Chapter 2

Design Principles and Models for Serious Games

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Abstract

Serious games in health education require structured design approaches that strike a balance between pedagogical effectiveness and engaging gameplay. This chapter examines the evolution of design methodologies developed specifically for educational game development, analyzing how different models address the unique challenges faced by multidisciplinary health education teams. Through comparative analysis, we explore three established frameworks: The Design-Play-Experience (DPE) model, which provides systematic organization of game elements; the Activity Theory-Based Model of Serious Games (ATMSG), which grounds design decisions in educational theory; and the Learning Mechanics-Game Mechanics (LM-GM) framework, which ensures alignment between instructional strategies and interactive features. Building upon these foundations, the chapter presents a detailed examination of the Art of Serious Game Design (ASGD) framework—a collaborative methodology specifically developed for education contexts. ASGD addresses the limitations of existing models by providing structured yet flexible tools for interdisciplinary teams, including ideation cards, visual canvases, and iterative design processes. Through practical examples and framework comparisons, this chapter demonstrates how structured design approaches can bridge the gap between educational theory and game development practice, enabling healthcare educators, instructional designers, and developers to create compelling learning experiences that maintain clinical accuracy while fostering engagement.

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1.Why structured design approaches are essential for serious games in health education

Serious games are transforming health education. They let learners safely explore clinical situations, practice decision-making, and develop critical skills—without endangering real patients.

However, without a well-structured design, these games often fail. They can become expensive projects that neither teach effectively nor engage players. That is because most existing game design methodologies were built for entertainment—not for the complex needs of interdisciplinary health education teams.

Key Terms:

- **Serious Games:** Digital games designed primarily for educational purposes rather than entertainment
- **Game Mechanics:** Basic rules and systems that define player interactions (e.g., scoring, progression)
- **Game Dynamics:** Emergent behaviors arising from mechanic interactions during play
- **Framework:** Structured methodology providing systematic design guidelines
- **Interdisciplinary Teams:** Collaborative groups from different fields (clinicians, educators, developers)

Recent evidence shows the potential of well-designed health games. For example, a study on asthma care showed that a rigorously designed game improved medication adherence (Poot et al., 2023).

To close the gap between general game design and education needs, Djafarova and colleagues developed the **Art of Serious Game Design (ASGD)** framework. ASGD is a step-by-step methodology tailored for concept development by educators, developers, and designers. It helps them

- **Clarify and integrate learning objectives** with game mechanics
- **Run focused, gamified brainstorming** sessions without technical distractions
- **Streamline interdisciplinary communication** through tangible artifacts
- **Maintain clinical accuracy** while fostering creativity

Early evaluations are promising. ASGD helps teams clarify learning objectives, run focused brainstorming sessions, and develop solid game concepts—without sacrificing clinical rigor (Djafarova et al., 2023).

This chapter examines how structured design frameworks—and ASGD in particular—can address the challenges of developing serious games for health education.

2. Frameworks That Informed ASGD

2.1. DPE Helps Organize Game Elements—But Limits Health Team Creativity

The **Design–Play–Experience (DPE)** framework, created by Winn (2009), builds on the popular **Mechanics-Dynamics-Aesthetics (MDA) framework.**

The DPE model (2009) decomposes a serious game into five interlinked components—Learning, Storytelling, Gameplay, User Experience, and Technology—and ties each to three "layers" of the design process (Design, Play, and Experience).

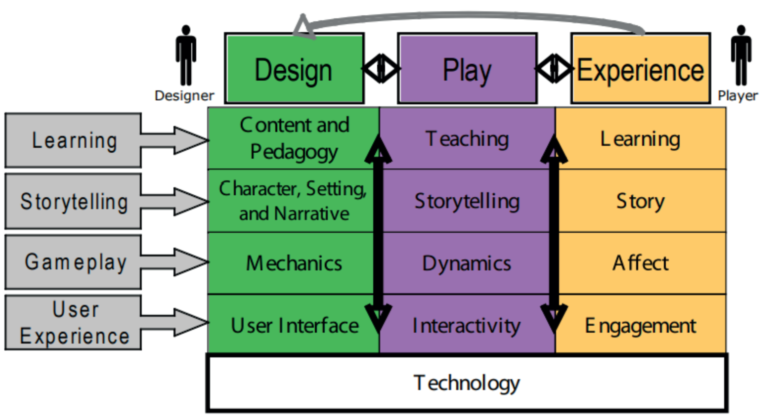


Figure 1. Expanded Design, Play, Experience Framework

In practice, teams:

