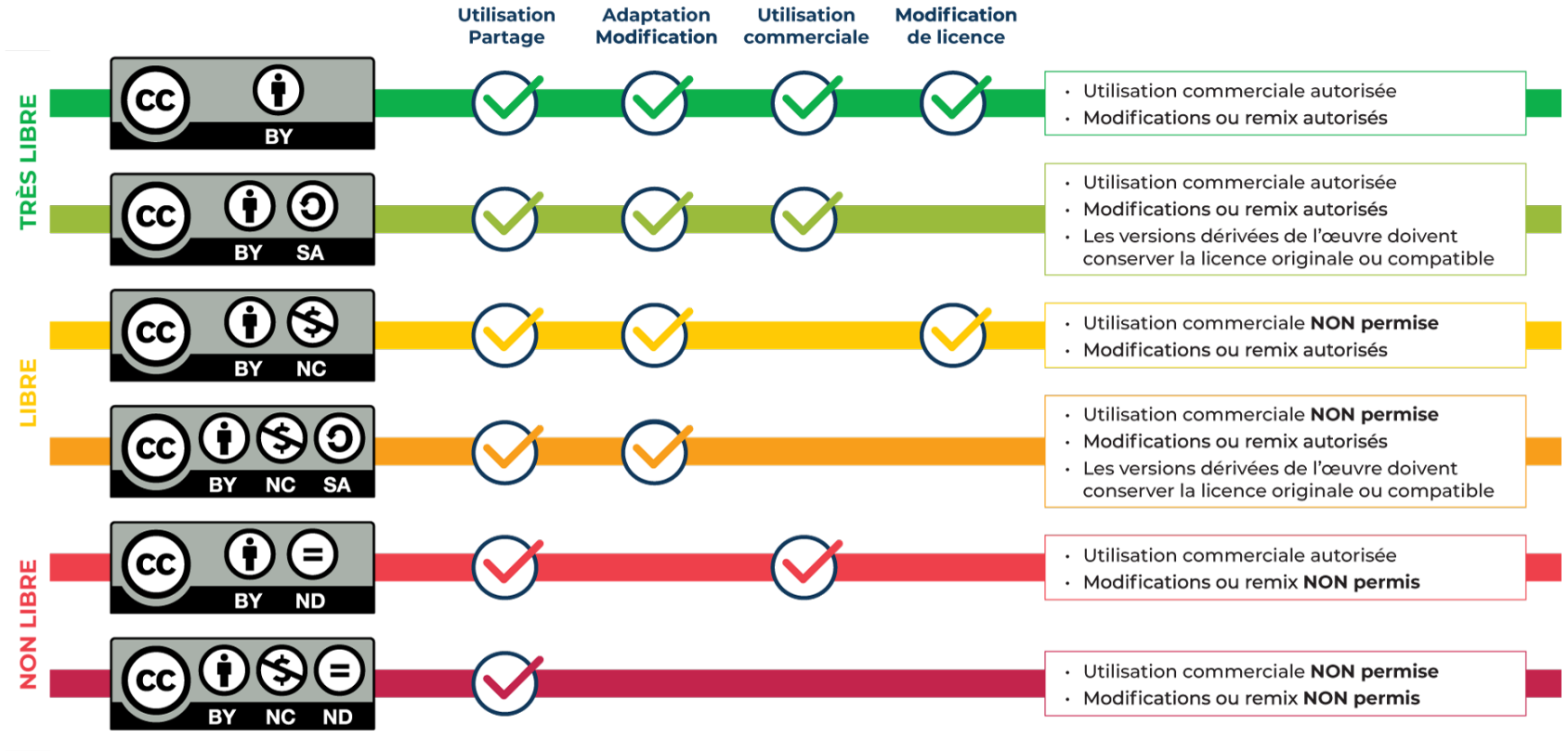

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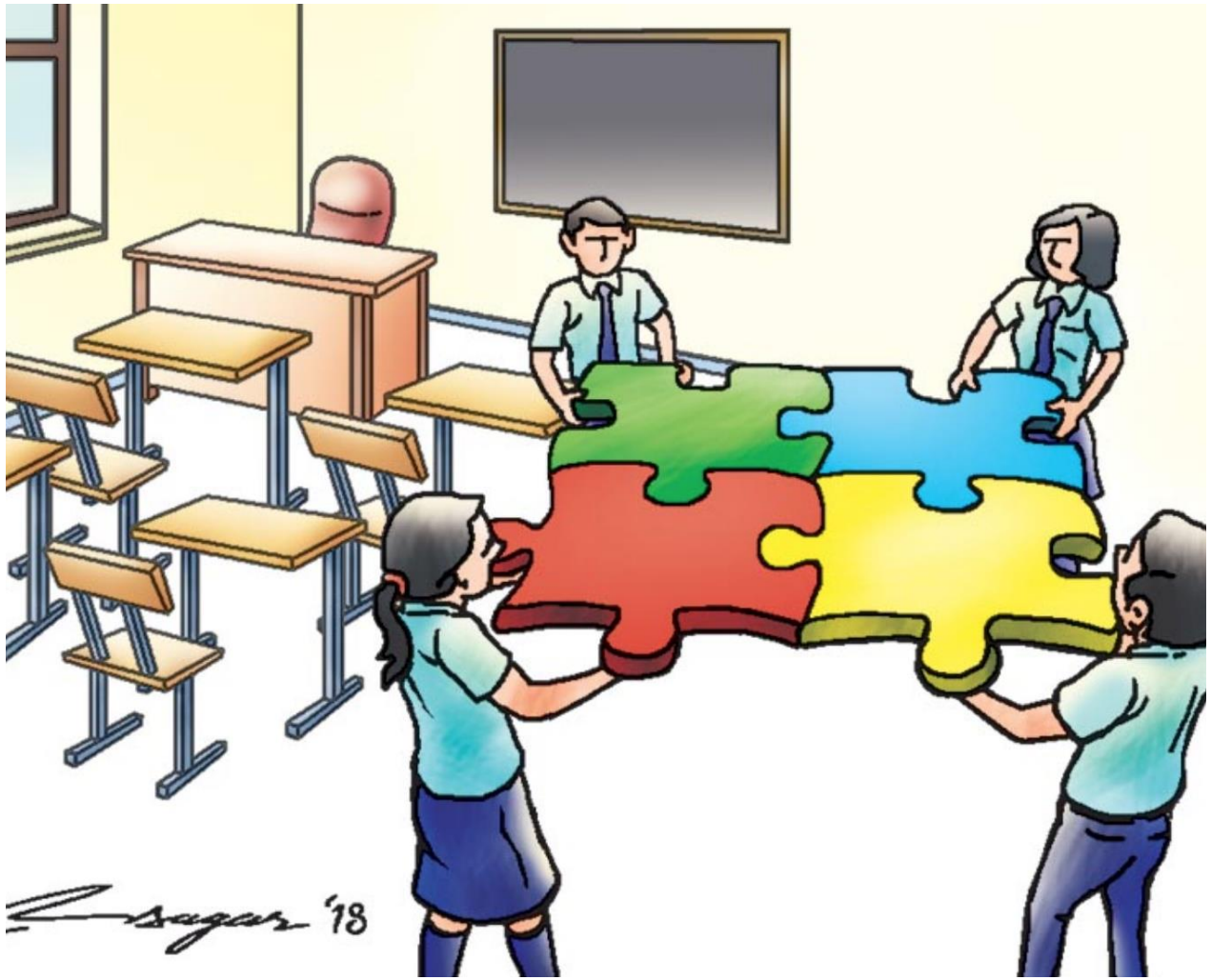
Collaborative Learning

What is Collaborative Learning ?

- Collaborative learning is an instructional approach where two or more learners work together to explore a problem, complete a task, or create a product.
- Emphasizes interaction, shared responsibility, and co-construction of knowledge, rather than individual, isolated work.



Cooperative vs. Collaborative Learning

Dimension	Cooperative Learning	Collaborative Learning
Focus	Teacher-centered; emphasis on individual achievement	Student-centered; emphasis on collective achievement
