Handbook of Games and Simulations in Teacher Education

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Digital games and simulations are serious new tools for learning. They can achieve dramatically higher levels of emotional power, interactivity and effectiveness for learning compared to conventional resources such as books, lectures, videos, and student-produced artifacts such as reflection papers, student research, tests and quizzes. Among their key advantages are immersive experiential learning, seamless integration with online resources, embedding of complex models to be discovered and acquired via mastery, and high-resolution time-based data for analysis of learning. As a result, games and simulations can effectively engage students in direct experience with the causal mechanisms and structures of systems, and through experiment and discovery, assist them in acquiring higher order knowledge.
and skills. Airline pilots, for example, train in simulators and regularly return to them to renew and further develop their experience base. The military extensively uses digital games and simulations to provide scalable, uniformly high quality training exercises. Medical schools are rapidly developing simulations for a wide variety of educational purposes. The time is right for schools of education to get serious about digital games and simulations in teacher education.

However, as an emerging field, where should people go to see the best practices enacted and producing good impacts? What implications from research should guide decision-making? Are there minefields to be avoided, and can people find out what not to do, to avoid making the mistakes that others have made? How can educators begin to build a collaborative foundation for sharing experience? If there are no “best practices” yet, then how can we co-invent the “next practices?” The essential question of this handbook is ‘What should institutional advancement leaders, deans and department leaders know and do in schools of education to ensure robust use of digital games and simulations in teaching and learning?’ The responses to this question include changing the conditions for improvement in schools of education, supporting faculty research, teaching and service in specific ways, providing specific experiences for pre-service students, and addressing a core of knowledge and skills needed to teach effectively with digital games and simulations.
The authorship of the Handbook differs from the method of a single author or team, or as a collection of chapters edited by an author or team. Instead, we have conducted a crowdsourced brainstorm and extended compilation of ideas across a broad range of communities in teacher education. Fluid editorial teams for each section then shaped the ideas, and Handbook editors prepared the final version. We chose this method in order to get the broadest possible input to the essential questions and to allow the boldest possible ideas to be expressed and organized into a comprehensive but brief practical outline for leaders to use to stimulate conversations in their organizations. The goal was not to produce a scholarly, highly referenced work in an academic tone, but to give pragmatic advice from the field of experts and adherents to begin the conversations and organizational journeys needed to speed up and manage a change process that to many seems inevitable.

The Handbook is not intended to convince anyone of the need for the new game changing directions. It is also not intended to teach you everything you need to know about the subject; although we do list a number of people, websites and projects worth exploring. The handbook is aimed at leaders and others who already sense the change coming and are looking for rapid development of knowledge and programmatic innovations to propel their faculties into action. As a result, the tone and purpose of the writing is to give practical, actionable advice, and short summaries from experts in the field.
Teacher Knowledge: What do K-12 Teachers Need to Know? If the graduates of an ideal program are to be among the best teachers in the world, they need to know 1) how to teach with digital games and simulations, and 2) how to involve all students, and 3) which specific examples they are prepared to use on day one of their career. The section outlines what pre-service teachers need to know and be able to do with games and simulations.

Program Experiences: What learning experiences should future teachers have? This section outlines how teacher education programs can ensure that teachers are prepared technically, pedagogically, and with conceptual subject area depth to effectively use simulations and games in their teaching practice. This preparation includes possessing experience and evidence-grounded attitudes, beliefs about the power of games and simulations, as well as effective practices that have been honed through repeated trials and feedback. Examples include simulations of teaching, such as simSchool, that operate as flight simulators to develop teaching skills; games and simulations and platforms utilized for teaching, such as 3D Game Lab, Civilization, DimensionM and Quest Atlantis; and game-like platforms as teaching, such as Fab@School, Scratch, Kodu, Gamemaker and other construction platforms, as well as OpenStudy and other emerging badge-based peer-to-peer applications.

Teacher Educators: What should faculty of education do? This section contains key ideas for potential avenues for scholarship, for example, research on the sociocultural, cognitive, and technical opportunities and their impacts on teaching, learning, assessment and organization. It outlines opportunities and incentives for faculty to play and work with games and simulations in order to understand the potential that their authentic learning tasks can add to pre-service and advanced study environments. The section also broadly outlines what good teaching looks like with games and simulations in a teacher education context.

Conditions for Improvement: What do schools of education need to have in place to promote the use of games and simulations in the preparation of future teachers? Three areas are identified - leadership, incentives & supports. Leadership ideas include the concept of achieving an “epic win” for the college or school of education by transforming the program to infuse and leverage digital games and simulations, which involves changes in beliefs about the potential of new technologies, skillful action in hiring and supporting talented innovators, and establishing an environment where risk-taking and collaboration leads to transdisciplinary research, teaching and service. Incentives include recognizing and rewarding new forms of design-based research as well as collaborative production of new applications. Support structures include ideas such as providing focus and impetus for setting up and funding ongoing transdisciplinary research, teaching and design teams.
The Handbook project used several phases of input. First, the National Technology Leadership Coalition Committee on Games and Simulations met in January 2011 and again in September 2011 and laid out the outline of the project. Members expressed an interest in authoring, reviewing, critiquing and shaping the work. A call for participation went out in November 2011, which expanded the group of potential authors and contributors. At a keynote address in the virtual world “Second Life” at the 2012 Virtual Worlds Best Practices in Education conference in March 2012, an open brainstorm by contributors was collected in four online documents, which was shaped into a final document.

Much progress is being made today in bringing the power of digital games and simulations into new learning tools and experiences. The Handbook aims to provide a digestible set of clear and useful guidelines and ideas that will stimulate the deeper conversations needed to make more rapid progress in integrating games and simulations into the “next practices” in teacher education.
In an ideal world, what would schools of education have in place to promote the use of games and simulations in the preparation of future teachers? Three areas are highlighted - leadership, incentives & supports. If you were a leader who could initiate any policy and shape your institution’s program and future, what are some steps you could take to set the conditions for faculty innovation in preparing teachers?

**Leadership**

We asked hundreds of participants from all over the world, “what do leaders in higher education need to do to advance the state of the art in games and simulations in education?” They replied: Be Bold! Be Brave! Be Epic!

College leaders are quite familiar with the need to be brave in the face of change, and possess the boldness needed to trust and support innovators in their system. “Epic” is a term used by gamers to mean something between rare and legendary. It distinguishes winning an important goal from among many smaller accomplishments that prepare one for a truly outstanding long-term performance. If you achieve an epic win, you may
have snatched a victory from the jaws of defeat and can now “level up” to face new more challenging situations with higher risks and rewards. This is our desire for colleges of education, that they achieve an epic win by integrating games and simulations into teacher education.

Ultimately, to be an epic leader involves beliefs about the potential of new technologies, skillful action in hiring and supporting talented innovators, and establishing an environment where risk-taking and collaboration leads to transdisciplinary research, teaching and service.

**Beliefs and Actions**

Modern educational leadership believes in the potential of digital games and simulations in teacher education as a real and continuous new force, not a temporary add-on or fad. To arrive at this belief requires a journey into computational science, seeing the role of computers at the vanguard of global knowledge production and communication, and developing a faculty’s vision for adapting lessons from the leading edge to renew teacher education policy and practices. We might typify the change in belief from seeing computers as tools of productivity to tools of discovery and innovation.

To integrate games and simulations into teacher education also requires taking action to develop it into a common occurrence within the construct of andragogy.

To promote the development of the required beliefs and actions, leadership needs to make space and time to listen to new ideas and provide rewards for experimenting and sharing with other educators. Epic leadership sets an example of continuous self-development, research and sharing, which builds a compelling, colorful, common picture of their team’s mission. Actions need to speak louder than words to engage faculty in learning not only how their specific subject areas are changing due to...
computational tools, but in addition, undertaking new ways of thinking. Faculty beliefs are formed out of opportunities to question their own attitudes, to collaborate with others to solve institutional problems and meet new challenges. But to do so, faculty members need to feel safe in order to be willing to take risks, advocate for innovation and influence others.

To achieve buy-in at all levels, leaders cannot be afraid to fail - a good leader knows his or her limitations and uses the skills of those around them to motivate others.

**NEW AND RENEWED FACULTY**

If current leadership does not play games or understand the gamer generation or the new computational potential of simulations - they need to hire and support people who do. If current professors do not understand how to utilize a simulation, collaborate online, communicate via multiple media, and have a presence online then they cannot model and explain these skills to others. So, hire people who play with technology. Appoint new faculty with the potential and mandate to lead in the design and field-testing of novel learning environments that utilize digital games and simulations.

Hire faculty that are willing to learn alongside pre-service students and are not afraid to make mistakes or be inexperienced in front of peers. Recognize and support people who are risk takers and who believe technology can be a valuable tool in the learning environment. Seek people who have or desire experience with a wide range of technologies in the classroom and who show the tenacity needed to master new technologies.

Employ and support faculty who demonstrate a passion for learning innovations, who can participate and lead public forums on learning technologies and who are willing to grow and acquire new and relevant knowledge to move the field forward.
Ensure that educators with this mindset toward innovation have a voice in the department or college’s policy, procedure and assessment processes.

Leadership needs to be tolerant of faculty taking the risk to use new approaches such as a virtual world. Students may at first be frustrated with the task of having to learn new technologies. Students may express this frustration through course and instructor ratings; however, getting initial poor student ratings due to implementation challenges is not a cause to abandon the path or the person on it. Leadership also needs to support professional development and collaboration with peers to learn how best to implement new technologies for their needs. Leaders need to recognize the time commitment to implement such learning environments, reward risk-takers to give their actions value, facilitate professional development opportunities, and encourage faculty to share new information during faculty meetings and conferences.