1. **Define goals and develop an initial design.**
2. **Playtest prototypes to observe how players experience those goals.**
3. **Iterate back on the design in light of play insights.**

Trade-offs for Health Education

- **Too analytical:** Clinicians struggle to map hands-on expertise into abstract categories.
- **Linear & rigid:** The mandatory sequence of construction-sheet questions can stifle brainstorming and rapid idea exchange.
- **Limited collaboration support:** There's a little built-in facility for real-time co-design under tight deadlines.

DPE encourages designers to refine these layers iteratively. For instance, a team creating a medication safety game could align dosage learning goals with realistic pharmacy simulations, scoring systems, and a clear visual interface.

This structured method offers a **common design language** for cross-functional teams. However, DPE's benefits come with trade-offs—especially in health education settings.

In practice, the framework might be found **too analytical and abstract**. It is possible for the practitioners to struggle to fit hands-on expertise into DPE's conceptual categories. More importantly, DPE offers **little support for real-time collaboration**—a core requirement when clinicians, educators, and developers must co-design under tight timelines.

Bottom line: While DPE provides a useful map for organizing ideas, its **rigidity slows down creative iteration** in health game design. That makes it a partial fit—strong in theory, but often awkward in practice.

2.2. ATMSG Connects Design to Pedagogy—But Slows Creative Development

The **Activity Theory–Based Model of Serious Games (ATMSG)**, developed by Carvalho et al. (2015), applies educational theory to every part of a serious game. It breaks game design into six interconnected components:

- **Subject** – who the learner is (e.g., background, role)
- **Object** – what learning goal the game targets
- **Tools** – the game's mechanics, visuals, and technology
- **Rules** – formal and informal expectations in gameplay
- **Community** – players, instructors, and social context
- **Division of Labor** – who does what in the game and the learning environment

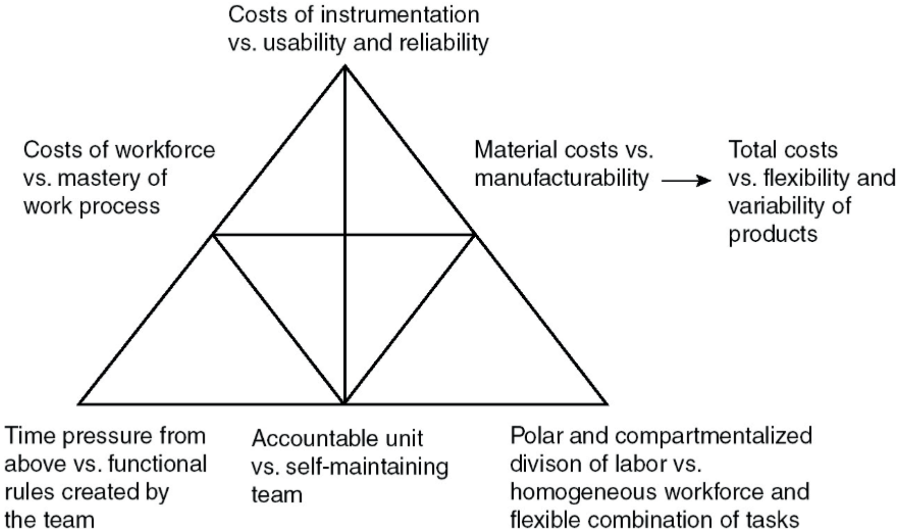


Figure 2. Activity Theory Triangle

For example, an **infection control game** might define nursing students as the subjects, hand hygiene as the object, hospital protocols as rules, and clinical simulations as tools.

ATMSG's strength lies in its **pedagogical grounding**. It helps teams connect game elements to learning theory, making it especially useful for research and evaluation.