Roles & Responsibilities	Roles often predefined or imposed; limited responsibility (each person completes a portion)	Roles negotiated and agreed upon; participants form a community to solve problems together
Mission / Goals	Delegation of sub-tasks with different individual goals	Common tasks pursued collectively with shared goals
Nature of Work	Closed assignments; predictable, static processes	Open assignments; unpredictable, dynamic processes

Collaborative Learning: Core Characteristics

Shared Goals: Students work toward a common learning objective.

Active Participation: All participants contribute ideas, questions, and feedback.

Mutual Interdependence: Each learner's progress depends on the contributions of others.

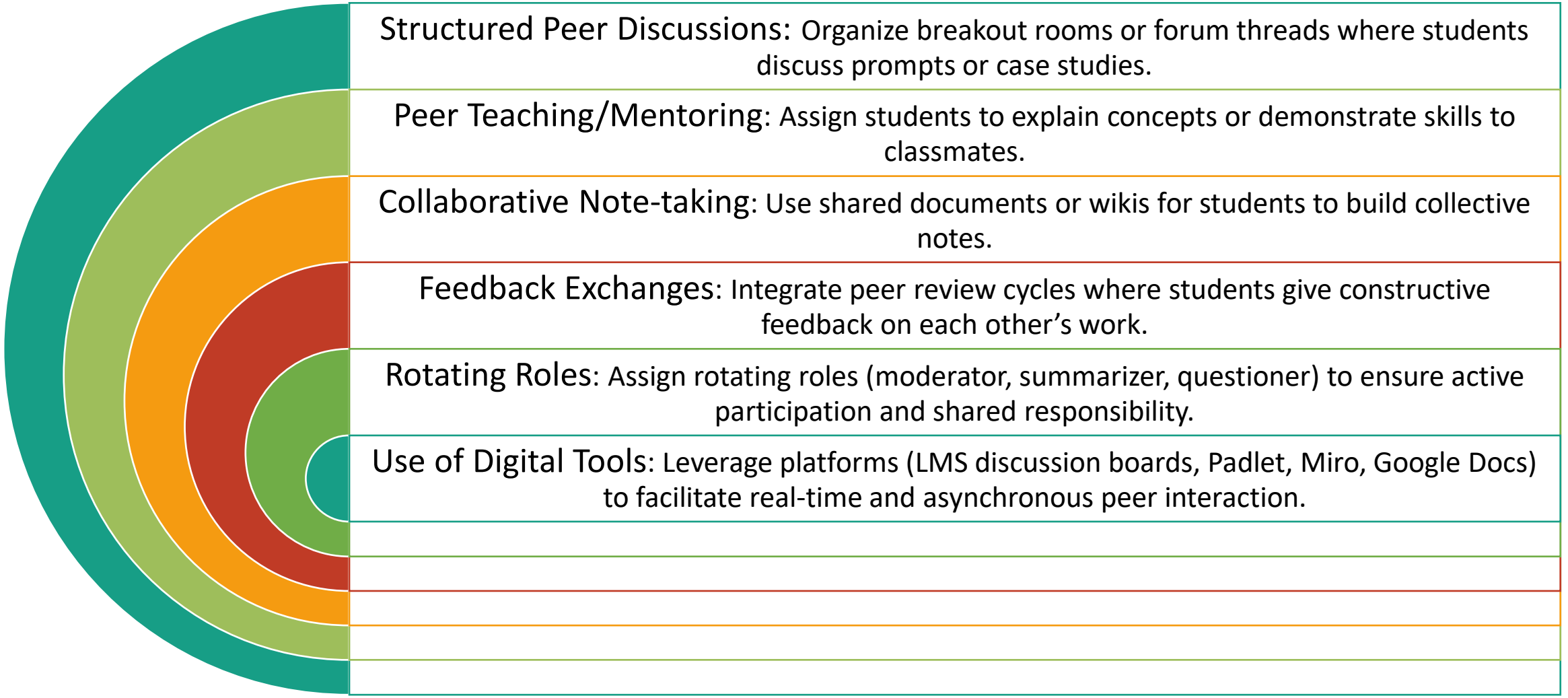
Dialogue and Reflection: Discussion, negotiation, and reflection are integral parts.

