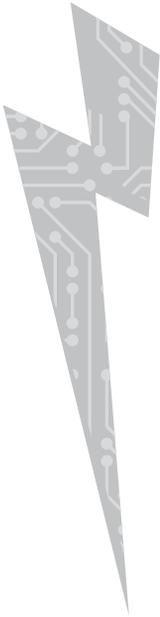


CHAPTER 5



Leverage Game-Based Learning for Student Achievement

In This Chapter:

- What is the foundation of gamification and digital game-based learning?
- How does game-based learning align with high-impact learning?
- How can game-based learning support opportunities for retrieval practice?
- In what ways can you begin to explore using digital game-based learning in your educational environment?
- What are strategies to support integrating game-based learning?

STANDARDS AND TRANSFORMATIONAL LEARNING PRINCIPLES RELATED TO THIS CHAPTER	
ISTE Standards for Students	Transformational Learning Principles
1.1 Empowered Learner 1.3 Knowledge Constructor 1.6 Creative Communicator 1.7 Global Collaborator	Nurture: Ensure Equity, Connect Learning to the Learner, Cultivate Belonging Guide: Develop Expertise, Spark Curiosity Empower: Ignite Agency, Prioritize Authentic Experiences

What Are Gamification and Game-Based Learning?

Game theory uses gaming reward systems, social interactivity, problem-solving strategies, and challenges and competition models in a nongaming environment (Azriel et al., 2005; Ehrhardt, 2008; Gros, 2007). From kindergarten through high school, innovative educators have long used various aspects of game theory to promote participation and learning in their classrooms. Within the language arts curriculum, for example, educators develop and implement multimodal, game-based learning activities to enhance student motivation, reading comprehension, and vocabulary. More recently, teachers have turned to *digital game-based learning (DGBL)* as a tool combat student disengagement and, more importantly to develop content knowledge, learning strategies, motivation, social interactivity, creativity, and innovation; improve group dynamics; and prepare students for the digital age workforce (Chin & Tsuei, 2014; Dourda et al., 2014; Sancho et al., 2009). DGBL tools such as Kahoot! give educators a new platform to capture student engagement and facilitate learning in a way that mirrors student engagement outside the school environment (Chin & Tsuei, 2014; Sanford & Madill, 2007). The literature on digital game-based learning is emerging and has yet to fully capture the potential benefits and implementation techniques of game achievement, critical thinking, reading comprehension, and learning motivation in the classroom. Whether traditional or digital, game theory in education is comprised of two components: gamification and game-based learning.

Gamification

The term gamification was first used to encourage electronics manufacturers to improve their production using gaming tactics (Tulloch, 2014). The term, therefore,

describes the process of using gaming mechanics in a nongaming context (Deterding et al., 2011). Mechanisms such as leaderboards, challenges, levels, badges, points, and rewards are frequently used by businesses to engage employees, to bolster morale and production, and certainly to stimulate customers to remain loyal (Tulloch, 2014). In the classroom setting, many teachers have integrated gamification practices insofar as the class itself becomes a game.

Game-Based Learning

Unlike gamification, game-based learning relates to the use of games to enhance the learning experience (Tulloch, 2014). Founded on game theory, which holds that people are intrinsically motivated by competition, achievement, status, and collaboration, digital game-based learning activities are designed in a way that is similar to the daily social media activities that students encounter in their typical world: messaging, video games, film scripts, online posts, graphic novels or comic books, text messages, and vlogs (Azriel et al., 2005; Sanford & Madill, 2007).

Educators, of course, have been using games in the classroom for years, as they strive to engage students in meaningful and complex skill acquisition. Gee (2005, 2008), who is a strong proponent of incorporating video games in modern education classrooms, explained that video games and other digital games are at their core educational experiences. In the digital arena, game-based learning arises from the belief that if teachers can make learning as engaging and motivating as a video game, students will be more willing to learn rigorous material (Eseryel et al., 2014; Gee, 2005).

Players have to learn the rules of the game, which are oftentimes not explicitly explained at the beginning of the game, and maneuver their way through complex narratives to attain a preset goal, or in many cases, an unknown resolution to an authentic problem. When tied to the educational curriculum, game-based learning acts as a powerful learning tool because it engages students in their gaming milieu (Eseryel et al., 2014; Gee, 2005). Digital game-based learning provides students a unique, immersive experience that allows ample opportunities to frame learning experiences in terms of goals, apply previous knowledge for problem solving, participate in social interactions, and provide and receive immediate feedback on their learning experiences (Gee, 2008). Using digital game-based learning strategies and platforms in conjunction with gamification techniques enriches the classroom experience and bolsters student learning and motivation (ClassCraft, 2014; Gee, 2005, 2008; Tulloch, 2014).