For existing faculty, provide professional development that reduces barriers and promotes positive attitudes. Charge faculty teams to find funding opportunities in the area of technology, games, and simulations in education. Deans and faculty chairs can add the “integration of advanced technologies including digital games and simulations” as a requirement or recommendation for tenure. Additional focus areas for tenure reviews could include evidence of continuing education, experimentation and growth in new leading edge topics, tools and methods. Technology is an important area for teacher candidates to demonstrate growth; faculty should set an example and follow the same standard.
Leadership must know what are the benefits and especially the best-case scenarios in all areas in order to bring all educators on board. For example, students today learn differently than they used to. In addition to the current generation’s ease and comfort with technology, research has shown that the more actively involved students are with the subject material, the deeper their learning. Games and simulations provide this hands-on active learning experience to students, allowing them to become more intimate with the course material and learn at a higher level. In addition, student access to serious games, game-based improvements to courses, and increased authentic embedded simulation experiences help increase student retention, desire to learn, and improved student outcomes.
HOW CAN KNOWLEDGE OF THESE BENEFITS AND BEST CASES BE DEVELOPED?

- Use social media to “crowd source” ideas, solutions, testing, and collection of data and dissemination of results.
- Limit the use of traditional advisory committees that are not representative or that rely on only face-to-face meetings to achieve results.
- Involve broad groups of stakeholders including students, teachers, administrators, and parents.
- Include student leadership voices and ask for thoughtful responses from students on their vision of gaming and how they see themselves learning from their experiences.

Explore implementation obstacles beforehand so when the leadership team decides to use a new technology such as virtual worlds, games and simulations, they can achieve engagement, shared commitment, and early successes.

INCENTIVES

Students are increasingly looking for technologically progressive educational institutions, so increased student enrollment and retention will result from the use of digital game and simulation technologies in the classroom, in research programs, and in outreach into the community. This is the institution’s incentive to integrate games and simulations into teacher education. Incentives are also needed at the individual level so faculty can see that taking risks, being entrepreneurial, and making discoveries and advances in this field are highly valued pursuits.
Here are a few ideas for incentives:

**Raise the level of awareness of this work to the front of your college or school’s web page.**

Develop a public display of faculty and student accomplishments on a flat screen TV with QR codes so visitors to the department can see the articles and works.

Develop a teaching award program to recognize innovative teaching in K-12 schools in partnership with the college’s faculty.

Conduct interviews for new faculty hires in a virtual world to allow them to show that they know their way around virtual learning environments; make it clear that you are looking for people who are curious about digital games and simulations in teaching and the role of computational resources in the production of knowledge.

Reward faculty for leadership in games and simulations research; provide value for developmental and implementation-oriented research.

Ensure that innovative entrepreneurial faculty are highly prized, decorated, rewarded and put on display as examples for others.

Include participation in innovation as a part of performance reviews as a valued element of tenure.

Establish internal publications and benchmarks for promotion to encourage faculty in discipline field areas to get caught up with computational science tools, processes, and research methods.

Incentives to unlearn. Help faculty understand that they have to stop doing some current practices - even best practices - if they want to create space for “next practices.”
Provide opportunities to enhance tacit and informal learning, in addition to explicit and formal professional development opportunities.

Create a game and simulation “book” club that explores new technologies and discusses the experiences.

Offer faculty professional development opportunities and stipends for implementing game-based innovations (e.g. virtual worlds, games and simulations) into their curriculum.

Run open “Games Room” events like a local area network party but with a specific educational outcome goal to build understanding for faculty and students.

Provide a short professional development course/seminar that is accessible 24/7 for those just starting out, followed by an in-world professional development that doubles as a learning network.

Consider education as a target market for entrepreneurial development of hardware and software by cross-disciplinary faculty teams; faculty teaching needs can be part of the driver of this entrepreneurial activity.

Have topic-oriented game contests and grants. For example, encourage a competition to create lessons about how to use games and simulations in science, technology, engineering, and mathematics (STEM) teaching.

Provide social justice opportunities for game usage. For example, partner with at-risk programs in K-12 to train and develop games that help students meet proficiency standards on standardized assessments.
Develop an external funding project team. Game-based and other innovative technology research grants are available from the U.S. Department of Education and State Education Departments. The National Science Foundation Cyberlearning program funds grants in this area. Small Business Innovation Research grants and Small business Technology Transfer Research grants can focus on companies that develop game-based curriculum for schools.

Develop corporate sponsorship. Leadership can invite ongoing contributions and participation from corporations who say they want a technologically literate workforce.

Provide directed internal funding to build out and shape your program.

Provide incentive funding for research into teaching methods for the students of the future.

Engage with the game development community so that people in industry can teach and learn alongside educators.

Support from industry equipment producers (e.g. Apple, Google, Microsoft) in creating new technologies that enable innovative teaching methods.
Leadership needs to provide the learning spaces that enable faculty to work together on understanding digital games and simulations. Supported collaborative learning spaces allow for faculty to acquire knowledge and skills to move forward. These spaces are not just labs and other forms of access to technology and models, but also time & opportunities that enable people to collaborate, share, and move between different activities. Providing supports lowers some of the barriers to progress. For example, time should be set aside for faculty and students to explore these tools in supportive, collaborative learning environments, because the lack of time can be a favorite excuse of those who choose not to participate in new technologies.

**ACCESS TO TECHNOLOGY**

Provide a wide variety of equipment, software and spaces for faculty learning

Develop a mentoring program for faculty, staffed by students, peers and experts.

Establish and support interdisciplinary research teams.

Getting support from the IT department is key to implementation. Instructors need to be proactive in showing results from others and possible results from what they are going to do.

A variety of interfaces, networks, and platforms, should be supported.

Up-to-date faculty members need to be able to use interfaces as advanced as MMORPGs (Massively multiplayer online role-playing games).

Mobile devices need to be considered.

When computers first arrived in our offices, people kept saying “I could have typed this letter in one tenth the time on my Selectric.” They were right, but they would never go back to the typewriter today. The investment in learning time was made available to them because administration decided it was worth it to put up with a few weeks of slow letters in exchange for years of improved productivity.
Encourage and fund assistants and doctoral candidates who are interested to research and can be faculty models.

Identify schools that can be used as ‘test beds’ for experiments, schools with supportive management, technical team and curriculum staff.

Encourage skunk-works development type projects built into the framework of both teacher and learner opportunities.

Develop a content management pipeline for virtual environments so that faculty members do not have to build excessively in order to put course content in place and implement lesson plans.

Orient people and expect some push-back and stumbling when they enter new environments, use new tools, or try on new practices; accept that feedback but keep things moving forward.

Accept each faculty member as a diverse learner.

Ensure that all activities are accessible to all students and faculty.

Advances in learning sciences have led the way toward valuing the importance of informal learning. Institutions and administrators must design new processes and environments to connect learners in all dimensions, crossing domains, generations, national boundaries, and cultures.
If we walked into colleges of education that are integrating digital games and simulations in teaching and learning, what would we see? Research, teaching and service activities advancing the field, preparing the next generation of teachers, and making valued contributions to the community.

There is data on youth use of games and simulations from PEW, Henry Jenkins, Beck and Wade, and from teachers use of technology on tech surveys...and a need for new research to create surveys to get this kind of information.

(Lenhart et al., 2008; Jenkins et al., 2006; Beck & Wade, 2004)

**RESEARCH**

Since research activities are a vital component of faculty performance, this section provides ideas for new research based on needs recognized by practitioners in the field of games and simulations in higher education, including teacher education. The section is organized by practices and themes that may stimulate thinking about the collaborative research potential in your institution. Some of the practices require additional research, and at the same time, research often suggests new practices, so there are strong synergies among these ideas.
PRACTICES TO STIMULATE RESEARCH

What would you see in one of the best colleges of education working with games and simulations in education? All of the good things associated with a vibrant area of research: seminars and reading groups, a PhD program, cross-disciplinary faculty involvement in research conferences, high quality publishing in the field, a steady stream of undergraduate and higher degree studies on the topic, student awards, faculty and student recognition for outstanding work and creative contributions to the field. Here are some suggestions for building a culture leading to these outcomes.

Paradigms are based around the way in which people express problem sets, but problem sets are highly dependent on the use of language, symbolism, and context in the exchange of information. Teacher educators thus need to have an ongoing dialogue with peers to establish a common language concerning how pre-service students, faculty peers, and administrators relate to the institution’s context of game and simulation-based research, teaching, and service.

Implement a year-long review of possibilities in research, teaching, and the development of new digital tools and materials. Include a broad sweep beyond games and simulations – all digital media learning and mediation in the global media culture – to help situate games and simulations within the broader scope of cultural transformation taking place today. Initiate a study group process on theories as well as practical, quickly applicable games and simulations for use across the entire current curriculum.

Promote the assessment of the degree and efficacy of educational games and simulations within the college’s content areas (e.g. use within special education, elementary education, leadership and policy, foundations and ethics courses, and subject methods). An example of a current game for special education that is based on sound is audiogames.net

Create a commons (e.g. virtual clearinghouse, seminars, speaker series) for expanding and sharing the college’s core of knowledge concerning games and simulations as well as other uses of digital media in learning. Wikis can be particularly useful to this end, as they are continuously updated.