Development of Soft Skills: Collaboration fosters communication, critical thinking, and conflict resolution.

Collaborative Learning: Benefits

Collaborative Learning : Approachs

Implementing Peer Interaction in Practice



- **Structured Peer Discussions:** Organize breakout rooms or forum threads where students discuss prompts or case studies.
- **Peer Teaching/Mentoring:** Assign students to explain concepts or demonstrate skills to classmates.
- **Collaborative Note-taking:** Use shared documents or wikis for students to build collective notes.
- **Feedback Exchanges:** Integrate peer review cycles where students give constructive feedback on each other's work.
- **Rotating Roles:** Assign rotating roles (moderator, summarizer, questioner) to ensure active participation and shared responsibility.
- **Use of Digital Tools:** Leverage platforms (LMS discussion boards, Padlet, Miro, Google Docs) to facilitate real-time and asynchronous peer interaction.

Implementing PBCL in Practice

Real-World Projects

Clear Objectives & Outcomes

Team Formation

Project Planning Tools

Scaffolded Milestones

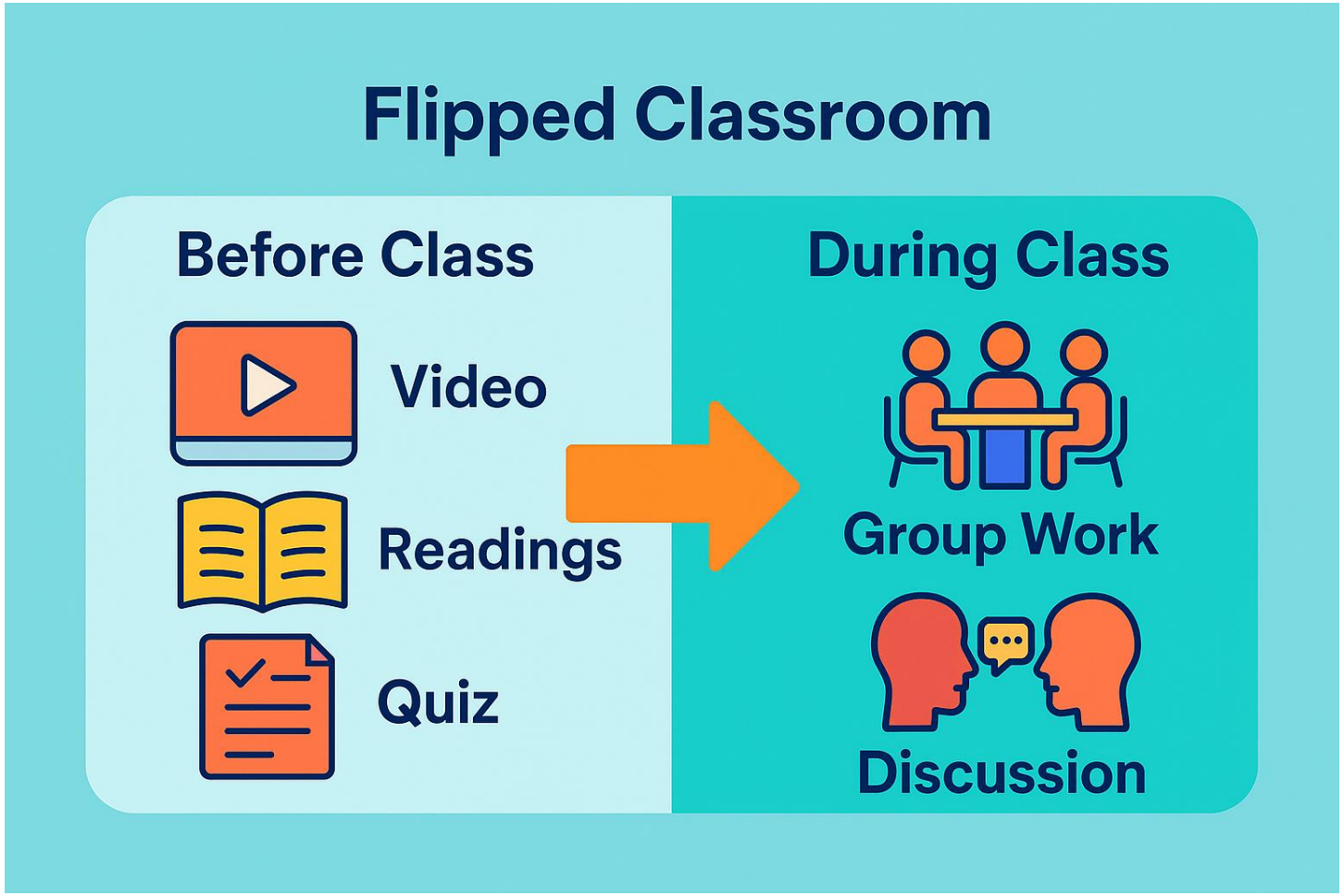
Instructor as Facilitator

Peer & Self-Assessment

Showcase & Feedback

Flipped Classroom

- Pre-Class Content Delivery
- Pre-Class Checks
- In-Class Active Learning
- Clear Guidance & Expectations
- Use of Digital Tools
- Feedback During Class
- Reflection & Follow-Up