But it has two major drawbacks in health game design:

1. **It's descriptive, not prescriptive.** ATMSG is excellent for analyzing existing games—but it offers little support for **developing new concepts**.
2. **It's complex and slow.** In fast-moving workshops, its detailed structure can overwhelm non-designers, especially clinicians with limited time.

In short, ATMSG is a powerful system for **justifying a game after it's built**, but it lacks the flexibility and creative flow needed at the start of the design process.

2.3. LM–GM Aligns Game Mechanics with Learning—but Misses the Big Picture

The **Learning Mechanics–Game Mechanics (LM–GM)** model, developed by Arnab et al. (2015), helps designers ensure that **every game element serves a learning purpose**.

It does this by pairing two types of mechanics in a matrix:

- **Learning Mechanics** – instructional strategies like repetition, reflection, or feedback
- **Game Mechanics** – interactive features like point systems, avatars, or progress bars

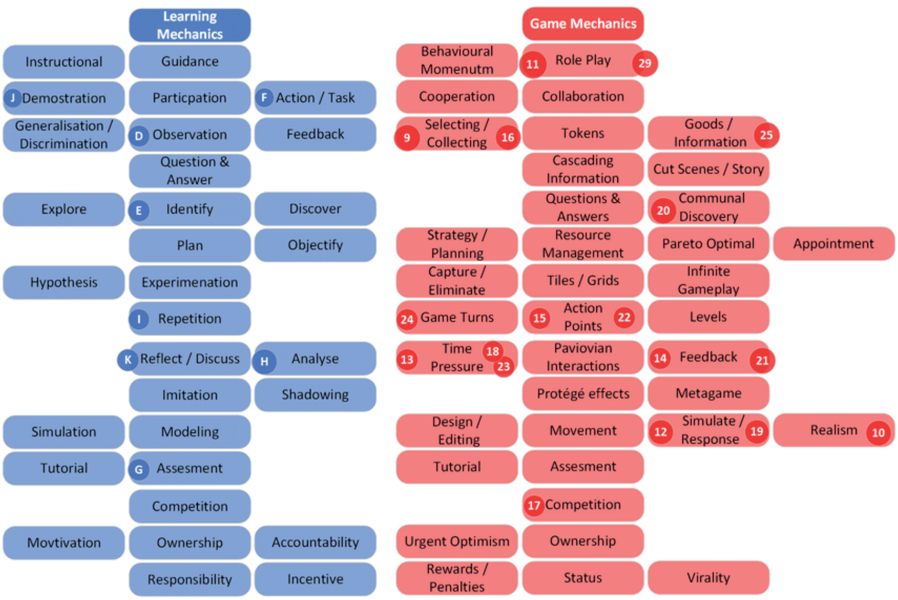


Figure 3. Learning and game mechanics used as the basis to construct the LM-GM map for a game

For example, if a game aims to teach **diagnostic reasoning**, the designer might pair the learning mechanic *hypothesis testing* with a game mechanic that rewards correct diagnoses under time pressure.

This approach is valuable because it prevents games from becoming "fun but pointless." It ensures **gameplay supports learning**, not just engagement.

But LM–GM has limitations:

- It **ignores bigger design elements** like story, collaboration, or long-term player motivation.
- It assumes that users already have strong **instructional and game design knowledge**.

While each framework brings valuable insights—DPE for clean process layers, ATMSG for deep theoretical grounding, and LM–GM for aligned mechanics—they also introduce barriers in interdisciplinary, fast-paced health game contexts. ASGD was built atop DPE's clarity but enriches it with flexible iteration, real-time collaboration tools (ideation cards, glossary), and explicit role division to better meet the needs of clinical-educational teams.