Support key college stakeholders (faculty, administration, education students, researchers) with effective survey instruments and public reporting to identify where they are on knowledge about and practices in the use of games and simulations in teacher education.
Reward faculty for contributing to a web-based exchange (e.g. a wiki, forum, webinar) on what games and simulations would work in both K-12 and teacher education.

Develop and equip collaborative research labs devoted to creating, piloting and studying the impact of games and simulations on learning.

Promote schools of thought in educational technology via conferences, discussion panels, collaborative papers and articles.

Implement new ideas and findings from undergraduate and graduate students based on ongoing action research on the college’s integration of technology in education, with a special focus on games and simulations development.

Engage in international research and dialogue, making uses of the affordances of the online community, (e.g. holding meetings, discussions, conferences within games and virtual worlds). Clinical faculty schools could also provide “clinical laboratory classrooms” where those who are involved as cooperating teachers assist researchers by having their students implement games and simulations. This would help educate cooperating teachers as well as engage pre-service students in research on games-based teaching.

Support open research projects where current progress can be viewed and collaboration is continuously sought. Games and simulations fit well within the open research model, as this can help ease the cost and resources necessary for software development as well as promote collaboration among professionals, leading to improved educational tools.

Leverage and highlight simulation and game-based research and best practices to provide a “hook” to engage more scholars across colleges of education who serve special populations of learners (e.g. multicultural or bilingual education, or special education). Developing interdisciplinary research teams that include scholars with content area expertise and in games and simulations, and expertise in addressing the needs of diverse learners can be powerful.

Although game and simulation software packages can sometimes be costly, there are ways to defray these costs. Encourage faculty to develop research partnerships with current game and simulation publishers. An example of a research-oriented project is EcoMUVE, designed to educate students about ecology and biology. With publishers and companies, often a limited number of licenses are provided at no cost to students. You can also outsource services to technical providers such as Reaction Grid, Open Sim, Open Wonderland, or Real Xtend for a minimal fee.
IDEAS AND THEMES FOR FUTURE RESEARCH

Conduct research on the status of games and simulations within the broader context of how teacher education programs are integrating technology in pre-service programs. (e.g. what is the range of models from stand alone to integrated courses, what role does faculty modeling play and is there any data on efficacy?)

Research the alignment between teaching methods and virtual manipulatives.

Research and design curriculum-plan shells for creating games and simulations and research and build frameworks for using games and simulations in teaching.

Research the change mechanisms at work in higher education and track the development of the use of digital tools including games and simulations in every aspect of the program.

Frameworks to consider: The Concerns-Based Adoption Model (CBAM) and the Apple Classrooms of Tomorrow - Today (ACOT2) framework, which identifies six design principles for 21st century secondary schools.

Conduct K-12 action research addressing the engagement and impact of games and simulations within school practicum placements.

Research is needed concerning the differences in analyzing the “learning” in a simulation or a game compared to information-based testing.

New methods are needed for multidimensional assessment of student performance, with information concerning collaboration, participation, innovation, sharing, and perseverance.

Because so much of working with simulations involves pairs or groups, evaluation methods for collaboration and group work are needed.

Collaborate on research with K-12 programs that can use simulations for new teacher induction programs.

Research is needed on the efficacy of using classroom simulations to help pre-service teachers gain experience in classroom management and curriculum design.

Research and development of appropriate methods for evaluating the effect of games and simulations on learning. Involve pre-service students, graduate students and early career classroom teachers in classroom-based action research.
Develop open frameworks for improving pedagogy in games and simulations with evidence-based data collection. We need to be able to meaningfully test our education outcomes while we develop our experiences, and refine them after they have been created.

Inquiries are needed into the efficacy of game and simulation methods versus traditional methods of teaching.

Research is needed on implementing games and simulations on mobile and affordable platforms for Title 1 communities.

Jargon-free interpretations of the research are needed that are accessible to everyday teachers who may not have a research background.

New metrics are needed for validating impacts and comparing approaches.

Research is needed on the impacts of games and simulations on marginalized students. Dr. Yee, a graduate of Stanford University, published several papers related to this topic at nicky-ee.com/index-papers.html.

Qualitative research is needed to help explain what is happening socially and culturally to both gaming and non-gaming teachers.

Research is needed on the role of metagame (activities external to the game such as social groups, online support groups, and literature resources) in learning.

Research is needed on the effectiveness of simulation and game-based learning in developing pre-service teachers’ deep knowledge and understanding of complex problems, concepts, and ideas.

Research is needed on the effectiveness of simulations of classroom teaching in enhancing pre-service teachers’ knowledge and skill in engaging and meeting the needs of diverse learners.

Findings are needed concerning what does not work, what conditions did not improve performance outcomes, because understanding and dissecting cases of poor performance is equally important to the community.
TEACHING

Teaching in a game and simulation enriched college environment looks significantly different from conventional practice. Students and faculty play more, create more, and use more data in high-density visualizations to understand complex systems. They talk about the strategic, instrumental, social and intellectual challenges of beating a game or testing the limits of a simulation. Classrooms for pre-service teachers effectively use games and simulations as part of their practical work as well as the theoretical foundations, content and methods. The program helps students curate and use game and simulation-based learning approaches to effectively teach concepts and skills and practice their own instructional skills. These include game-based practice of classroom management, differentiated instruction, identifying at-risk students, curriculum design, sequencing tasks, and meeting the individualized needs of students. The new model of teaching engages both the faculty and students in the discovery process, exchange of ideas, and creation of new knowledge in the field.

Unquestionably, many authors have built a strong case for the importance of engaging students in gaming and simulation activities. Perhaps topping the list is the potential of engaging greater numbers of students, including those typically underserved, in active experiential learning situated within rich and immersive environments. Various stakeholders agree that students must be immersed in authentic real-world contexts that actively engage them in learning. The combination of deep and specific content knowledge and a thorough understanding of

Empire State College has first-year students in the Master of Arts in Teaching Program use simSchool and report on their experiences. SimSchool is a cloud-based application utilized to help pre-service teachers practice classroom management skills. Students discussed how they found the simulation to be a useful tool, as it presented realistic and diverse student profiles and reminded them of the need for detailed information on student strengths and weaknesses. Simulations help give students practice in a virtual classroom before they become the teacher of record.
diverse learners are necessary for preparing teachers to close the achievement gaps across high need content areas. Exploring new ways to prepare teachers to engage all students in rich and effective learning experiences, offers great promise. Several scholars and practitioners uphold the tenet that integrating design principles and gaming and simulation activities into K-16 curriculum can enhance learning and overall engagement in new and exciting ways.

In order to develop a college curriculum that effectively teaches with games and simulations, education faculty need training in current applications and their uses and advantages; practice in trying out new approaches, and opportunities to grow into new

GUIDELINES FOR A COURSE TEMPLATE

- Take advantage of existing resources; find games and simulations that others use and try them out.
- Ask students to be producers, not just consumers; students are active participants in social media and game worlds, create those same opportunities in your class.
- Ensure mechanisms for serendipity.
- Be aware of non-electronic and non-media-intense games and their value in the online classroom.
- Focus on learning, not technology.
- Provide lead-up and debriefing sessions.
- Embrace interdisciplinarity.
- Think about ways to use serious games.
- Make the most of collaborative technologies and virtual worlds to help manage complexity.
- Playtest your courses frequently and often.

Adapted from (McDaniel & Telep, 2009)
roles as new kinds of teachers. The time has come to get all faculty members on board. Institutions would not tolerate a faculty member who could not publish, and should barely tolerate one who cannot use email and other communications technologies to participate in contemporary scholarly work. It is now time to include games and simulations among the other important digital media tools for learning that all faculty should be aware of, conversant in, and rapidly developing expertise for productivity and effectiveness as teachers.

THE CHANGED PARADIGM OF GAME-BASED TEACHING

We recommend creating a process to reexamine your current models of coursework for pre-service teachers. Do the courses model as well as instruct and are game-based principles embedded and ubiquitous in them and the program as a whole? What are the game-based learning principles that your faculty grasps and critically understands, and to what extent do faculty see the principles as advancing their own teaching abilities (e.g. enhanced ability to reach students, motivate them, and engage them in participatory learning using digital media?). Faculty would benefit from discussions of how game and simulation technology is changing the paradigm of teaching and how it is integrated and used in teacher preparation programs in other colleges. How are practices elsewhere related to local environmental factors such as access to technology, faculty knowledge and experience, and the beliefs and efficacy of the faculty concerning teaching and learning with technology?

When a class or group gets involved in a game-based project or simulation-based exploration, the conventional role of the teacher becomes less relevant to the progress of activities; and their interdisciplinary research team at Texas A&M University have redesigned a traditional undergraduate problem-solving course. The Knowledge for Algebra Teaching for Equity (KATE - kate.tamu.edu) project enriches the education of pre-service teachers by using virtual classrooms and immersive learning spaces in Second Life to provide pre-service mathematics teachers early teaching experiences that address topics in problem solving and equity. Pre-service teachers design and engage in a series of culturally relevant simulations in their virtual lab classroom throughout the course.
coaching and facilitating, observing and guiding reflection serve better. The role of the teacher also varies depending on the group, context and technology, so educators need to be flexible. This is consistent with research on effective teaching and learning, which supports the need to minimize lecture-based instruction and emphasize cooperative learning activities.

To encourage faculty to offer to teacher candidates courses with the pedagogical elements of good game design and the affordances of computational resources in simulations, the college needs to provide faculty members with professional development on how to design, implement and improve these kinds of courses. Three suggestions follow: 1. offer online training and workshops, 2. develop a course template on how to effectively teach with games and simulations, 3. sponsor shared exploration time to use the template together to develop collaborative game-based course experiences.