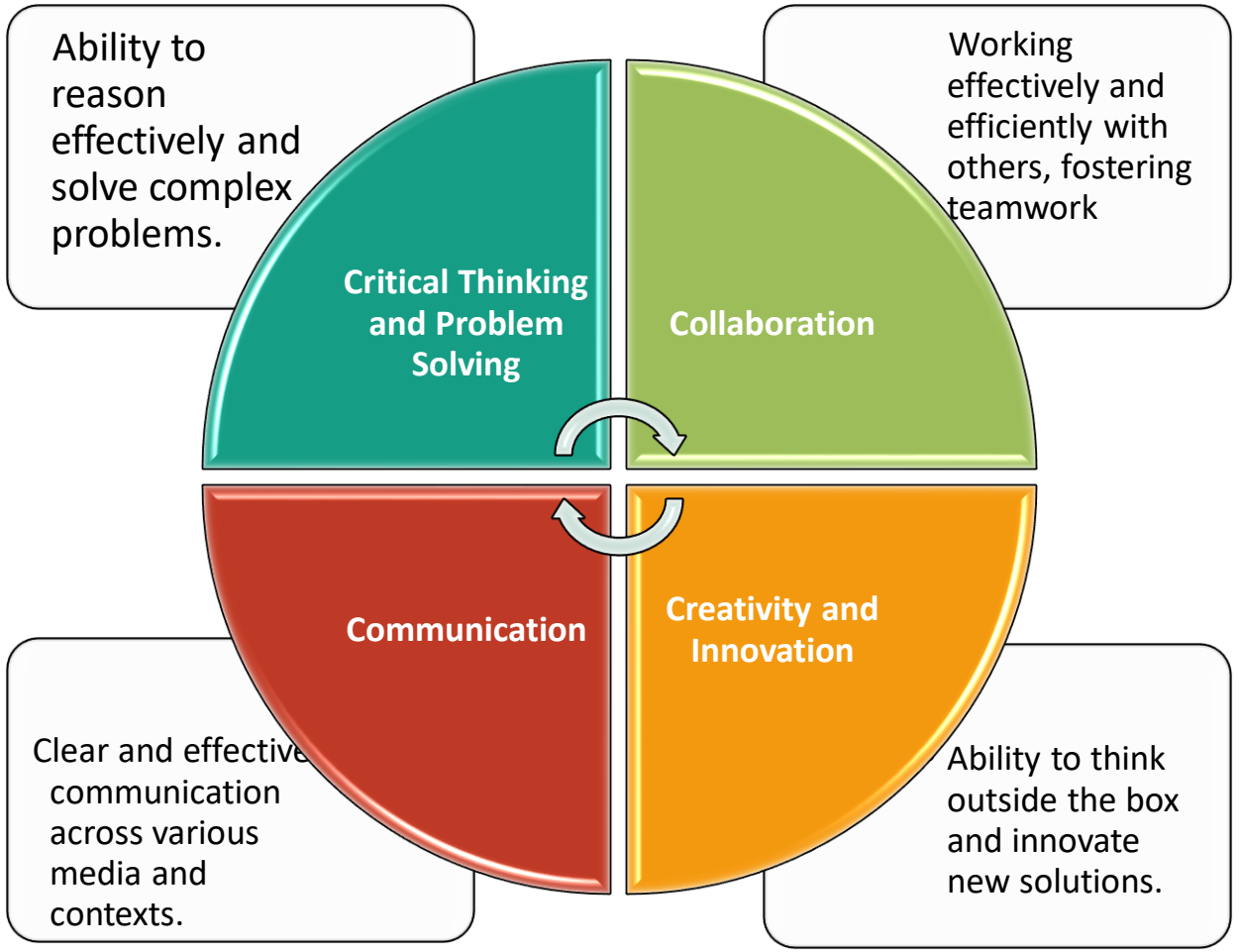


Implementing Social Learning in Practice

- Create Online Communities: Set up discussion forums, chat channels, or social media groups where learners can interact informally.
- Integrate Social Features in the LMS: Enable comment threads, likes, or peer endorsements on shared content to encourage interaction.
- Peer Mentoring & Resource Sharing: Encourage students to post helpful articles, videos, or tools and mentor each other on topics.
- Facilitate Informal Learning Events: Organize virtual coffee chats, open Q&A sessions, or “ask an expert” hours to strengthen the community.
- Recognize and Highlight Contributions: Acknowledge active contributors publicly (badges, shout-outs) to reinforce positive participation.
- Use Micro-Content: Encourage short posts, quick polls, or mini-videos to keep interactions lively and continuous.
- Blend Synchronous & Asynchronous Modes: Combine real-time webinars or live discussions with ongoing forum threads for deeper engagement.

Assessment

- **Assessment of P21 Learning Skills**
  - The Partnership for 21st Century Learning (P21) framework focuses on preparing students with the skills necessary to succeed in the 21st century.



Core Dimensions of Assessment in Collaborative e-Learning

Individual Contribution	Measuring each learner's input, quality of ideas, and effort.
Group Outcome	Evaluating the product or solution developed collectively (e.g., a shared report, prototype, or presentation).
Collaboration Process	Observing interaction patterns: participation frequency, responsiveness, role distribution, and conflict resolution.
Peer Assessment	Learners evaluate one another's contributions, providing feedback on effort, quality, and teamwork.
Self-Assessment	Learners reflect on their own performance and learning within the group context.