Game-Based Learning and Student Achievement

Well-crafted game-based learning (GBL) opportunities integrate game content with learning activities to facilitate the acquisition of domain-specific knowledge and skill, leveraging the unique characteristics of games to engage students on a cognitive, behavioral, and social level. While research has shown that game-based learning can be motivating to students, it also comes with caveats. For example, if the game is too complex or complicated, students may focus too much on the logistics of the game and not enough on the larger learning goal.

TABLE 5.1. INTEGRATING GAME-BASED LEARNING FOR STUDENT SUCCESS

EDUCATOR ACTION	QUESTIONS TO CONSIDER
Develop students' foundational content knowledge.	<ul style="list-style-type: none"> • What have I done to build and activate students' prior knowledge? • What informational sources should students engage with prior to gameplay? • What limitations might students face during gameplay, based on their understanding of the content?
Define how the game-based learning experience supports learning.	<ul style="list-style-type: none"> • How might I use learning intentions to frame the purpose of the game? • What steps can I take to help students understand how the gameplay will assist their learning? • What key elements of the game should students be made aware of prior to gameplay?
Leverage feedback as a part of learning.	<ul style="list-style-type: none"> • What feedback systems are built into the gameplay and system? • How might I help students become more aware of feedback given during gameplay?
Maximize interactivity.	<ul style="list-style-type: none"> • What protocols or roles can I put in place to facilitate student interactions and collaboration during gameplay?
Leverage GBL to spark student reflection and goal setting.	<ul style="list-style-type: none"> • How can I support students in reflection before, during, or after gameplay so they can make the most of feedback they receive? • What resources or graphic organizers can I integrate to support student reflection and goal setting?

Competition is another controversial aspect of game-based learning. Competition in games can take many forms, for instance, competition against oneself or a virtual opponent, against peers, or against time. Typical competitive elements of games include points, levels, and leaderboards. These competitive elements can be motivating for students who are already high performing and confident in their learning.

At the same time, competition may create anxiety and can be detrimental to students who are struggling or who have not yet mastered the initial concepts (Chen et al., 2020). Educators should take specific steps when integrating game-based learning to successfully support the learning of all students. Table 5.1 outlines specific actions that educators can take to develop a high-quality game-based learning environment for all learners.

Leveraging Adaptive Scaffolding to Support Inclusive Game-Based Learning

Think about the learner variability that exists within your student population. As educators, our responsibility is to design learning environments and experiences that are inclusive and can help students to be successful. Scaffolding—whether provided by teacher, peers, technology, or a combination of all these—is just as important for helping students develop knowledge and skills within a game-based environment as it is in any other type of learning environment.

In a digital game-based learning environment, scaffolding can take many forms (questions, prompts, modeling, visuals, and more) and serve a variety of purposes. Scaffolding can be integrated to facilitate students’ cognitive, metacognitive, and competition within gameplay. Research shows that scaffolding plays a key role in directing player’s attention to important information that is often overlooked during gameplay, helping them to organize and integrate knowledge that is necessary for making connections between game content and content knowledge (Chen et al., 2023). As with many other types of learning experiences and design, educators must make an intentional effort to help students stay focused on the larger learning intentions and goals, and scaffolding built within a game-based learning environment can help to do this.

Adaptive scaffolds are unique in the sense that they are specific to students’ dynamic and varying needs. Common scaffolds based on core-game design elements include providing learners and game participants with clues, additional content, feedback, guiding, prompts, or structures they need to be successful. Think about game shows that allow a player to “phone a friend” for help with a tough question: The player considers who they know who is most likely to have the answer and gets to choose the source they go to for the best insight to solve the question. Educators can build similar elements and more into the mechanics of game-based learning experiences

to scaffold the student learning process. *Game mechanics* are the fundamental rules, actions, and interactions that govern how a game works and how players interact with it. Table 5.2 illustrates how scaffolding techniques can be used to support different game mechanics and create active learning exercises. It is also important to consider what scaffolds are built into pre-created digital games and game-based curriculum resources and to identify ways to create student awareness around the use of those supports and features.