2.4. The Art of Serious Game Design (ASGD)

2.4.1. ASGD Helps Health Teams Design Games—Together, From Day One

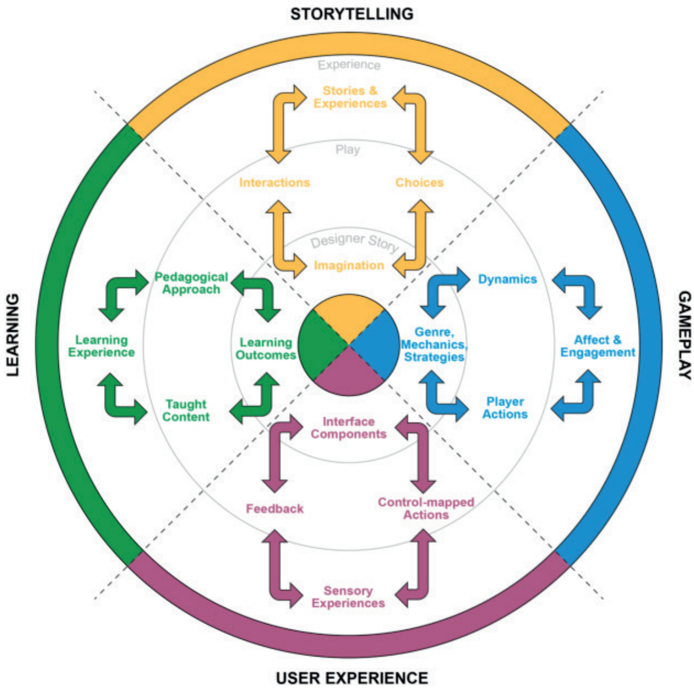
The **Art of Serious Game Design (ASGD)** was created by Djafarova et al. (2023) to help **multidisciplinary education teams**— including clinicians, instructional designers (IDs), and game developers—**co-design** serious games from day one. It emerged from real-world workshops with **professionals from different sectors, educators, and game designers**—the very teams who build these games.

What makes ASGD different? It starts where other models don't: with **early-stage, collaborative design**. Instead of analyzing a finished game, ASGD helps diverse stakeholders shape a game concept **from the ground up**.

It offers practical, hands-on tools for:

- **Defines clear learning objectives** through structured prompts, anchoring every design choice
- **Frames clinical narratives** by distinguishing **embedded** (intended) vs. **emergent** (player-driven) story elements
- **Selects goal-aligned mechanics** (rules, dynamics, control mappings) that reinforce key clinical decisions
- **Maps realistic player experiences** via a shared visual canvas that balances all game components

2.4.2. The ASGD Canvas: A Shared Design Map



At its core is the **ASGD Canvas**—a poster printed as a circle with **three concentric layers** (Design → Play → Experience) split into **four equal quadrants** (Learning, Storytelling, Gameplay, User Experience). Teams populate it with sticky notes, ensuring **equal weight** for each component and **iterative movement** between layers.

Detailed examples of canvas usage and ideation card applications can be found in the ASGD implementation guide (https://pressbooks.library.torontomu.ca/guide/front-matter/introduction/).

Key Artifacts

1. **Ideation Cards**
   - **Solid-border deck** for **Part 1** brainstorming: broad idea generation
   - **Striped-border deck** for **Part 2**: deep refinement and alignment with learning goals
   - Cards prompt questions like "What are the game's learning objectives?" or "How does the UI present progress?" ards prompt

questions like "What are the game's learning objectives?" or "How does the UI present progress?" The complete set of ideation cards with usage examples is available in the brainstorming toolkit (https://pressbooks.library.torontomu.ca/guide/wpcontent/uploads/sites/43/2018/06/BrainstormingPart1.pdf)

2. **Glossary of Terms**
   - Ensures consistent understanding of pedagogical and game-design jargon across the team
3. **Framework Poster**
   - The physical ASGD Canvas where ideas converge into a **Low-Fidelity Prototype (LFP)**

2.4.3. ASGD Guides Teams Through 4 Flexible, Collaborative Design Stages

ASGD breaks early concept development into **four iterative, hands-on stages**—each mapping to one of the ASGD Canvas quadrants and designed to loop as new insights emerge. These aren't rigid steps—they're meant to loop, evolve, and respond to new insights as the design unfolds.

2.4.3.1. Learning Goal Mapping – What Should Players Learn? (Design layer)

The team starts by turning **clinical or educational standards** into **clear, player-focused outcomes**.

- Instead of saying "improve hand hygiene," the game goal becomes: *"The player chooses the right hand hygiene action based on setting and timing."*

This step ensures every design decision ties back to **what learners must know or do**.

2.4.3.2. Narrative Ideation – What's the Story Behind the Learning? (Play layer)

Next, the team shapes those goals into **engaging, real-world scenarios**.