Formative vs. Summative	Formative: ongoing feedback during collaboration. Summative: final evaluation at the end of a project.

Methods and Tools

Learning Analytics: Dashboards showing interaction metrics (messages posted, files shared, leadership roles).

Rubrics for Collaboration: Clear criteria for both the quality of the group output and the process of working together.

Peer Review Platforms: LMS modules or apps allowing structured peer feedback.

AI-Supported Feedback: Automated suggestions or alerts about low participation or imbalanced groups.

Portfolios & Reflections: Individual or group submissions showing evidence of learning and collaboration.

Research Challenges of Assessment in Collaborative eLearning

1. Measuring Individual Contributions within Groups
2. Balancing Process and Product Assessment
3. Developing Valid and Reliable Assessment Instruments
4. Integrating Peer and Self-Assessment Effectively
5. Leveraging Learning Analytics and AI Responsibly
6. Addressing Cultural and Contextual Differences
7. Ensuring Ethical and Inclusive Practices
8. Scaling and Sustainability

Main innovations in assessment in collaborative eLearning

- Analytics-Driven Assessment
- AI-Supported Feedback and Grouping
- Peer and Self-Assessment 2.0
- Process + Product Assessment Models
- Game-Based and Scenario-Based Assessment
- Learning Portfolios and e-Badges
- Multimodal and Cross-Platform Data Integration
- Ethical and Explainable Assessment Tools

Recent Publication – Ontology-Driven Project Recommendation (01 April 2025)

Recent Publication – Open Assessment Framework in PBCL (26 July 2025)

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Original Research | Published: 26 July 2025

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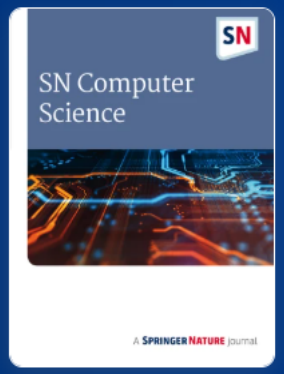