TABLE 5.2. ADAPTIVE SCAFFOLDING TECHNIQUES TO SUPPORT GAME MECHANICS

GAME MECHANICS	STUDENT SKILLS REQUIRED	SCAFFOLDING TECHNIQUES AND RECOMMENDATIONS
<p>Recall and Review Require players to recall information they previously learned.</p>	<p>Having prior knowledge or experiences to draw from, the ability to recall and review information.</p>	<ul style="list-style-type: none"> • Create opportunities for students to ask for clues or ask a follow-up question. • Identify feedback that can be given when students make a wrong answer or need to clarify misconceptions. • Incorporate a variety of question topics and levels.
<p>Sequencing, Sorting, and Categorizing Require players to use their knowledge to form connections between the content shared.</p>	<p>Evaluating facts, concepts, or procedures; looking for commonalities and connections; classifying and ordering information; recalling an order of operations.</p>	<ul style="list-style-type: none"> • Have students complete analogy activities to prepare or to provide a visual to be used during the activity. • Provide students with graphic organizers they can use to jot down ideas and categorize information. • Create options for students to choose differing levels of difficulty. • Provide a model. • Offer an option for additional prompting.
<p>Puzzle Require players to solve problems or overcome challenges using logic and critical thinking.</p>	<p>Analyzing and finding relationships or patterns.</p>	<ul style="list-style-type: none"> • Design games that require students to follow a consistent format, such as comparing concepts by noting how they are “Alike, but Different” or “Similar or Different.” • Create protocols for working with others, such as having all participants write down ideas and create consensus. • Build time and steps into the game during which students have opportunities for soliciting feedback.

GAME MECHANICS	STUDENT SKILLS REQUIRED	SCAFFOLDING TECHNIQUES AND RECOMMENDATIONS
Visualizing, Designing, and Spatial Reasoning Require players to represent their ideas using physical space, materials, or sketching.	Creating something new, reassembling components, brainstorming, visualizing and sketching new ideas.	<ul style="list-style-type: none"> Provide students with resources and tools to sketch ideas or visualize their thinking. Provide visual cues and handouts to help students understand the task or steps they need to follow. Incorporate manipulatives that students can use to test out their spatial reasoning skills.
Strategic Maneuvering Offer planning, decision-making, and tactical choices that affect gameplay.	Finding relationships, looking for similarities, engaging in if/then thinking, recognizing inputs and outputs.	<ul style="list-style-type: none"> Provide opportunities to ask for advice from others. Use “If ____ then ____” sentence stem templates that students can use for brainstorming scenarios.
Simulation Role Play Require participants to assume a persona or position as it relates to a specific setting or scenario.	Perspective taking, empathy, foundational knowledge required to understand the simulation or role.	<ul style="list-style-type: none"> Provide summaries to provide foundational knowledge of an event or scenario being simulated, allowing students to make connections to the perspectives or roles they are taking.
Social Interaction Ensure players interact with each other through teamwork, competition, negotiation, and the like.	Communication, collaboration, and coping with disagreement and competition.	<ul style="list-style-type: none"> Adopt specified team roles. Provide sentence starts to support collaborative communication.

Game-Based Learning to Support Retrieval Practice

When I was a second-year teacher, I was approached with the opportunity to teach Advanced Placement (AP) Psychology. While this was an honor and an opportunity to develop new skills, it was also intimidating. How was I going to help students learn and remember eighteen chapters’ worth of content and perform well on a high-stakes test?

The key was retrieval practice and metacognition—approaches that can be amplified through digital tools. Although then I used more traditional methods, if I were to face the same challenge today, I’d tap into additional technologies and opportunities. At the time, I created digital fill-in-the-blank note packets using Google Docs. This

allowed students to focus on new information during explicit instruction and later use these materials interactively for retrieval practice. Now, I'd also maximize digital review games using platforms like Kahoot! and Quizizz, where students race to recall concepts and examples under timed conditions.

To build deeper understanding, I created a collaborative activity called AP Review Team using Padlet. Students worked in teams as "AP test reviewers," analyzing sample student responses uploaded to a shared space. Using rubrics aligned with AP scoring criteria, they discussed and determined scores, evaluating information accuracy and justifying their reasoning. Today, I would expand how and when students participated in this process using collaborative features of Canvas, our learning management system (LMS). To promote spaced retrieval, I would now also incorporate adaptive quizzing tools like Quizlet's Smart Study and EdPuzzle review quizzes, embedding questions from previous chapters into new assessments.

For test readiness, students completed online practice tests and then engaged in whole-class digital debriefs using interactive whiteboards or tools like Nearpod and Pear Deck. Together, we analyzed question wording, highlighted key terms, and discussed why some distractor answers were less accurate.

Such digital adaptations to proven strategies provide opportunities for enhanced engagement, accessibility, and feedback while keeping the focus on cognitive science principles. I believe that integrating retrieval practice with digital tools helps students take ownership of their learning and equips them with strategies that extend far beyond the AP exam.