OTHER IDEAS INCLUDE:

- Have each department identify three to five games or applications they want to explore, with the goal of implementing one or more in the current year.

- For at least one course taught by every faculty in all branches of education, challenge faculty members to select three tools they can implement immediately with fifteen minutes or less of training and introduce these tools within a course.

- Professors need professional development in designing or using a game to teach or reinforce a concept. Engage professors in an iterative development process including user testing with students.

- Help faculty members take steps to integrate games and simulations into their teaching.
UNIQUE USES OF GAME-BASED LEARNING TO DEVELOP TEACHERS

It might seem obvious to some, but we’ll make it perfectly clear for all, that teacher educators need to know and be able to do what they aspire to guide future teachers to know and be able to do. This truism goes for games and simulations, and other areas of digital media in learning, as it does for other areas of the teacher education curriculum. Therefore, the expected content concerning what teacher educators should know and be able to do are outlined in Chapter 3 in sections on experiences that should be collaboratively provided to pre-service teachers and Chapter 4 in sections that outline the specifics of what an individual teacher educator should know and be able to do with games and simulations. In this section, we focus on unique teacher educator applications of games and simulations that might only be found in a teacher preparation program, and teaching ideas that are focused on useful practices for preparing future teachers.

Simulations of teaching offer a way to develop teaching skills without harming real students. For example, encourage students to role-play teaching inside a virtual world and within a game setting. Use a special focus simulation such as The Cook School District Simulation (cook.wou.edu/) or simSchool (sim-school.org) to provide virtual field experiences and practice classroom management.

Use games and sims to expose teacher candidates to social issues, such as digital divide and digital citizenship. iCivics (icivics.org/) has some great games on this topic. Provide training in universal design for learning (UDL) and disability-accessible assistive technology use, so that pre-service teachers can ensure that all students are included in games and simulations.

Incorporate case-study based simulations into teaching pre-service teachers how to identify students at risk for mental health issues, violence, or substance use.
Purposefully integrate games-based learning modules in teaching for specific content (mathematics, social studies, etc.) and purposes (e.g. research on teaching, advancing learning sciences, ethical development of teachers as advocates of education in the community, community and citizenship literacy, etc.). If the institution involves faculty from other departments to teach subject-specific content, those people need to be involved in the faculty development program to integrate games and simulations into teacher preparation programs.

Invite game practitioners including K-12 teachers and students to share and present in classes.

Encourage faculty to integrate virtual worlds into their courses in a pedagogically appropriate manner. These courses can then serve as the basis for research on the effectiveness and engagement.

Use visualization-based tools, games and simulations to capture or create data for reflection on the act of teaching, the trajectories of learning, and cognition, as part of the learning environment enhancing teacher preparation.

Use games and simulations to provide pre-service teachers with opportunities to work with a diverse student population (Ellison, A. M., Tyler-Wood, T.L., Periathiruvadi, S., Sayler, M., Barrio, B., & Lim, 2011).

Develop ethical educational decision-making via games and simulations scenarios (Schrier & Gibson, 2010, 2011).

In an ideal setting, professors of teacher education would be working with K-12 students in order to model for their pre-service students.

Have K-12 teachers who are using games, simulations and virtual worlds visit the college classrooms to participate in pre-service teaching, allowing pre-service students to see and talk to people who integrate into real settings. See the NYC school “Quest2Learn” (q2l.org/) and the PBS documentary “Digital Media – New Learners of the 21st Century.”
SERVICE

The service component of faculty responsibilities does not hold the same weight as research and teaching in many institutions. But there are strong untapped possibilities with games and simulations to bridge from formal to informal learning, strengthening town-gown relationships as well as opening new doors for research and teaching. For example, faculty members could become part of remote teams of experts who stand behind the learning opportunities of new games and simulations embedded in informal programs such as community mentoring, LEGO robotics, and other online learning challenges. Here are some additional ideas:

Faculty members need to be highly recognized for providing professional development service for K-12 teachers in any aspect of education, including games and simulations.

Harness the power of social media to spread Open Source resources to the community of educators (both K-12 and Higher Ed) to promote new venues of educational technology including games and simulations.

Teacher educators should be interacting every day with students and teachers in schools anywhere, including the most isolated rural communities. This benefits both K-12 and higher education.

Connecting to the community in virtual games and simulations will give a ready place for service engagement, and should be recognized as valid. Community service can be in virtual worlds or with organizations whose work is entirely online. Host a conference for teacher educators, K-12 teachers and researchers on the use of games and simulations.

Partner with school districts. Games and integrative pedagogies developed by faculty and pre-service teachers can partner with K-12 at-risk students as beta testers for the new applications and methods.

I have worked in a virtual world on a joint project with students I never met, in a rural community I never visited. We worked in multiple sessions, costing me all of a couple of hours, no gas or lodging. When it comes time for those students to decide whether and where to go to college, they will know our university as a place with which they have already successfully worked.

-Teacher educator
Teacher educators and pre-service students are not necessarily digital gamers and need support in becoming comfortable with gaming in their own learning and teaching. Program experiences need to expose future teachers to experiences with games and simulations as learners; as most teachers teach how they were taught. For example, future teachers need to experience quest or game-based courses, take courses in which games and simulations are used as learning tools, and receive feedback on their use of these tools.

Teacher education programs should ensure that teachers are prepared technically, pedagogically, and with conceptual subject area depth to effectively use digital simulations and games in their teaching practice. This preparation includes possessing experience and evidence-grounded attitudes, beliefs about the power of games and simulations, and effective practices that have been honed through repeated trials and feedback.

**Learn to play**

-- OR RATHER, REMEMBER HOW

Teacher educators and pre-service students are not necessarily digital gamers and need support in becoming comfortable with gaming in their own learning and teaching. Program experiences need to expose future teachers to experiences with games and simulations as learners; as most teachers teach how they were taught. For example, future teachers need to experience quest or game-based courses, take courses in which games and simulations are used as learning tools, and receive feedback on their use of these tools.
simulations are regularly used, and take courses designed to engage them in creating, evaluating, and teaching with games and simulations as pedagogical tools.

Some pre-service teachers come into teacher education programs with low technology skills. There is a need for diagnostic tools to examine their knowledge and skills and support them in feeling comfortable with the integration of the technology, pedagogy, and content.

**ATTITUDES ABOUT TEACHING WITH GAMES AND SIMULATIONS**

You can expect attitudes towards games and simulations to be impacted as evidence mounts that they can be effective for improving standards-based skills. There is a growing body of research that focuses on pre-service teachers’ beliefs, attitudes, and technology experiences, as well as identifying the strengths and weaknesses in their technology knowledge and skills. This handbook’s references are a starting point for that research.

What are the beliefs and attitudes about using technology in teaching? How do those extend to games and simulations? Self-efficacy beliefs of both teacher educators and pre-service students about using game and simulation-based technology impact how it is viewed and used in teaching/pre-service teaching. Teachers’ self-efficacy or belief in their capacity to work effectively with computers is a significant factor in determining their patterns of computer use. Studies suggest that teacher’s self-efficacy beliefs are useful indicators of technology integration.

Teacher attitudes should be measured pre and post the pre-service program to see if and how they have changed.

What about the future teacher who thinks “I don’t have time to learn about games and simulations in teaching. It is not core to my mission.” There must always be time for innovation. Learning to teach with games and simulations is a new non-negotiable of a 21st C educator; it reaches students of the digital, plugged-in generation. Imagine in the 1980s refusing to use the television simply because you “didn’t have time” to make the changes to your lesson plans.
GAMING AND SIMULATION ACTIVITIES FOR TEACHER EDUCATION

Teachers teach as they were taught. Teachers should not only learn about games and simulations and be asked to teach a sample lesson using them, they should be taught via direct experience with games and simulations activities. Colleges of education, in other words, should model teaching with these new technologies and develop the epistemic framework of teaching to include this specific form of technology integration. Teacher education programs should develop pedagogy and assessment lessons that use games and simulations rather than just being about games and simulations, or worse, simply mentioning them.

A basic outline of activities that all pre-service teachers need to experience includes 1) playing with and learning from games, 2) creating game ideas, 3) practice teaching with games and simulations and 4) critiquing and reflecting on a wide range of games and simulations.

PLAYING WITH AND LEARNING FROM GAMES

Play is a fundamental aspect of human learning and development. Educators acknowledge this when considering child development but then somehow forget that it is still applicable to adults as well, including pre-service teachers. We don’t lose the capacity to learn and develop through play when we become responsible, contributing members of society. So, future teachers should play games and use simulations in their preparation program; we believe it is so important that a game or simulation
should be found in most of their classes! Since future instructors need to develop the belief that using virtual tools in instruction is a vital part of their job, an excellent way to support them is to involve them in game or quest based courses at the heart of their quest to enter the profession.

Teacher education programs could themselves be designed as a game-based experience for teachers to learn about learning and teaching. For example, one of the promising new directions in bringing game-based methods into teaching – badges – could be developed as pre-certification signposts of achievement, as door openers and recruitment strategies to the profession, and could be aggregated into valuable entry requirements to new learning opportunities. By developing new motivational strategies in the preparation program, the larger quest for becoming a teacher can include game and simulation-based narratives that are relevant to the pre-service students’ experiences.

Consider using a blended teacher training approach integrating simulation and telecommunications experiences with real life teaching activities. Online programs can, for example, begin by introducing games and simulations into typical “Blackboard” or “Moodle” courses - and can engage pre-service students in finding, cataloging and promoting key simulations for introducing

Games Allow Learners To:

To play a game, you must make an effort.