SN Computer Science

Aims and scope →

Submit manuscript →

Asma Hadyaoui & Lilia Cheniti-Belcadhi

Part of a collection:
Advances on Web Information Systems and Technologies

Stealth assessment in collaborative elearning environment

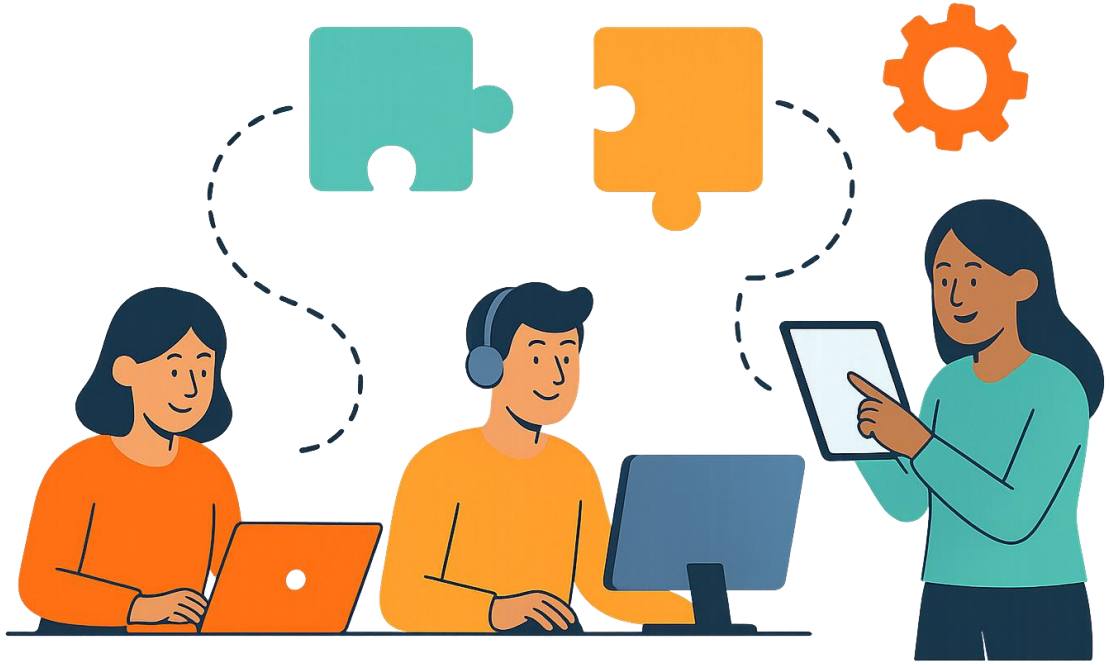
Problem with Traditional Assessments

- Quizzes/exams disrupt learning flow
- Anxiety + surface knowledge focus
- Misses process data

Stealth Assessment: Concept and Rationale

Stealth assessment is an emerging approach in digital and collaborative eLearning environments.

It is embedded in activities, so learning is assessed naturally as students interact, solve problems, and collaborate.



Stealth Assessment: Concept and Rationale

Embedded and invisible

Assessment happens naturally inside digital and collaborative eLearning activities.

Authentic evidence

Captures what learners do (skills, decisions, interactions) rather than only test answers.

Continuous process

Evaluation occurs throughout learning without interrupting progress.

Lower stress

Reduces test anxiety and supports more natural engagement in collaborative tasks.

Visible vs. Invisible

Traditional Test

- Separate from learning activities
- High stress, test anxiety
- Focuses on outcomes (scores)
- Snapshot at a single moment

Stealth Assessment

- Embedded within learning activities
- Low stress, natural engagement
- Focuses on process and skills
- Continuous, real-time evidence

How Stealth Assessment Operates

Stealth assessment works in two main steps:

1. **Step 1 – Logging learner actions:** every interaction is captured in the background.

2. **Step 2 – Mapping to indicators & competencies:** actions are transformed into meaningful measures of learning.

This process ensures assessment is **continuous**, **invisible**, and **tied directly to authentic learning activities**.

How Stealth Assessment Operates

Step 1 – Logging learner actions:

In the first step, the system logs traces of learner activity without interrupting the task.
Traces may include:

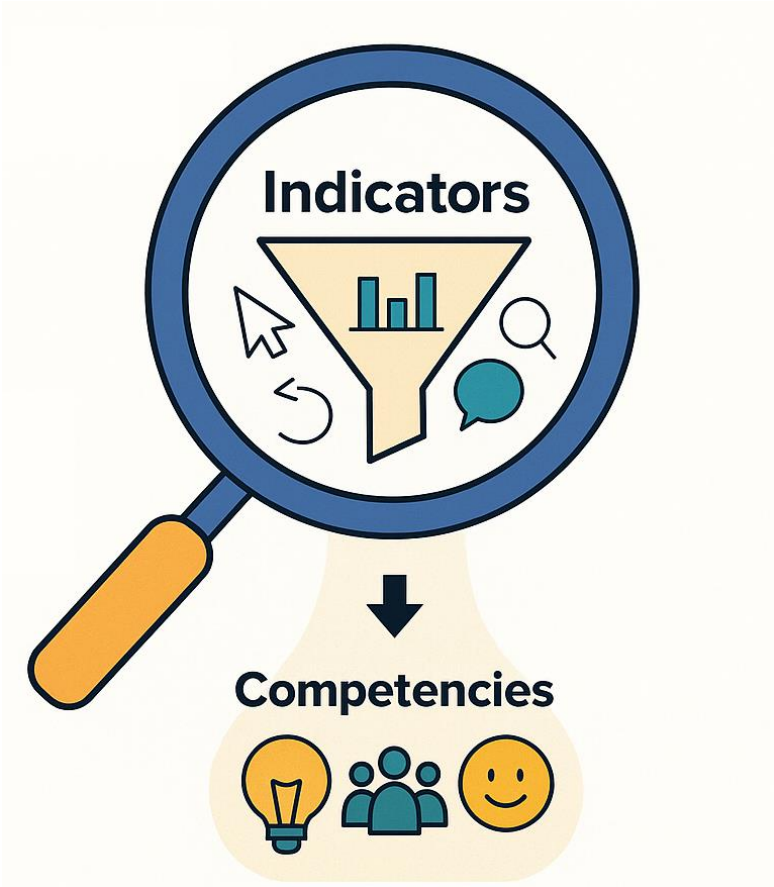
How Stealth Assessment Operates

Step 2 – Mapping to indicators & competencies:

In the second step:

- Logged actions are translated into indicators.
- Indicators are then grouped into competencies.

This creates the bridge from observed behavior → learning outcomes.



Indicators

Indicators = measurable patterns in learner actions that provide evidence of skills and behaviors.