No matter the topic, the more prior knowledge a learner has, the stronger their foundation is for developing their understanding and making connections to new knowledge. According to Wang et al. (2024) in "The Mediating and Moderating Role of Cognitive Engagement in the Relationship Between Prior Knowledge and Learning Achievement in Game-Based Learning," numerous studies demonstrate that learners who have more knowledge in long-term memory achieve higher levels of achievement after digital game-based learning than learners who lack foundational knowledge and understanding of concepts. Furthermore, the authors also discussed specific steps educators can take to integrate digital game-based learning with students who lack prior knowledge in a way to improve the academic achievement outcomes. One thing teachers can do to offset deficits in prior knowledge students may have is to incorporate explicit teaching on that content to bolster students' foundational knowledge and set them up for success prior to gameplay.

One of my favorite strategies to help students strengthen their ability to find connections between concepts—and distinguish between them—can also be implemented as a highly engaging, collaborative digital game. In the traditional version, teams send one representative to the front of the room, while a key word or concept is displayed behind them. The team must then provide academic descriptions, examples, or applications of the concept without using the term itself. This strategy easily translates into a digital environment using tools like Flippity, Quizlet, or Pear Deck's Flashcard Factory, with which teams can collaborate in real time to generate clues and apply content knowledge. In video conferencing platforms such as Zoom or Google Meet, the same activity can be conducted using breakout rooms and shared slides, where the key term appears on the screen of everyone except the guesser. Students can use shared Padlet boards to post academic clues, supporting multimodal collaboration.

To promote metacognition, students can later use digital reflection journals or discussion boards to explain the reasoning behind their clues and how they recognized concept relationships. Scoring and timing can be automated through tools like Kahoot! Team Mode or ClassPoint, maintaining the fast-paced, game-like feel. This strategy not only deepens conceptual understanding and recall but also supports digital collaboration, communication, and creative thinking. It works equally well for activating prior knowledge in professional learning settings, where adult participants can engage in the same digital challenge using content from their own discipline.

All learners can benefit from retrieval practice, the act of retrieving prior information from memory, which in turn strengthens memory and learning. At [RetrievalPractice.org](https://retrievalpractice.org), Dr. Pooja K. Agarwal details the behind-the-scenes effectiveness of retrieval practice and its benefits as a strategy to improve students' complex thinking and application skills, how learners organize knowledge, and their ability to transfer knowledge to new concepts. It should be viewed as a learning strategy, not simply an assessment strategy.

With that in mind, how can game-based digital learning platforms like Kahoot! be implemented to facilitate their effectiveness for enhancing academic achievement and learning? Meta-analysis studies note there is an average effect size of 1.492 and a 95% confidence interval of .839 to 2.145 of how game-based digital learning platforms can be used to improve the retention of knowledge (Özdemir, 2025). Findings suggest that there is a very large positive effect that game-based digital learning platforms can have on student learning. It is important to address students'

misconceptions promptly and intentionally use the feedback mechanisms in game-based digital learning platforms to reinforce learning and clarify misunderstandings promptly (Chen et al., 2023). Students may not intrinsically understand how to incorporate immediate feedback provided within game systems.

As educators it is our responsibility to provide students with guidance for using real-time feedback and to engage in discussion around why some answers are correct, and others are not. A part of powerful teaching is to guide students in how they learn to discriminate between different concepts and information. For example, educators can help learners to develop and use thinking routines to categorize information, explain the connections between concepts and make connections to their prior knowledge and new information. The “Strategies to Support Effective Game-Based Learning Opportunities” section of this chapter will provide concrete examples, protocols, and resources for scaffolding and implementing game-based learning platforms.

Fitting Gamification into Your School: Getting Started

There are many ways to introduce gamification to your class community. For example, you could start with competition by teams, rather than individuals, so that rewards go to collaborative teams. This supports the idea that students are mastering material, and students are more likely to help each other. Another way to support gamification is through badging. Gibson, Coleman, and Irving (2016) present three primary roles of using digital badges to support learning:

bringing visibility and transparency to learning, teaching and assessment; revealing meaningful, identifiable and detailed aspects of learning for all stakeholders; and providing a new mechanism to recognize skills, experience and knowledge through an open, transferable, stackable technology framework.
(p. 115; italics in original)

Another option might be to gamify the work and tasks that are already required, which can encourage persistence and responsibility. How about a treasure hunt? Quests? Or perhaps you will choose to try all of the above. Acedo (2017) offered these ten ideas to gamify specific parts of your teaching:

- Make Students Codesigners
- Allow Second Chances. And Third
- Provide Instant Feedback
- Make Progress Visible
- Create Challenges or Quests Instead of Homework and Projects
- Give Students Voice and Choice
- Offer Individual Badges and Rewards
- Have Students Design a Classwide Skills and Achievement System
- Implement Educational Technology
- Embrace Failure; Emphasize Practice

In Spotlight 5.1, “Design Active Learning by Integrating Complex Game Mechanics,” Victoria Mondelli and Joe Bisz provide an overview of various game mechanics and how teachers can create active learning environments using game-based learning with them.