Your decisions are based on
1) current state of the game,
2) prior experiences in this situation
3) anticipation of the future,
4) the game’s rules and reactions to you, and
5) your last move.

You are free to make a move that may not be expected just to see what will happen.

FAIL It is ok to fail, in fact it builds resilience!
in every course in the teacher education curriculum. In activities like these, there are several key skills that pre-service teachers can develop, including: co-participating in authentic inquiry, dealing with open-ended problem solving, and collaborating with peers. We briefly discuss each of these next.

**Co-Participating in Authentic Inquiry**

First, a teacher who plays with their students is another player, an authentic co-participant, and is not required to be ahead of others. This situation develops the attitude and positionality of being an authentic learner. This situates the future teacher to viscerally grasp that K-12 students also need to be prepared and supported to learn from the novel technologies. It also helps ensure that pre-service teachers see new connections to the theory they are learning.

A part of the experience of authenticity involves exploring the projective identity possibilities of games and simulations. Teachers should be trained in how to express a variety of personalities through multiple avatars in various learning environments. For example, the teacher can be a presenter, helper, guide, friend and a troublesome imp, all at the same time, for educational purposes in a role-play.

Another result of authentic engagement as a co-producer of play and a co-participant in a game or simulation is learning that while some people want to be taught step-by-step, many others want to explore and discover. Games and simulations encourage rapid failure and learning from feedback, which allows the future teacher to learn more from many safe failures than from doing things one prescribed “right way.” The pre-service
Future teachers need to experience collaboration in many contexts where technology is a mediator; organizing and working on global teams, finding remote expertise, utilizing cloud-based resources, and marshalling digital resources to solve problems. In the game world, one important example is “guild play” involving people outside of one’s face-to-face classes, which provide an opportunity for people to collaborate worldwide using virtual environments, to achieve purposes through telecommunications. Collaborative play elicits communication, which strengthens identity, values and beliefs.

Teachers who play, learn to use games and simulations in ways that interest them and in ways that can be translated to their own classroom. As they learn first-hand with games and simulations, they are then more likely to teach with these powerful technologies.

Open-Ended Problem Solving

Second, great outcomes from play are not rigidly structured. Rather than nobody being surprised at the end, a successful game often has an outcome impossible to predict and contains interesting revelations. While a pre-service professor (or teacher) has a critical role in preparing situations with boundaries and rules for a particular teaching purpose, the best games introduce and support open-ended problem solving. Their core puzzles and challenges often are solved by unforeseen events and interactions. Pre-service teachers need to experience these kinds of moments as authentic participants with others in complex challenges in order to extend to their role as creators of learning experiences (not simply transmitters of information).
Experiences with games and simulations promote involvement in a participatory culture of creativity and empowerment. People who play and experiment with digital games and simulations expect to exercise control, make decisions, produce things and express themselves with media. These technology experiences can help prepare teachers with the skills needed to envision and create their own classroom materials to engage students.

Curriculum and instruction courses can involve teachers as researchers in projects that include design, development, training and management of games and simulations. Creating new ideas for a game or a simulation is also powerful, because creating the situation, rules and concepts of interaction engages and challenges thinking as much as or more than for those who come along later to play or observe. An example of the creation process would be an exercise in comparing the effort involved in a game or simulation with that needed in a traditional study or homework assignment. Have pre-service students compare a “game grind” - the persistence and effort needed to succeed in a game - to the normal curriculum they have experienced and how they would change both experiences with learning theory-based game and simulation experiences.

Teachers should know the basics of how games are created. Ideally, teachers should create an educational game themselves and be given a chance to assess its learning content. That way they will have a finer understanding not only of how these tools work, but how they can work with them in order to help students actively construct their knowledge and share it with the rest of their class.

However, it is not critical that the ideas for new games and simulations become actual new games or simulations. It is enough
to think about the issues, explore the challenges and opportunities of creating a highly engaging interaction, and testing one’s ideas with peers, to acquire the powers of thought and reflection that can advance thinking about teaching and learning.

**Practice Teaching with Games and Simulations**

Practice is critical to learning, developing confidence, and gaining the skills of using games and simulations in teaching. Preparation programs thus need to allocate time for teachers to learn how to use games and simulations as teaching tools. Teachers integrating simulations and games-based learning should be provided with the time to develop lesson plans, practice them with others and receive feedback from peers and students.

Teachers need to know that students can be their best instructors. Teachers do not have time to learn all of the complex multiple platforms - so don’t attempt to expose future teachers to everything. Teach them that their students should be a resource on integrating technology in the classroom by modeling how to engage students as co-learners. This means that professors of education need to model and become co-learners with their pre-service students and point out to them what they are doing, so the future teachers can replicate the practices in the K12 classroom.

Teachers, who have concerns about their ability to deal with technology in the classroom, will have these same classroom and behavior management concerns when teaching with games and simulations. These teachers need to know how to create a classroom culture where it is second nature to utilize technology and media including games and simulations. Teachers also need to shape how games will operate in their classroom in ways that minimize misunderstandings, hurt feelings, and inactivity from student spectators. A good classroom environment should obviously require activity and input from every student while teach-
ing and reviewing appropriate academic content. Like many other aspects of the classroom, establishing routines and expectations concerning game and simulation based learning experiences is paramount. A pre-service program might utilize these challenges to rethink opportunities to co-train potential K12 instructional technology leaders to support their peers, including co-designing experiences and co-teaching.

Content-specific courses for pre-service teachers should have a component that investigates the various ways that games and simulations can be used in their subject area. The Microsoft Teacher Education Initiative has several free modules organized with subject-area focus on using technology to advance content learning. Each of the subject area associations is also moving quickly to incorporate leading edge technologies, so simulations and games should be appearing soon everywhere. Now is a good time to encourage content faculty to take leadership in incorporating games and simulations into their teaching, research and service!

The program should also ensure that classroom experiences with games and simulations stay within guidelines for Universal Design for Learning. If pre-service teachers cannot access the games or their students cannot access the content or experiences due to a disability, adaptive steps must be taken.

**CRITIQUING AND REFLECTING**

Experiencing games and simulations first hand helps teachers learn how to explore and discover. Practice helps them develop the skills for incorporating them into effective teaching, and reflecting on how they learn with these technologies cements the lessons and expands critical thinking skills needed to maintain a high level of effective practice.

The first order of business is to construct reflective realizations from actual real world experience with educational games and simulations that address and assist with common classroom situations and typical teaching challenges. As in any area of
teaching, the number and quality of these reflections are important determining experiences that promote maturation into a thoughtful practitioner. Has the teacher ever created an avatar and experienced the emotionally charged learning of a 3D simulation? Has the teacher built a personal list of favorite technologies including games and simulations? Does the teacher have a bank of experiences in designing teaching with a game or simulation technology at the core of activities? Has he or she been able to try out ideas with real students and receive feedback from them on how lessons are going? Is there evidence of these activities in the professional portfolio?

Teachers also need to be able to perform basic critical analysis and classification of games that are potentially useful in their teaching. Can the teacher identify and validate which games will support higher order thinking and sort out the good from the bad? Are some genres better able to meet a pressing classroom concern than others? What is the scope of games and simulations available in a specific subject area? Is there a basic taxonomy to help a teacher think about these issues? There are an increasing number of articles and books to help answer these kinds of questions, which a future teacher needs to know exist, how to find, and how to use. These skills of ongoing inquiry and self-guided research based on reflective use of new technologies are critical to becoming an effective teacher today.

To deepen their skills for critiquing and being smart consumers of games and simulations, involve pre-service teachers in research on games and simulations. One path is to research what is already being done in other areas of endeavor, (e.g. medical, aviation, military, corporate education & training) and envisioning what might transfer to K-12 and university education environments. Another path of research is to challenge pre-service teachers to create projects with schools and other public organizations; provide them with the tools for public engagement.
SUMMARY

It is not enough to stand in the twentieth century and point into the twenty-first. Schools and colleges of education must step into the new era by offering program experiences that prepare future teachers to use game and simulation-based learning tools and processes. To be leaders in the 21st Century, schools and colleges must continually shape and test a strong theoretical and practical vision of teaching with these advanced tools and methods.

By doing so, colleges can pride themselves on continuously developing and improving the necessary learning experiences for future teachers that help them use advanced computational tools to help all students achieve to high standards.
Teachers need to understand the content they are teaching and to know how students learn, how to provide feedback to guide performance, and how to create and maintain a community within the classroom and one that interfaces with the real world. They also must be able to design and manage the learning process so that each student is meaningfully engaged. Since the computational revolution began in the arts, sciences, and culture in the late 20th century, technology has increasingly become an inseparable partner in the pursuit of knowledge. Games and simulations are an important outgrowth of that partnership and are among the most powerful tools available to help teachers with these tasks.