Examples:

Number of retries → persistence

Turn-taking frequency → teamwork

Hint usage → self-regulation

Error correction speed → problem-solving

Navigation choices → strategy and planning

Time on task → engagement

Competencies in Focus

Once indicators are established, they are grouped into broader **competencies** that capture different dimensions of learning.

- **Cognitive**: problem-solving, reasoning
- **Social**: collaboration, communication
- **Affective**: persistence, self-regulation

Stealth assessment and collaboration

In collaborative learning settings, stealth assessment captures how groups work together, not just individual performance.

Captures authentic teamwork

Reveals invisible dynamics

Promotes adaptive feedback

Benefits of Stealth Assessment

Stealth assessment offers broad **advantages** for learning and evaluation

Richer data – captures learning processes and strategies, not just end answers.

Low-stakes evaluation – reduces test anxiety while ensuring continuous measurement.

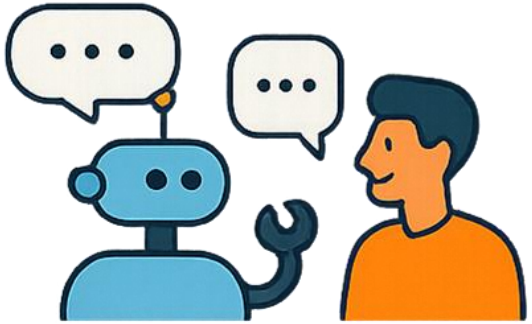
Real-time adaptivity – enables immediate, personalized feedback.

Future-ready skills – supports the development of 21st-century competencies.

Stealth Assessment in Practice

Escape-room style puzzles

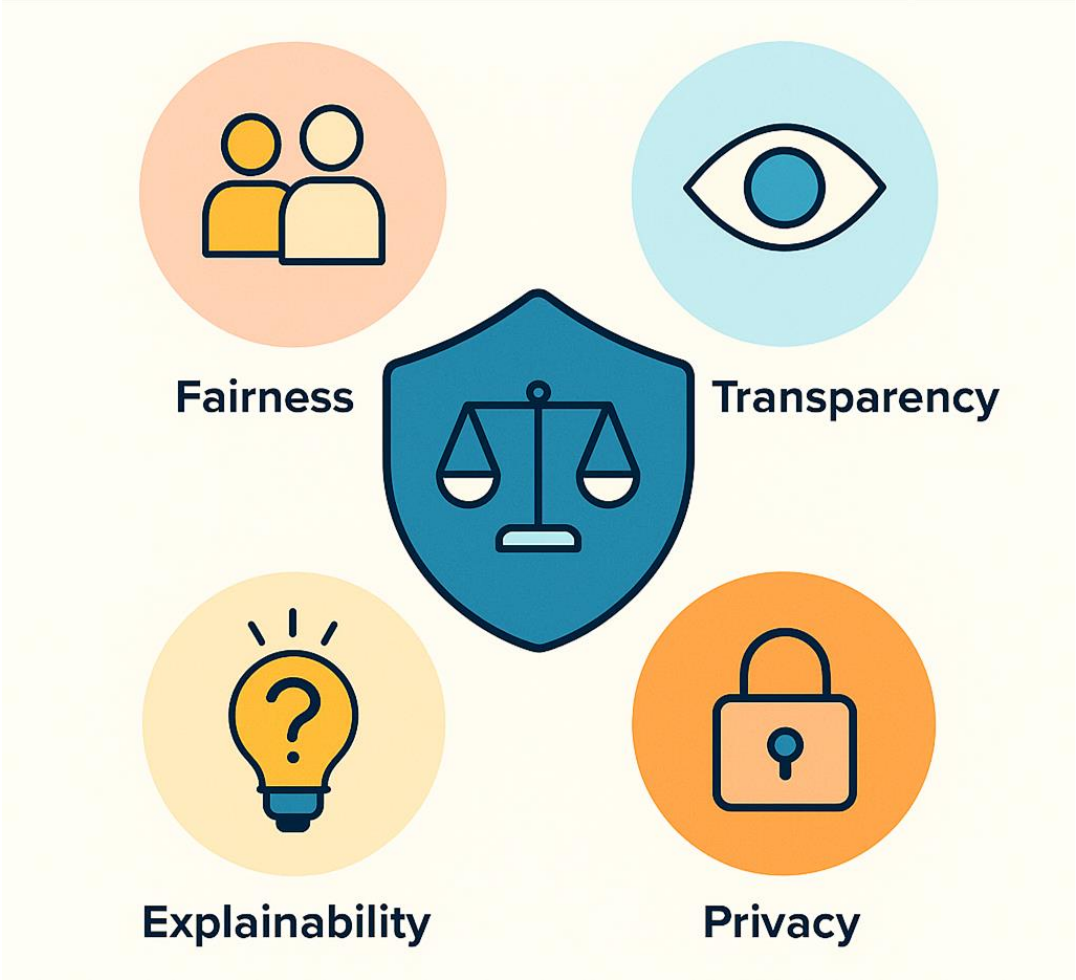
Collaborative design projects



AI-assisted debate

Teacher dashboards

Ethical & Practical Considerations



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Ontological model for intelligent assessment in collaborative environment based on serious games

Ameny Rjiba[a], Lilia Cheniti Belcadhi[a], Judita Kasperiuniene[b]