Clinicians surface authentic scenarios (e.g., misdiagnosis, emergency protocols); designers use ideation cards to sketch branching narratives, embed clinical stakes, and ensure embedded vs. emergent story balance and then translate them into game elements—like branching dialogue, surprise events, or time-based decisions.

Example: In a medication safety game, the story might follow a nurse managing high-risk patients over a simulated shift.

2.4.3.3. Mechanics Brainstorming – How Will Players Take Action? (Play ⇄ Experience)

Using **striped-border ideation cards**, teams propose and **refine game systems**—timers for urgency, point/feedback loops for accuracy, level progression for mastery—while continuously checking alignment with learning goals.

2.4.3.4. Experience Alignment – Does the Game Feel Right? (Experience layer)

Finally, the team fine-tunes the **player journey** so the game is effective and emotionally engaging.

- Is the interface intuitive?
- Does the pacing support reflection and challenge?
- Are emotions (like urgency, empathy, or confidence) aligned with the game's purpose?

This stage blends **UX design with instructional intent**—so learners feel motivated, not just informed.

Why flexible loops matter: Unlike linear models, ASGD lets teams cycle back to any stage as new ideas or constraints arise—mirroring best practices in iterative serious-game design.

2.4.3.5. ASGD's Distinctive Advantages

Compared to other serious-game frameworks, ASGD does something crucial: it guides **multidisciplinary teams** through the **messy, time-constrained** early stages of concept development—where clear goals, rapid iteration, and strong collaboration matter most.

Here's how it differs:

- **DPE (Design–Play–Experience)**

Excellent for analyzing finished games but **too linear and analytical** for ideation workshops—its rigid, construction-sheet sequence can stifle creativity and slow down brainstorming.

- **ATMSG (Activity Theory–Based Model)**

Deeply grounded in learning theory yet **descriptive rather than prescriptive**—it offers rich post-hoc analysis but little step-by-step guidance, and its complexity can overwhelm busy clinicians.

- **LM–GM (Learning Mechanics–Game Mechanics)**

Ensures each game mechanic serves a learning purpose but **focuses narrowly on micro-level mechanics**, overlooking narrative, pacing, and team dynamics—risking loss of big-picture coherence.

By starting **at day one** with **shared tools** (ideation cards, glossary) and a **visual ASGD Canvas**, ASGD helps teams:

1. Align on clear, player-focused learning goals
2. Frame authentic clinical narratives
3. Brainstorm mechanics that truly reinforce objectives
4. Iterate rapidly on low-fidelity prototypes
5. Maintain clinical accuracy while fostering creativity

In real-world pilots, ASGD empowered organizations to **design in-house**, **streamline concept development**, and **communicate effectively**—all without outsourcing or settling for off-the-shelf games that miss specific learning needs.

Practical evolution: ASGD turns collaboration into an **asset**, not a barrier—so health-education teams build **meaningful, playable** learning experiences under real-world constraints.

2.5 Comparative Analysis and Future Directions

The evolution of serious game design frameworks reflects the maturing understanding of how educational goals can be effectively integrated with engaging gameplay experiences. Each design process examined in this chapter addresses specific aspects of the design challenge; yet, none provides a comprehensive solution for all contexts.

Selecting an appropriate design framework for serious games in healthcare depends heavily on the project's constraints, team composition, intended outcomes, and design maturity level. The matrix below presents practical use cases aligned with each framework's core strengths, offering guidance for interdisciplinary teams seeking the most suitable model.

2.5.1. Framework Synthesis and Selection Guidelines

The comparative analysis reveals that methodology selection should be guided by project context, team composition, and intended outcomes rather than a one-size-fits-all approach. **DPE excels in projects requiring systematic documentation and structured analysis**, making it particularly suitable for large-scale implementations with extensive stakeholder involvement. Its strength lies in providing clear organizational structure, though this can become constraining during creative ideation phases.