Knowledge

If the graduates of an ideal teacher preparation program are to be among the best teachers in the world, on day one of their career they need to know how to 1) teach with games and simulations, 2) involve all students, and 3) effectively leverage active learning for student learning. In this section we address the characteristics of novice teachers as well as the needs of experienced professionals who may have limited experience with games and simulations.
Knowledge: What Teachers Need to Know

Deep understanding of content develops over time as teachers’ expertise, self-efficacy, and inquiry skills mature and they learn to select tools and classroom processes appropriate to their discipline and the needs of students. Teachers spend years honing their pedagogical practices within their discipline in order to provide the most effective learning experiences for students. When technology resources are added to this evolution in their thinking and classroom practices teachers reconsider pedagogical decisions and the requirements of their discipline in the context of the needs of their students combined with the unique affordances of the technology. Mishra and Koehler (2006) called this intersection of technology with teachers’ pedagogy and content knowledge, TPACK. They acknowledged that finding the optimal intersection of Technology Pedagogy...
and Content Knowledge is ongoing and evolutionary for technology using teachers – especially in the context of the speed of change in technology innovation. As new technologies evolve, so must teachers’ classroom practice and so the cycles of discovery begin again and again and again. The previous chapter contends that K-12 teachers must have ample experiences with games and simulations within their licensure programs so that they are prepared to appropriate the unique features of these resources to maximize student opportunities to master both subject matter and learning skills.

Managing the classroom culture for learning is an equally essential role of a teacher. As teachers gain confidence in their practice, they refine their pedagogy and become adept at seeing the world through what Shaffer (2007) might call the epistemic frame of classroom teaching. Beyond what the community knows, this frame of reference includes the social skills of the classroom community, the shared understandings and beliefs fostered by the community, the processes for making group decisions and the individual roles within those processes. For students, learning to function well in a sociocultural milieu holds as great an importance to their future success in the workforce as their knowledge of their subject matter discipline. Games and simulations can powerfully provide this sociocultural frame as a context for problem-solving with the tools and practices of the discipline while simultaneously allowing students to practice and explore subject matter content, through designed learning experiences that require learners to acquire and apply knowledge in real-world contexts. For example, having students interact with simulated environments prepares them for engineering classes where simulated systems are often used to predict behaviors of new designs.

To be able to leverage the unique affordances of games and simulations, teachers need to develop their knowledge about the why, what and how of using games and simulations to help students acquire deep understanding of content. The following sections explore these aspects.
THE WHY

There are five broad reasons why games and simulations need to be understood as critical to teachers’ knowledge.

1. Student Engagement
2. Masterful Learning
3. Creation of Powerful Insights
4. Visualization of complex concepts
5. Playing in a safe space where failure becomes an opportunity for learning
Playing with simulations as well as games is highly engaging for many students and develops important new literacy skills in an environment that is as effective as the real world in presenting challenges, delivering emotionally charged decision-making moments, and producing insights. By design, games and simulations require the user to master and manage scaffolded skills and knowledge in order to progress through the activities. In addition, high-resolution visualizations and the analysis of big data, which are nearly ubiquitous in serious games and simulations, are involved in most of the leading edges of new knowledge. For example, progress in biology, astronomy, physics, chemistry and other fields routinely depends upon computational models and machine learning approaches built into simulations that allow a free play of ideas. Finally, there is great value in students trying various alternative solutions to a problem and seeing the consequences, without worrying about safety, cost, and feasibility. Using games and simulations can enhance subject matter via the seamless integration of subject matter, expert practices, and the discipline’s standards.
The content and kind of knowledge in a game or simulation stands in contrast to the same content in a book or lecture – knowledge is fundamentally and authentically interactive, systems oriented, embedded and emotionally charged with powerful cultural and ethical overtones. Teachers must be able to help students transition between the knowledge accumulated through a simulated world and that found in a textbook. Transitioning from “book learning” to real-world experience is found in many professions. For example, emergency medical technicians regularly use simulated experiences to practice the application of their acquired knowledge. Likewise, teachers may need to help students identify and describe how the material from the text was applied in the simulation or game. Helping students to identify the additional benefits from learning in the simulation versus the textbook will support the development of meta-cognitive skills in identifying their less measurable skills such as decision-making, problem solving and creativity.

Interactivity is a highlight of game-based learning. A player must make decisions, choose from among options, explore the performance space, and practice with the tools and processes
of the game or simulation model. In contrast with many other experiences, these choices have immediate consequences that authentically transform the game environment. This immediacy and responsiveness leads to a realistic experience of power, which if supported by the narrative of the context attracts repeated experiments and creates self-efficacy.

Teachers need to understand that game-based learning involves systems knowledge. When people learn how to play, they are mastering a system of rules in a context with multiple layers of meaning. Thus, well-designed experiences can promote the construction of mental models that integrate complex elements into a big picture needed for deeper understanding of a discipline. For example, a simulation can allow one to experience eons of time in minutes, vast distances in space, and to see how causes at one place and time make impacts in far removed systems.

By “embedded” we mean that knowledge, rather than being “presented by,” is ubiquitously implied in the roles, rules and structures of well-designed games and simulations. A simulation can, for example, thrust the user into the role of a real doctor or city planner making a life or death decision. In such a situation, knowledge is called for, called upon and called forth in an authentic context, rather than verbally absorbed and rehearsed for a future test.

Teachers also need to know that the culture, ethics, and morals of social gaming environments are themselves cultures and should be approached with openness and a desire for understanding. The teaching of ethics through games is a subject worthy of a teacher preparation program’s research and further development. At the same time, teachers must be critical consumers of games and simulations and evaluate them carefully for the quality of the roles, rules, and representations presented. While games are supposed to be fun and allow players to explore new worlds, they should be carefully screened for the values they present, the power relationships they develop, and the values that are articulated through the rules of play. Many
games present moral choices in the context of adventure and excitement as the means to enhance the game experience. Through the game experience, players can explore the consequences of unethical actions. The question for teachers to ask is, ‘how will you put those explorations into a learning context that is ethical and moral?’ Or, will you filter out those games and simulations. The age of the students certainly is a key factor in making this determination. Teachers must be ready to make these choices and to balance them with the benefits of playing in the game or simulation.

Teachers need to be able to identify the purpose of a game or simulation in order to integrate it effectively into their curriculum purposes. Pre-service programs should offer courses where teachers can learn what constitutes a well-designed simulation that supports specific learning objectives via an interactive and authentic setting. As is suggested in Chapter 3, whole courses or programs could be redesigned to immerse teacher candidates in a game-based learning environment. In turn, teachers can create game-based experience for their students. An emerging example of adapting a web-based tool for this purpose can be seen in the use of Edmodo.com. A social networking site, Edmodo allows teachers to create their own content and criteria for assessment. Badges can be awarded for student performance and teachers can use these to shape the both the culture of the online interactions as well as to drive up levels of performance and encourage students to strive for mastery of content.
Teachers must continually play and tinker within games and simulations, by themselves and with their students. By doing so alone, they can acculturate themselves with the game or simulation before using it in their classrooms. They can take notes of their thoughts and actions as a “first-timer” so as to remember how students who are new to the game or simulation might feel in their classroom. They must walk the walk, not just talk it–be involved in the technology, be fully immersed–not be afraid of it!

This has a two-fold benefit:

- First, teachers discover which games and simulations are best suited to teach with and why - which ones give them the most leverage to teach the content they want to teach. By gaming on their own, a teacher develops a basic understanding of the wide range of game genres and that different learning objectives may be best served by different game genres. Is it always appropriate to play a game? Why or why not? These are questions the teacher must wrestle with and, through their own discovery experiences, allows them to better support students in their game play.

- Second, when teachers play games and simulations with their students, they experience first-hand the same social, emotional, and cognitive stimuli. This authentic engagement with students allows for attitudinal and pedagogical adjustments to be made to the curriculum design based on the reality of the game’s ability to support student mastery of content and objective. The teacher’s knowledge of TPACK grows with each immersion while simultaneously enhancing the development of classroom culture through their connection with students in ways that go beyond cognition and assessment. An added benefit is the building of bonds of trust based on common experiences – a trust that goes in both directions.

Teachers need to know how to turn the creation, play, and forward motion over to the students and to trust that the students will handle the responsibility well. Teachers should leave behind their fear of not knowing exactly where the energy of the classroom is at any given point and yet understand that when they point they can look back and see how the strands of learning came together to form an understanding. It needs to be OK for students to not acquire exactly the same learning - but rather develop ways of learning.
Teachers need to be willing to let go and let learners take the lead. Yes, a teacher is designing the instruction, assessing learning, and ensuring that content is being taught, but they have to be willing to let students direct learning and to use those decision points in assessment. Many teachers are not adequately prepared for self-determined learning due to lack of experience or confidence, which must be practiced to be mastered.