SPOTLIGHT 5.1

Design Activities that Bring the Allure of Play to Your Students

By Victoria Mondelli, Assistant Professor, College of Education & Human Development University of Missouri, Columbia, Missouri, and Joe Bisz, Full Professor of English, City University of New York (CUNY), New York City, New York

The finest active-learning exercises are designed for both engagement and deep learning. But how do you jump into activity design, if you’re a newbie designer, or speed up the process, if you’re a veteran? Don’t start from scratch. Instead, use one or more of our nine “complex mechanics,” teaching templates that quickly transform your lesson idea into a playful activity or game, whether non-digital or digital. Each complex mechanic (or CM) is based upon common thinking operations performed by students (matching, classifying), but is also grounded in engagement and deep learning principles.

Complex Game Mechanics and Student Thinking

In Figure 5.1, you will notice these CMs are also classified by the highest cognitive process (à la Bloom’s taxonomy) that they typically teach (Bisz & Mondelli, 2023). They can also teach every cognitive process below their listed verb. Therefore, the CMs adapt perfectly to backward design pedagogy, where you list a student learning outcome, then think about what the students must do to demonstrate that outcome (“Students will *apply* course concepts to relevant texts.”) This means the CMs also help you decide which type of activity or game is best-suited to support your students’ thinking processes and to actually practice the needed steps.

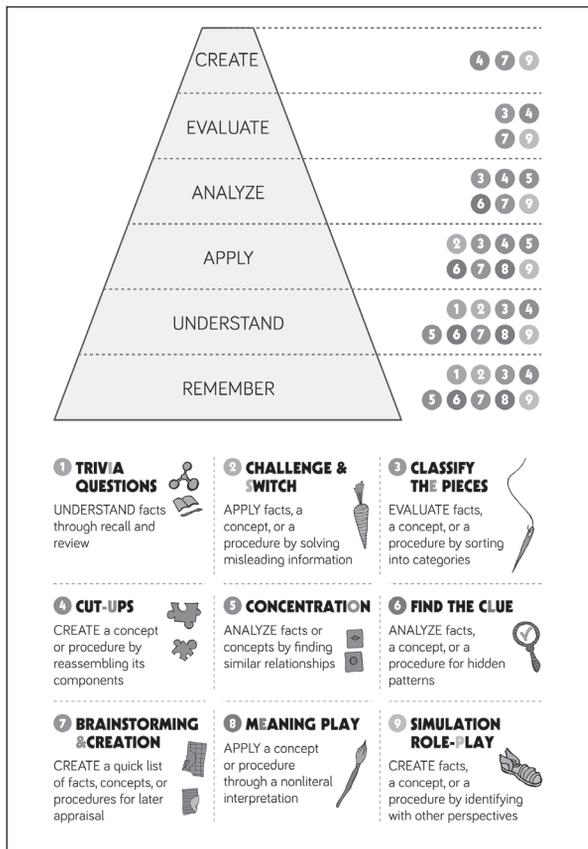


Figure 5.1. The complex mechanisms (CMs) mapped to Bloom’s Taxonomy.

Here’s a quick list of the CMs and short sample activities you might design, followed by longer games created by our readers and workshop attendees.

- **Trivia Questions.** For more or less points, choose a category of quiz questions to answer, or their *difficulty*.
- **Classify the Pieces.** Sort scientific details by their concepts, then the concepts by related studies.
- **Challenge and Switch.** Play *Two Truths and a Lie* with your content.
- **Cut-ups.** Cut up a timeline, procedure, formula, or essay.
- Concentration: Match figures or theories with contributions or examples.
- **Find the Clue.** You place an odd image/news headline on board; students deduce the connection to a concept.
- **Brainstorming and Creation.** Generate ideas rapidly (lists, orally, mind maps), then evaluate all for a “best of” list.
- **Meaning Play.** Improv, sketch, or free-associate ideas for what a concept “feels like.”
- **Simulation Role-play.** Defend the perspective of characters in a case study (or story).