[a]PRINCE Research Lab, ISITCom , Hammam Sousse, Sousse University, Tunisia
[b]System Analysis Department, Faculty of Informatics, Vytautas Magnus University, Kaunas, Lithuania

Intelligent collaborative assessment in game-based learning: A bibliometric analysis

Ameny Rjiba
PRINCE, Research Lab,ISITCom
Sousse University
Sousse, Tunisia
ameny.rjiba@gmail.com

Lilia Cheniti Belcadhi
PRINCE, Research Lab,ISITCom
Sousse University
Sousse, Tunisia
lilia.cheniti@isitc.u-sousse.tn

Judita Kasperiuniene
System Analysis Department, Faculty of Informatics
Vytautas Magnus University
Kaunas, Lithuania
judita.kasperiuniene@vdu.lt

***Abstract*— Game-based learning environments are capturing increasing attention for their ability to engage learners and promote knowledge acquisition. Artificial intelligence holds immense potential to personalize learning experiences and deliver intelligent assessment. Collaborative learning approaches, when integrated seamlessly with game settings, can further enhance the learning process. This study explores the domain of intelligent collaborative assessment in game-based learning environments through bibliometric analysis. Using data from Scopus, we uncover important research themes, global impact trends, influential sources, and the evolution of research over time. Our analysis of findings reveals a gap in research concerning the integration of AI assessment within collaborative game-based learning environments. To address this gap, we propose a novel framework that utilizes continuous assessment, personalized learning, and dynamic adaptation to optimize the learning experience for all participants. This study provides valuable insights to guide future research and educational improvements in intelligent collaborative assessment for game-based learning.**

Keywords— Serious games, Assessment, Game-based learning, Collaborative learning, Artificial intelligence, Co-word analysis, Bibliometric analysis,

impact. Researchers use bibliometric analysis for a variety of objectives, such as discovering developing trends in article and journal performance, collaboration patterns, and research elements, as well as exploring the intellectual structure of a certain area in the existing literature.[5]

Our study focuses in the field of education. Bibliometric analysis provides a useful lens through which to explore the dynamics of academic discourse in game-based learning environments specifically in serious games. Serious games go beyond basic entertainment by emphasizing both enjoyment and skill development. They appeal to a variety of audiences while simultaneously meeting instructional objectives, aiding skill acquisition, and fostering knowledge enhancement.[6]

Integrating AI components into gaming systems has become indispensable, enhancing their complexity and adaptability [7]. Through AI-driven assessment mechanisms, personalized feedback and learning paths are facilitated, catering to the unique needs of each learner [8]. Additionally, serious games emphasize collaborative learning, emphasizing the importance of teamwork and shared experiences.[9]

Our research aims to address the following questions:

Adaptive Difficulty and Stealth Assessment in Collaborative Game-based Learning

Abstract

This article explores the application of reinforcement learning-based dynamic difficulty adjustment(DDA) algorithms in collaborative game-based learning environments, with a focus on intelligent assessment. Adaptation in gaming environments is essential for providing personalized learning experiences that adapt to a wide range of learner needs. Although DDA algorithms are commonly used to adjust game difficulty for individual performance, research on their effectiveness in collaborative settings remains limited. Our study addresses this gap by proposing a novel reinforcement learning based DDA algorithm that integrates real-time performance data from both individual and group interactions, enabling dynamic adjustments that maintain an optimal balance between learner challenges and skills. Additionally, we introduce the GRADES framework, a layered architecture that combines adaptive decision-making, stealth assessment, and continuous performance monitoring to personalize learning experiences at both individual and group levels. Comprehensive simulations and comparative analysis of existing DDA algorithms show that our approach improves engagement and learning results across a range of game difficulty levels. These findings highlight the possibility of integrating reinforcement learning and stealth assessment to develop adaptable, responsive educational environments, thereby advancing the field of collaborative game-based learning.

Keywords

Dynamic Difficulty Adjustment (DDA), Collaborative Learning, Game-Based Learning, Intelligent Assessment, Artificial Intelligence

A framework for Stealth Assessment in Collaborative Game-Based Learning

Abstract

Stealth assessment has emerged as a promising approach for unobtrusively evaluating learners' skills in game-based environments. While prior research has focused on individual gameplay, the assessment of collaboration remains underexplored despite its central role in learning. This paper presents a framework for stealth assessment in collaborative game-based learning, grounded in the principles of Evidence-Centered Design (ECD). The framework integrates competency, evidence, and task models to capture five core collaborative competencies: team coordination, collective problem solving, collaboration effectiveness, self-regulation, and engagement. To formally represent these relationships, we modeled the framework using an ontology that links in-game events to behavioral indicators and competencies, enabling semantic consistency and explainable inference. A puzzle-based prototype was developed with structured event logging, sliding-window segmentation, and an AI collaborator to simulate teamwork. Logged events were processed into real-time competency scores, accompanied by narrative explanations displayed on an educator dashboard. A preliminary case study demonstrates the feasibility of this approach, showing how collaborative competencies can be inferred transparently from natural gameplay. This work advances stealth assessment in collaborative contexts by aligning ECD with semantic modeling techniques, offering a pathway toward interpretable and continuous evaluation in serious games.

Thank you…

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Gamified Open Collaborative Assessment Environment

Dr. Lilia Cheniti & Dr. Asma Hadyaoui & Mrs Ameny Rjiba

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