The development of a management strategy is essential for instructional use of games or simulations in the classroom. Just as a teacher needs to teach students how to work in cooperative learning groups, the same is true for incorporating games and simulations in the classroom. Teachers should appreciate, for example, the unique classroom management issues that arise when conducting games and simulations with different age and maturity levels. As part of a management strategy for engaging students, teachers need to understand the power of games and their own ethical responsibility when instituting these experiences into their classroom. For example:

• Facilitators should always provide an alternative for participants to participate fully or in alternate roles, or to not participate.
• Listen to your students so you can meet them where they “live.”
• Be careful not to bring too much personal investment into any one game or simulation into their classroom.
• Love what you do, but be aware that not all students will share that love and some can get turned off.
• Equity and inclusiveness are essential. Ensure that all students are able to participate fully by making accommodations and adaptations as necessary.
• Employ culturally responsive pedagogy: Remember that motivation is inseparable from culture and engagement is the visible outcome of motivation.
• Ensure that the gaming environment in which students are immersed is one that connects with students’ prior learning and experiences and works to build deeper knowledge of content and social understanding.
Benefits to Students

- The Importance of Play
- Learning with Games & Sims
- Masterful Learning
- The Whole Child
- Culturally Responsive
- Developmentally Responsive
Learning to play well has benefits that support students throughout their lives. Asking children to play encourages them to do what comes naturally. Through imitation and play, students learn important accommodation and assimilation skills that will serve them throughout life: be curious, solve problems, take risks, and try again when you fail. Through simulations and games, whole new worlds can be created for students where they learn to master key competencies without the consequences of failure found in reality. This encourages risk-taking and supports the development of mastery learning. Chapter 3 recommends that teachers be given opportunities to remember how to play and to develop attitudes that respect its value to both the psychosocial development of students as well as mastery of content. In turn, teachers must encourage students to remember how to play and acceptable behavior allowed by the game or simulation.
LEARNING WITH GAMES & SIMS

Today’s earliest learners have been exposed daily to many more hours of media than even the youngest new teacher experienced during their developmental years. At the time of this writing the public Internet celebrated 25 years, the iPhone 6 years. Both of these technological advancements exponentially expanded the accessibility of technology in households. While the controversy over whether students in the current era have different brain structures because of exposure to media cannot be settled in this chapter, we do have incontrovertible evidence that repeated mental activity lays down neural pathways in the brain. The more repetition there is, the stronger the pathway. There is little doubt that the brains of students entering kindergarten today are wired differently even from those who are in their 6th year. Both of these groups of students have grown up with a computer or smart phone from day one, but the research shows that the daily exposure to media has significantly increased. There is reason to consider that learning habits if not the neural pathways themselves are biased towards shorter visual and auditory experiences whereas most teachers are still more focused on printed and spoken word for learning.

Teachers must consciously consider how to teach students in new ways that align with how students are ‘wired’. For example, if you ask most teachers to find the definition of a word, they will look for a paper dictionary. Students might “Google” the word or post a tweet to Twitter or their Facebook page asking their followers for help. The social aspects of technology use has become pervasive for students. Almost nothing is done in their daily life without the desire to share and receive networked validation. Learning is a social endeavor, so teachers should use this focus for students to their advantage. Provide opportunities for students to interact socially before, while gaming or in simulations and, afterwards to debrief. Leverage social media to support reflection and discussion of the lessons learned.
Devising a management plan should also include principles of digital citizenship and guidelines for participation and play between learners. Consider the following suggestions for a set of agreements for the group:

- Invest in your own learning process
- Be a good team member
- It is OK to pass, but not all the time
- Failure is OK. Learn from it!
- Everyone gets to be part of a team, but can work alone if they choose to.
- Everyone gets to be a “newbie” and an “expert” at some time.
- Competition is OK, but bad attitude isn’t.
- Creatively attack problems!
- Teachers can assist with team formulations.
- It is OK to be ahead of or behind another player. Just play YOUR game.

Another part of the classroom management plan should address how to accommodate students who are uncomfortable using technology, gaming or participating in a simulation. Even before instruction begins, teachers should first ascertain who is unsure of themselves in this new learning environment and then take time to teach the technology first, before teaching the content.
**MASTERFUL LEARNING**

Technological advances in computing power at lower costs of production along with widespread access to the Internet has made game and simulation based learning more widely accessible to K12 schools. Military and aviation successes with using simulations and game based mastery training has, when applied to medical training, proved time and time again that the medium and results can be replicated across a variety of content areas. As the educational software and programming industry scales up to address this burgeoning K12 market, schools and teachers need to embrace the many benefits of mastery learning through games and simulations. They need to move away from traditional approaches and include immersive activity-based discovery and exploration opportunities in the curriculum that require mastery of concepts or skills before one can move on to the next level.

Given enough time, students naturally progress from the rote tasks of remembering to mastery level tasks of analyzing, evaluating and creating. As they master new skills there are concomitant positive psychosocial effects on student engagement, motivation and self-confidence. The risk-free environment for learning in a game or simulation has the added bonus of being individualized to the player; these environments are self-diagnostic by design. The player can’t move on to the next level until they have figured out how to solve or master the level that they are on. Simulations add an immersive environment that attempts to replicate real life, the gaming aspects of both sims and games make the activity fun, thereby more engaging and motivating.

A common cry of classroom teachers is, “how can I better engage my students?” Teachers have long used paper and pencil simulation games like Gold Rush to involve students in a mock history adventure. The Tom Snyder Decisions, Decisions and Choices, Choices games of the 1990s used a computer to randomize the results of the players’ decision, but still required paper to support the simulation. Today, a U.S. history teacher can immerse students in a variety of simulations online at Mission U.S. (mission-us.org). If a teacher creates learning contracts
for students to “level up” by participating in activities and producing products, then what students have learned can be easily measured.

Games and simulations innately inspire an element of competition; whether it be between the programming and the player, between players, or between the characters in the product; and competition raises the level of interest in the activity. “Beating” the player or the level is rewarding and provides a sense of satisfaction resulting in heightened self-esteem. Failures become opportunities to try a new strategy, analyze steps taken, reassess the logic or to search for more information. Beating a level or an opponent, a “boss”, that others have struggled with becomes a badge of honor among other players and students are driven to become an expert among their peers.

Two additional benefits of immersive games and game-based play stem from the internal dialog of the player: self-regulated learning and meta-cognition. The autonomy built into games allows players to immerse themselves into play at whatever level they desire. They can play without care or delve deeply into the structure regulated by the programming. Along the way, self-talk emerges as they assess their status in the gaming aspects - what are the resources they have, what are their choices, what
are the threats. This deliberate attempt to understand their situation has been characterized as epistemic conflict that leads to self-reflection and self-regulation - lifelong skills that transfer to future real-world work environments.

We all have heard about people who have become so involved in a game or simulation that they have difficulty stepping away from the environment. These players are so engaged and motivated by the experience that they get carried away in the “flow” of the game. For flow to occur, several factors must be met to keep the player engaged. The most important of these is for the challenge and the player’s ability to be well matched so that the player stays active in the learning process. The deep satisfaction the player gets from meeting and beating each level keeps them engaged in the learning process. Wouldn’t all teachers want to provide such an optimal learning environment for each one of their students every hour of every day? Unfortunately, this is an impossible task for a mere human. But, the massive computing power available in games and simulations today, can meet this challenge.

**The Whole Child**

As we consider the optimal learning environment for students, whether it be in a gaming situation, a simulation or in real life, teachers must consider the needs of the whole child: mental, physical and emotional. Full inclusion of students is not just for those identified as special education students – every human is unique. Thus, it is important to realize that in the context of gaming and simulation, everybody can play; there are no innate or unique characteristics for playing. No game or simulation will suit all learners or subjects and teachers must be ready to be creative and adaptive to provide students with alternate learning opportunities. Below are some suggestions to consider:
Many students who aren’t the A students in class succeed in a gaming or simulated environment.

Choose games and simulations that are appropriate for anybody and everybody in the class. All students should be able to interface with the learning tool as far as it is possible.

Thoroughly play the game or simulation yourself. Teachers need to know the types of feedback given and how to use game results and outputs to better interpret scores so as to understand the learning differences among students.

Customizing or constructing games for class use is another way to learn about your students.

**Culturally Responsive**

Teachers need to be able to design learning environments that allow students to connect with and build upon their cultural experiences and prior learning to reach new levels of performance. Choose game and simulation environments that address the following:

Take into consideration methods that honor cultural or environmental elements that children and families bring to school

Expand on the classroom experience to build skill and language.

Honor families’ home language, cultural heritage, and personal experiences.

Observe the different ways children/parents express themselves that reflect their personality; i.e. learners must be encouraged to invest in their own learning processes.
DEVELOPMENTALLY RESPONSIVE

Teachers need to know how games and simulations can assist in meeting the physical, emotional and cognitive developmental needs of learners. For example:

Recognize and identify the manifestations and the instructional and management implications of flow and engagement, which in games and simulations can have a level of intensity not typically found during teaching and learning.

Teachers need to know that simulations and games help (a) to balance the amount of information that learners receive through their auditory and visual channels, and (b) prevent overload of information when designed according to multimedia principles.

Learners’ perceptions play a major role in the acceptance and effectiveness of instructional technology.

Teacher should know that simulations illustrate the dynamic relationships of phenomena. They allow students to repeat and replicate by playing things back, dilate time by slowing it down or speeding it up, and highlight certain phases to sharpen focus on processes and events. These attributes help learner make sense and consequently construct own knowledge consistent with general principles.
Teachers need to know how to observe the impacts of games on student learning and how to utilize the technology to learn what their students know and can do. This requires knowing acceptable accommodations when using games and simulations as part of assessment. Simulations, as opposed to tutorials, provide a wide range of possibilities of being introduced in the classroom. Teachers need to realize though, that not the simulation itself, but the underlying purpose of presenting the simulation to students (e.g. engagement, testing a hypothesis, supporting dynamics of a process of a phenomena) determines the magnitude of the learning effects.
ASSESSMENT

One element of games that needs to be included to ensure that learning is not diminished is how to cultivate the experience and learning via debriefing. This process can follow a number of strategies to include journaling, guided discussion, and reflective writing. Failing to debrief the experience of a game or sim diminishes the probabilities and opportunities for students to restructure the knowledge into long-term memory, as well as draw social, emotional, and cognitive inferences from the experience. An easy model for debriefing is to ask the student to think about What? So what? And Now what? The student can talk about or write about what happened during the experience, what the experience meant and how it connected to other things being learned, and what lessons were drawn from the experience that will make a difference or lead to new attitudes, or actions.
**IMPORTANCE OF REFLECTION**

For students to be successful, teachers need to provide a measure for assessing progress toward the learning outcomes and they must hold students accountable for meeting those goals. The adage ‘what gets measured gets done’ implies the need for articulation of the knowledge elements, both explicit and tacit, that lead toward changes in behavior. If the in-game learner characteristics and knowledge characteristics cannot be articulated, it often leads to less meaningful documentation of only the transactional characteristics of the game rather than its transformative characteristics.