Examples

GalactiVote, a video game developed for American Government 1100 at the University of Missouri, demonstrates the pedagogical power of our CM Simulation Role-play. The game situates players within the electoral environment of a newly discovered planet, requiring them to reflect on their ideological values and what kind of presidential leader they desire to be or have represent them. Students can choose from popular meme images and then brainstorm and create (from our CM) their own campaign slogans inspired by the memes. They also have a fun time upvoting one another’s creations. Unlike traditional didactic instruction, the simulation’s playful narrative and fantasy grant students large doses of co-design and agency.

Fear Not Arthrology, developed for Veterinary Science at Mercy University, lets students play a Concentration-style CM matching game. At the beginner level, the flashcards showcase explanatory text and images about synovial, fibrous, and cartilaginous joints in animals. As players level up, they face similar cards with less information, which increases the recall challenge. Other learning mechanics include *sorting* for one of three joint categories (our Classify the Pieces CM), or *deducing* the category (our Find the Clue CM).

Additional Resources

To explore our full ALLURE design method, check out our book from Teachers College Press, which provides a comprehensive description of all CMs along with countless example

activities and games. Get your copy and other free resources at allureofplay.com, including information about our professional development speaking engagements in the U.S. and abroad.



Strategies to Support Effective Game-Based Learning Opportunities

One of the challenges of game-based learning is that although it motivates some students, it can increase anxiety for others. In addition, it presents challenges for students who do not have enough content knowledge exposure and learning prior to integrating game-based learning strategies. The purpose of the strategies in this chapter is to support educators as they work to provide students with opportunities to activate content knowledge for successful learning, facilitate productive collaboration, and engage in reflection that supports metacognitive outcomes.

STRATEGY 5.1. Activate and Build Content Knowledge Exposure

Research clearly reveals that game-based learning is most effective when students have prior exposure to content knowledge and instructional supports are provided along with gameplay. This strategy leverages concept mapping and graphic organizers to activate students' prior knowledge and reinforce content knowledge to support students during gameplay.

When to Use It

This strategy is best used as a part of introducing the game-based learning experience to students. Consider this strategy as an opportunity to direct students' attention to the learning goals that the gameplay supports as well as to activate students' prior knowledge.

What to Do

STEP 1: Create a five-step process and graphic organizer to help students learn and review vocabulary, phrases, or concepts related to content knowledge. First, identify the terms and concepts you want students to focus on. You may decide to develop several of these for different concepts or terms.

STEP 2: In box one of the graphic organizer, provide students with highlights and key points of relevant information that students need to know.

STEP 3: In box two, include a visual or image that illustrates the concept or can be used to help students remember the information.

STEP 4: In box three, provide a space and direction for students to define a word or explain a concept in their own words, and to include an example. In box four, direct students to draw a picture that will help them remember the meaning of the key term or concept.

STEP 5: In box five, direct students to continue to add examples or information as they play the game and learn more about the content. This section of the activity also would be a great opportunity to have students work with others to generate additional examples and information, supporting the collaborative aspects of the learning experience.

STEP 6: Instruct students to use their graphic organizer to aid review. (You'll find a digital template for this activity on the book's companion website; use the link in the Introduction to access it.)

STEP 7: When you introduce the gameplay process to students, explain the purpose of gameplay as it relates to the learning goals and intentions they are working toward.

STEP 8: Remind students that games are most effective when students have already had exposure to content knowledge, and you will be sharing a concept map with them to share information that they will add to activate their thinking.

STANDARDS AND TLP CONNECTIONS	
ISTE Standards for Students	ISTE+ASCD Transformational Learning Principles
Empowered Learner 1.1.a Learning Goals Knowledge Constructor 1.3.c Curate Information	Nurture: Ensure Equity, Connect Learning to the Learner Guide: Develop Expertise Empower: Ignite Agency

STRATEGY 5.2. Word Sort: Developing Tier 3 Vocabulary and Content Knowledge

A common game mechanic requires players to evaluate facts, concepts, or procedures, looking for commonalities and connections. For this, students need to be able to classify and order information, as well as recall an order of operations. The purpose of this strategy is to support students as they come across new terms as well as to evaluate their own understanding and connect new knowledge across concepts and terminology to make meaning. This strategy develops students' ability to consider how things are alike but different by creating categories, chunking information, and making connections.

When to Use It

This strategy is a powerful tool to use before students engage in gameplay, and after they have some foundational content knowledge that is incorporated into the game.

What to Do

STEP 1: Identify a list of terms that are relevant to content knowledge understanding and that can be grouped into different categories. Consider coming up with twenty-five terms that can be sorted into three student-defined categories.

STEP 2: When selecting terms, consider the following questions to identify which terms are high impact: Is it critical to developing student understanding? Is it needed for discussion or writing? How frequently is the term or concept encountered?