Table 2.5. Framework Selection Matrix

Scenario	Primary Framework	Secondary Support	Rationale
Tight deadline + Mixed team	ASGD	LM–GM	Enables rapid co-design through shared tools (Canvas, cards), while LM–GM ensures that gameplay directly supports learning goals.
Research-focused project	ATMSG	DPE	Offers rich theoretical mapping and post-hoc analysis, with DPE aiding in documentation of design and play structures.
Large-scale institutional rollout	DPE	ASGD	Provides a systematic and scalable structure; ASGD adds flexibility and collaborative engagement for diverse stakeholders.
Prototype or concept testing	LM–GM	ASGD	LM–GM ensures tight alignment between mechanics and pedagogy; ASGD supports iterative ideation and low-fidelity prototyping.

ATMSG demonstrates its value in research-oriented projects where theoretical grounding and detailed pedagogical justification are paramount. Academic institutions and research teams benefit from its comprehensive approach to educational theory integration, though the framework's complexity may overwhelm practitioners working under tight development timelines.

LM-GM offers precision in mechanic-level design decisions, ensuring that every interactive element serves a clear pedagogical purpose. This methodology proves invaluable during detailed design phases where specific learning objectives must be translated into concrete game features. However, its narrow focus may overlook broader design considerations such as narrative coherence and emotional engagement.

ASGD addresses the collaboration challenge that pervades multidisciplinary health education teams. By prioritizing real-time co-design and providing tangible tools for cross-functional communication, it fills a critical gap in framework applications. The framework's emphasis on iterative development and shared ownership of design decisions reflects modern agile development practices while maintaining educational rigor.

Implementation Considerations

Successful implementation requires careful attention to several factors beyond theoretical compatibility. **Team expertise levels** significantly influence method effectiveness. Teams with strong game design backgrounds may find DPE's structured approach restrictive, while those new to serious game development may struggle with ATMSG's theoretical complexity without adequate support.

Project timelines and budget constraints also shape framework selection. ASGD's emphasis on rapid prototyping and iterative design makes it suitable for projects with limited development windows, while ATMSG's comprehensive approach requires substantial upfront investment in analysis and planning phases.

Organizational culture and stakeholder expectations further influence framework adoption. Healthcare institutions with strong evidence-based practice cultures may gravitate toward ATMSG's research-oriented approach, while innovation-focused organizations might prefer ASGD's collaborative flexibility.

Hybrid Approaches and Framework Integration

Rather than viewing these frameworks as mutually exclusive, successful serious game projects often benefit from hybrid approaches that combine elements from multiple methodologies. For instance, projects might begin with ASGD's collaborative ideation process, transition to LM-GM's detailed mechanic mapping, and conclude with DPE's systematic documentation for implementation teams.

Such integration requires careful orchestration to avoid methodological conflicts and ensure smooth transitions between framework phases. The key lies in identifying each framework's core strengths and applying them at the appropriate project stages, rather than attempting to implement multiple complete methodologies comprehensively.

Emerging Trends and Future Framework Development

The serious games field continues to evolve, with emerging technologies and pedagogical approaches creating new design challenges that current frameworks may not fully address. **Artificial intelligence integration, virtual and augmented reality capabilities, and personalized learning systems** represent areas where existing frameworks may require extension or fundamental reconceptualization.

Data-driven design approaches enabled by learning analytics also suggest a future evolution of the model toward more empirical, evidence-based design decisions. The integration of real-time player data with design models could enable dynamic adaptation of learning experiences based on individual performance patterns and engagement metrics.

Cross-cultural and accessibility considerations represent another frontier for framework development. As serious games reach increasingly diverse global audiences, frameworks must evolve to address cultural sensitivity, language adaptation, and inclusive design principles more comprehensively.

Recommendations for Practice

Based on this comparative analysis, several practical recommendations emerge for serious game development teams:

Start with context assessment: Evaluate team composition, project constraints, and institutional requirements before selecting a primary framework approach. Consider conducting small-scale framework trials to identify best fit.

Embrace selective integration: Rather than committing to a single framework, identify specific tools and processes from multiple approaches that address project-specific needs and team capabilities.

Invest in team training: Ensure all team members understand selected framework principles and tools. Consider bringing in external facilitation for initial implementations, particularly for collaborative approaches like ASGD.

Plan for iteration: Build framework flexibility into project timelines and budgets. The most successful serious game projects often require multiple design iterations as teams learn and adapt their approaches.