STEP 3: Create a graphic organizer that lists the terms and provides a space for students to sort and group the terms and summarize why they are categorized the way they are.

STEP 4: Introduce students to the word list and ask them to sort the words into groups that have special connections. Have students work with others to decide what a rule or summary is for why the words can be categorized in the same group.

STEP 5: At the end, have students discuss their categories and the words they included. Have students articulate why they sorted them as they did.

STEP 6: After gameplay, have students revisit the activity and decide if they would change anything.

STANDARDS AND TLP CONNECTIONS	
ISTE Standards for Students	ISTE+ASCD Transformational Learning Principles
Empowered Learner 1.1.a Learning Goals Knowledge Constructor 1.3.c Curate Information	Nurture: Ensure Equity, Connect Learning to the Learner Guide: Develop Expertise Empower: Ignite Agency

STRATEGY 5.3. Our Final Answer: Facilitating Collaboration in GBL

One way to decrease anxiety that can come with gameplay is to create pathways to support student collaboration. This strategy not only facilitates student collaboration but also guides students to connect new knowledge to make meaning and evaluate their own understanding.

When to Use It

This strategy is best used at the launch of and through the gameplay process.

What to Do

STEP 1: Identify what question you want students to answer. Make it an open-ended question that has many sides to it. For example, to deepen contextual understanding, a science teacher may ask, “Why do you think that pattern occurs in nature?” or “How could this scientific discovery impact people’s lives?”

STEP 2: Create a graphic organizer that students can complete, or download the template for this activity from the Learning Supercharged companion site. Include the following sections and prompts students can respond to:

- Based on what you know and after you play the game, answer the question provided. Use “I think…” as a sentence start.
- Work with a classmate or team member to discuss what they have written; readjust your thinking and summarize it here. Use “We think…” as a sentence start.

- Ask your teammates to discuss the issue. Keep rethinking your own understanding. Jot down specific points that are made that influence your understanding. Use “Others say...” as a sentence start.
- Write your conclusion to the answer here. Use “I/We conclude...” as a sentence start.
- Reflect on the gameplay process and the final answer you have to the question. What effect did the gameplay and working with others have on your final answer?

STEP 3: Provide the opportunity to interact with others in a scaffolded way to give students the opportunity to talk about their learning, organize their thinking, and solidify new information.

STANDARDS AND TLP CONNECTIONS	
ISTE Standards for Students	ISTE+ASCD Transformational Learning Principles
<p>Knowledge Constructor 1.3.c Curate Information</p> <p>Creative Communicator 1.6.c Communicate Complex Ideas</p> <p>Global Collaborator 1.7.b Multiple Viewpoints 1.7.c Project Teams</p>	<p>Nurture: Cultivate Belonging</p> <p>Guide: Spark Curiosity</p> <p>Empower: Prioritize Authentic Experiences</p>

STRATEGY 5.4. I Think I’m Lost: Using Hints in GBL

Feedback and hints provided within gameplay can be an important part of the learning process. We can’t assume students know how to leverage feedback, and sometimes games don’t have the most useful hints built in. It is the educator’s role to consider what supports learners may need to advance their content knowledge and skills through gameplay.

When to Use It

This strategy is best used when students are encountering new information or developing their understanding. It provides a way for students to evaluate their own

understanding and think about how feedback and hints within the game can be used to make meaning.

What to Do

STEP 1: Provide students with directions explaining that sometimes games can be challenging, and it is important to be aware of the feedback and hints provided. Encourage students to think about elements they encountered that were confusing or challenging. Explain that this activity is about helping students develop solutions to eliminate confusion and increase their understanding.

STEP 2: Create a graphic organizer that students can use to document their thinking; include the following prompts:

- What didn't you understand or got wrong? What confused you? How did you know you were not understanding the question or information provided?
- What feedback and hints in the game helped you to change your thinking? What did you do to eliminate confusion and get back on track?
- What new understandings have you gained from the gameplay?
- Which hints, feedback, and strategy did you use that helped you the most? How will you use this strategy in the future?

STEP 3: When introducing the activity to students, explain how it is important to recognize that everyone struggles at times. When confusion occurs, it is important to determine exactly what the confusion seems to be and reflect on ways to eliminate this confusion.

STEP 4: Draw students' attention to how feedback or hints are provided within the game and model how they may incorporate these during gameplay to support their learning.

STEP 5: Integrate opportunities for students to connect with and collaborate with others to exchange ideas to help navigate confusion.