Document lessons learned: Maintain records of framework effectiveness, team feedback, and implementation challenges to inform future project planning and framework selection.

2.5.2 Stakeholder-Specific Framework Guidance

Different team members have different needs when selecting and using design frameworks. This section provides practical guidance for each stakeholder group involved in serious game development.

2.5.2.1. Clinical Educators and Healthcare Professionals

The Challenge: You have deep medical knowledge but limited game design experience. You need tools that respect your expertise while being easy to learn and use.

Best Framework: ASGD

- **Why it works:** Uses your clinical experience directly through ideation cards
- **Key benefit:** Maintains medical accuracy while fostering creativity
- **Time commitment**: 3-5 hours for initial workshop

Quick Decision Guide:

- Need skill-specific training? → Add LM-GM elements
- Academic/research project? → Include ATMSG validation
- Large institutional rollout? → Use DPE for documentation

Success Tips:

- Start with familiar clinical cases before introducing framework concepts
- Request medical terminology in workshop materials
- Pair with instructional designers for best results

Avoid These Pitfalls:

- Don't skip the glossary review—design terms can be confusing initially
- Don't try to implement full methodologies under time pressure—use abbreviated versions
- Don't resist the "game" aspect—think "simulation" and "case-based learning"

2.5.2.2. Instructional Designers and Educational Technologists

The Challenge: You understand learning theory but need to bridge educational goals with game mechanics effectively.

Best Approach: ATMSG + LM-GM Hybrid

- ATMSG for theoretical grounding and curriculum alignment
- LM-GM for detailed learning-mechanic mapping
- Timeline: 6-8 hours across multiple sessions

Project Phase Strategy:

1. **Planning:** Use ATMSG for comprehensive learning analysis
2. **Design:** Apply LM-GM for mechanic-pedagogy alignment
3. **Development:** Switch to DPE for team communication
4. **Evaluation:** Return to ATMSG for outcome validation

Quick Wins:

- Create custom learning mechanic libraries for your institution
- Develop templates that translate framework outputs to development specs
- Establish feedback loops with learning analytics data

2.5.2.3. Game Developers and Technical Teams

The Challenge: You need precise, implementable specifications that translate educational goals into working game features.

Best Framework: DPE

- **Why it works:** Systematic organization matches development workflows
- **Key benefit:** Clear documentation structure for implementation
- **Integration:** Maps well to agile sprints and user stories

Implementation Pathway:

1. Design Layer → Technical architecture and requirements
2. Play Layer → Core mechanics and interaction systems
3. Experience Layer → UI/UX and feedback systems

Development Integration:

- **Agile teams:** Map DPE layers to sprint planning
- **Waterfall projects:** Use for comprehensive upfront specs
- **Rapid prototyping:** Combine DPE structure with ASGD ideation

Technical Success Factors:

- Create framework-to-code translation templates
- Establish feasibility checkpoints in chosen framework processes
- Document handoff protocols between design and development

2.5.2.4. Project Managers and Administrators

The Challenge: You need to balance educational quality, timeline constraints, limitations, and stakeholder expectations.

Framework Selection by Project Type:

Resource-Constrained Projects:

- **Primary:** ASGD (fast, collaborative)
- **Timeline:** 1-2 weeks for concept development

High-Stakes Institutional Projects:

- **Primary:** DPE (comprehensive, systematic)
- **Timeline:** 4-6 weeks for complete design documentation

Research and Development:

- **Primary:** ATMSG (theoretical rigor)
- **Timeline:** 6-8 weeks for comprehensive analysis

Management Best Practices:

- Build framework learning time into project schedules
- Plan for potential framework switching if initial choice doesn't fit
- Establish clear success metrics for framework effectiveness
- Create fallback plans for resource or timeline constraints

2.5.2.5. Cross-Functional Team Leadership

The Challenge: Managing competing priorities and communication gaps across different expertise areas.

Leadership Success Factors:

- Involve all stakeholders in framework selection
- Maintain flexibility—be ready to switch approaches
- Schedule regular framework effectiveness check-ins
- Address resistance or confusion quickly

Quick Framework Selection Guide

Use this decision tree when stakeholders disagree on framework choice:

1. Is this primarily a research project? → Yes: ATMSG / No: Continue
2. Do you have less than 3 weeks? → Yes: ASGD / No: Continue
3. Is the team primarily technical? → Yes: DPE / No: Continue
4. Do you need precise mechanic alignment? → Yes: LM-GM / No: ASGD

Common Hybrid Combinations:

- ASGD + LM-GM: Creative ideation followed by detailed mechanic mapping
- DPE + ATMSG: Systematic development with theoretical validation
- All frameworks: Use different frameworks for different project phases

Framework Customization Tips

Make frameworks work for your context:

- Replace jargon with familiar terminology from your field
- Adjust workshop timing to fit your team's availability
- Integrate with existing organizational tools and templates
- Connect framework outputs to your established success metrics

Remember: The goal is effective serious game development, not perfect framework implementation. Adapt these tools to serve your team's needs and project constraints.

Conclusion

The landscape of serious game design frameworks continues to evolve as the field matures and new challenges emerge. While no single framework provides a complete solution for all contexts, the comparative analysis presented in this chapter demonstrates that each approach offers valuable tools and perspectives for specific aspects of the design challenge.

The emergence of ASGD represents a significant step toward addressing the collaboration and communication challenges that have historically hindered multidisciplinary serious game development. However, the continued relevance of established frameworks, such as DPE, ATMSG, and LM-GM, underscores the complexity of serious game design and the need for diverse methodological approaches.

Success in serious game development increasingly depends not on finding the "perfect" framework, but on developing the expertise to select, adapt, and integrate multiple approaches based on project-specific needs and constraints. As the field continues to evolve, frameworks that emphasize flexibility, evidence-based decision making, and cross-functional collaboration are likely most valuable for addressing the complex challenges of educational game design in healthcare and beyond.

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Case Study: "Code Blue" – A Serious Game for Emergency Response Training

1. Background and Context

In response to frequent simulation scheduling constraints and growing demand for scalable training in emergency protocols, the **Emergency Medicine Department** at a metropolitan teaching hospital partnered with the internal **Educational Technology Unit** and an indie **game development studio** to create a serious game. The goal: train medical interns in recognizing and responding to cardiac arrest (Code Blue) situations.

Despite the team's enthusiasm, early collaboration proved challenging. Medical experts struggled to communicate nuanced procedures in game terms, while developers lacked insight into clinical workflows. To address these challenges, the project adopted the **Art of Serious Game Design (ASGD)** framework.

2. **Design Process Using ASGD**

Stage 1: Learning Goal Mapping

Using ASGD's ideation cards, the interdisciplinary team began with clear, player-centred outcomes:

- *"Identify early signs of cardiac arrest."*
- *"Initiate basic life support within 60 seconds."*
- *"Delegate tasks using standard code team roles."*

These were mapped using the **Learning quadrant** of the ASGD Canvas, anchoring game design around authentic, measurable learning objectives.

Stage 2: Narrative Ideation

Clinicians contributed real-world scenarios, which designers converted into branching narratives. For instance, one scenario begins with a disoriented patient in a crowded ER. If players fail to monitor vitals, the patient deteriorates into cardiac arrest. Correct actions trigger different story branches—prompting ethical dilemmas and teamwork dynamics.

Key features:

- Embedded Story: Scripted deterioration timelines based on missed cues.
- Emergent Story: Player decisions lead to praise or reprimand from virtual staff.

Stage 3: Mechanics Brainstorming

Gameplay was structured around real-time decision-making:

- **Timer Mechanics**: Pressure to act within clinical windows.
- **Point System**: Accuracy-based scoring (e.g., correct drug dosage).
- **Role-Switching**: Players can switch among code team roles (compressor, airway, leader) across levels.

This stage drew heavily from **striped-border ideation cards**, ensuring mechanics aligned directly with training outcomes.

Stage 4: Experience Alignment

Using the **User Experience quadrant**, developers tested UI prototypes with interns:

- UI provided quick-access action wheels.
- Real-time feedback offered color-coded prompts and vitals monitoring.
- Emotional tones (urgency, empathy) were tested via animated facial expressions and audio cues.

Iterations based on UX testing improved engagement and reduced cognitive overload.