STANDARDS AND TLP CONNECTIONS	
ISTE Standards for Students	ISTE+ASCD Transformational Learning Principles
<p>Empowered Learner 1.1.c Feedback to Improve Practice</p> <p>Creative Communicator 1.6.c Communicate Complex Ideas</p> <p>Global Collaborator 1.7.b Multiple Viewpoints 1.7.c Project Teams</p>	<p>Nurture: Cultivate Belonging</p> <p>Guide: Develop Expertise</p> <p>Empower: Prioritize Authentic Experiences</p>

STRATEGY 5.5. Expand My Mind: Reflection in GBL

The purpose of this strategy is to help students connect prior knowledge to the topics covered in gameplay and reflect on their learning.

When to Use It

This strategy can be used before and after gameplay.

What to Do

STEP 1: Create a graphic organizer that identifies the topic or essential questions students will encounter during the game-based learning experience.

STEP 2: Present the topic and essential question for students to think about, and then create sections within the graphic organizer that students can use to address the following before and after gameplay:

- Before you begin gameplay, think about and jot down what you already know. Then discuss your response with teammates.
- Before you begin to play the game, jot down ideas as you hear things from teammates that you forgot to jot down in the first column. Use prompts like: “My teammates shared with me...”
- After gameplay, jot down new ideas and information you now have because of the gameplay. Connect these ideas to what you knew as well as what your teammates and classmates shared. Use prompts like: “And I learned _____ while playing the game.”

- Share your new learnings with others and listen to theirs. After talking about your learning with a small group or class, jot down new things you learned and how your thinking is extended. Use prompts such as “And then when we talked about it, I learned even more...”
- Reflection: What connections did you make as you added information to each column? This is the section that you want students to be able to identify connections and elaborate on the purpose and outcomes of learning because of gameplay.

STEP 3: When introducing this activity to students, consider providing them with informational sources to make connections to prior knowledge. This activity also is an opportunity for students to identify questions they have and how they might approach the game-based learning experience to further their understanding.

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Summary

This chapter presented the concept of gamification, which includes using games for engaging students in content materials. It can also be used as a strategy to make a game out of an entire classroom. The educators and researchers note that game-based learning is highly engaging and exciting for many students. Research also highlights the importance of scaffolding, activating, and building students’ prior knowledge before gameplay and identifying opportunities for student reflection and progress monitoring as it relates to the learning intentions and goals. The chapter suggested ways to begin small, by incorporating elements of game-based learning,

such as collaborative sorting and matching activities, into the work you are already doing. Digital game-based learning technologies support the implementation of retrieval practice as a learning strategy that cognitive science researchers have noted to be a highly effective method for improving student achievement.

Questions and Reflections

- Is the idea of gamification something you think could improve students' enthusiasm and persistence for learning?
- How might you prepare students for game-based learning (GBL) by developing content knowledge and skills prior to GBL?
- How might you support students who struggle and leverage scaffolding to support GBL experiences?
- Are there local resources or individuals who might assist or inform your school or colleagues about gamification?
- What safeguards are necessary to protect privacy within a gamified classroom?
- Can you identify one area where your grade- or subject-level teachers might work together to integrate game-based learning into an assignment or a project?

Further Resources

The following resources share strategies backed by research and cognitive science to support the design of game-based learning. Additional resources to support educators in how they evaluate pathways for integrating game-based learning within their unique learning environments are also included. As you review the resources below, consider the learning and motivation needs of your students.

RESOURCE	ACCESS	DESCRIPTION
Cognitive Science Research on Retrieval Practice	 tinyurl.com/4ref55yt	This research database hosted by RetrievalPractice.org shares studies demonstrating the effectiveness of retrieval practice. It is important to share the why and provide a rationale to stakeholders for strategies that will be implemented.
Cognitive Science Research on Retrieval Practice: Citation Guide	 tinyurl.com/3knrbf5v	This resource can be used to guide and cite the effectiveness of retrieval practice for learning and illustrate how to integrate the digital tools that support retrieval practice in a digital game-based learning environment.
The Education Arcade	 tinyurl.com/4z9azypp	This rich site from MIT includes dozens of games for learners of all ages. The site also offers overviews of projects in development, such as Collaborative Learning Environments in Virtual Reality (CLEVR) and AI-supported game-based learning.
PBS Learning Media Games	 tinyurl.com/3bks65sp	PBS Learning Media offers a wide variety of games and game-based learning resources for K–12 learning environments. You can search the library of resources for “games” then filter the results by grade level, content area, length, language, and more.
Retrieval Practice Strategies and Research	 tinyurl.com/ytsnss7u	RetrievalPractice.org provides resources and strategies from cognitive psychologists and researchers that are easy to adapt into any curriculum and learning environment. These strategies are helpful to consider when and how to integrate digital game and review tools, such as Kahoot! or others.