**PERFORMANCE-BASED LEARNING**

Teachers need to know how to get a game or simulation to assist them in the assessment process. When teachers are properly prepared, they will not think of the game or simulation route as being more trouble and work for them, but rather as a tool to make their lives easier and more fun. Imagine being able to cheer students on in real time while watching class scores accumulate and knowing that the scores are measuring real improvement in student learning.

It can be difficult at times to measure what and how students are learning if the game or simulation does not capture data for the user. As a student moves from lower to higher levels of skills, teachers must develop ways to measure both the surface and deep learning. Surface learning includes memorization, rote learning and unquestioning acceptance of information. Surface learning is easy to assess as it is easily quantified. In contrast, deep learning is complex in nature, and requires the player to analyze, synthesize and create solutions or strategies that apply knowledge in context. It often requires complex systems thinking and multitasking.
When assessing student performance, prior knowledge may hinder or enhance their ability to meet the challenges of the game or sim. Teachers must be carefully analyze the components of a chosen game or sim to see if it adequately sequences the levels and activities to meet the needs of the learner. Does the game slow down when necessary to provide success and “flow”? When player choices indicate obvious misconceptions, does it go back and review material to ensure mastery? It can be difficult to provide learning challenges that help students to let go of learned misconceptions but a well-designed game or sim is capable of providing the needed experiences to do so. Good games and sims provide multiple representations of the content, deep analogies and challenge-based learning.
The assessment challenge becomes one of unpacking what was learned so it can be analyzed. Storytelling and reflection are two tools teachers need to use to uncover this data. Complex models also provide data, but it may require the teacher to develop a tool, such as a survey or activity in which students demonstrate the application of knowledge, in order to collect that information. Here are some suggestions:

Create levels of achievement for students to attain. Imagine having an add-on to Facebook that showed achievements like “First top grade”, “Arriving to school in time 5 days in a row.” Small real-life rewards like cinema tickets or coffee coupons can be made available for completing some of the harder achievements. If a student sees some friends complete something it might make him or her want to do it as well.

Create a way to gain introspection into the game activity. Use observation forms to document learning happening within the game or sim.

Create virtual rewards and status badges to increase engagement and effort. These are known as gamification strategies, that is, using game-based motivators to enliven traditional learning materials and methods.

Align the assessments in games and simulations with existing assessment systems and standards or competencies.

Allow students to be participants in the assessment design. This will provide more ownership of the experience and allow them to be aware of learning goals at the same time.

Note that simulations can enhance concept understanding, but there is also a need to extend applicability of these learning media to open-ended problem solving.

Incorporating screenshots of simulated experiments that students use in their assessments enriches transition of a simulated environment to a traditional classroom.

Use games as formative assessments.

Evaluate by using a rubric-based assessment of the learner’s involvement in the game or simulation. Use the rubric in a self-reflection on the emotional context of the experience and effects on the individual learner and as a validity cross-check on a content-based assessment.
Using Commercial Games

Some games can be played with electronic clickers (such as the Promethean Activote or the SRT Response). Ideally, every student should have a clicker during such games, but if budget restrictions prohibit this, then efforts should be made to ensure that every student has ample opportunities to control a clicker during the game. Another alternative is to use cell phones as clickers since phone technology is relatively widespread among students. Websites such as polleverywhere.com or socrative.com allow teachers to pose questions to a class and enable students to use cell phones to respond. Socrative includes a “Space Race” mode, in which students (either individually or in teams) compete against others in the class by successfully answering questions in order to propel their rocket to the end.

Electronic Student Response Systems

The benefits include:

- Fast feedback
- Provides quick formative assessment opportunities

The drawbacks include:

- Technology is required
- Every student requires an input device for maximum benefit

Some students cannot operate the clickers due to disability and appropriate accommodations must be made for full inclusion of these students.
SHARE THE LEARNING

ACTION RESEARCH

Action research can address a highly challenging problem a teacher identifies in her classroom. Often, she wants to change her practice, but doesn’t know the right solution. Action research is an iterative, investigative process that generates data that the teacher can use to determine what is working and what it not. In some cases, with qualitative input it can also tell her why. Informed by data rather than only by intuition, the teacher can then enact changes in practice and observe the resultant impact on student performance. In this manner, the teacher participates in her own professional development through the action research cycle, leading to positive change in the classroom.

 Communicating the results of action research investigations is crucial for helping to advance the field of education, teaching practices, and teacher preparation. Unfortunately, too few teachers are inexperienced in or aware of how to publish their action research investigations. However, they are often comfortable speaking with colleagues about their learning. To this end, teachers, administrators and teacher educators should use professional learning networks to spread information. Professional learning communities, whether formal or informal, and social networking are effective ways of disseminating information that support and extend what is learned by attending conferences.
Some suggestions for action research topics and methods:

Extend research into comparative experiments of real vs virtual and which method should students conduct first (e.g. learning properties of harmonic motion). What are the necessary components of simulated experiments that allow for a smooth transition between virtual and real world. What hinders the transition?

Topic: Simulations tend to be situated. Do educational games also have to be situated?

Develop exemplary lessons outlines where using simulations enhances the learning. Lesson outlines are needed to illustrate the use of simulations as topic introduction, procedure visualizations, and process visualizations.

Develop an increased understanding of the ways in which games and simulations can help develop skills that are highly relevant to daily lived experiences (e.g. logical thinking, reading, observation, vocabulary development, problem solving).

Teachers need to know how to effectively design and use games and sims to include ALL students in the classroom. What are some models?

Provide alternative lesson strategies where students will learn being guided by the teacher during a simulation.

Action research is needed concerning how to overcome teacher and parent skepticism. How can teachers gain confidence and skill in using game-based learning since many of them are not gamers?

Administrators also need to adopt a new mindset about what is good game and simulation-based classroom teaching and student learning. What are some models and how can action research help administrators and teachers create their own?
Parents need to realize that simulations do enhance students’ learning outcomes. What methods support this knowledge development?

How do we help teachers become more aware of the safety factors of games and simulations? Games and simulations provide access to expanded experiences that might not be readily possible and available in one’s real life. But teachers must also know how to integrate these experiences in a way that protects their students’ online presence while simultaneously conforming to their school’s/district’s acceptable use policy.

Write longitudinal case studies on gamers, enabling others to see how the game they played changed them for good. (An article in the Journal of Virtual Research relates a story of a girl who grew up playing Neopets and was active in journals in that virtual world. She ended up studying journalism). Such case studies, read by educators, show how students can be changed by games and push educators to think of new ways of using them.

Analyze the level of voluntary participation needed for effective social growth in the digital citizenship arena. Many video game designers report on the collaborative nature of players in massively multiplayer online games. The design of pro-social games of various platforms could offer students the opportunities to accept this social change through assimilation and accommodation on their own terms. Does this self-driven change work with this generation of learners, especially in the area of digital citizenship growth?
There needs to be greater emphasis on continual and effective professional development for all teachers that includes research-based best practices in new educational technologies such as games and simulations. Some suggestions include:

Expand your Personal Learning Network; Participate in or develop a Professional Learning Community to wrestle with these potential issues

Continuing education and professional development opportunities need to be provided so that teachers are able to find the new ideas and implementations that are constantly being created.

Teach creative thinking to the teachers to use for themselves as well as with their students as they work with students to create games. Take advantage of the students’ preference for collaboration and competition when applied to games

Teachers and administrators need to understand that classrooms that incorporate games and simulations won’t look like the traditional picture of learning, with students sitting in rows, quietly doing work, raising their hands to ask questions.

Social Networking

Join a gamer communities and participate in the discussions.

Foster and allow an inclusive social community to arise and evolve within your classroom as a “community of practice” around winning the games and performing to high levels on the sims you place in front of the students.

Get a twitter account and begin following teacher gamers. Start tweeting your thoughts and experiences.

Seek out teacher gamers on Facebook, Pinterest, Edmodo and other social networking sites. Read, digest and develop your thought about gaming. Relate others’ experiences to your own. When you’re ready begin sharing your thought via your own posts.

Get a Blogger account and start practicing reflection and metacognition about your game-based learning experiences. This will create models for your students, if you share them. You don’t have to make them public right away. Just start practicing. Then when you’re ready, invite a few colleagues to read your blog – get feedback and gain confidence. Invite others to comment or join you in blogging.
Knowledge: What Teachers Need to Know

Teachers need to get beyond their fears and take down the walls around their classroom gardens. However, not all communities are necessarily instructional. If aspects of a particular gamer community permit destructive behavioral patterns, teachers have to be cognizant and skilled in protecting youth and using counter-cultural incidents for learning. The means for global and open collaboration takes teacher effort to make sure it does not put children at risk. But the effort is well worth it when students on seven continents can collaborate on class projects.

It is important to have opportunities to get involved in a wide range of gaming communities - not just the ones where there is a focus on complex building, techie puzzles or competitive games. Look for ones that involve more home-building, building relationships, clothes, and pets. Some people might find some of the worlds that concentrate on this kind of thing too consumerist, but they are popular and involvement in these games can also be leveraged. When teachers are working with children to draw on their gaming experience, it could be very demotivating if the teacher feels that the kind of game a student is interested in is trivial (e.g. even a girl’s dress-up challenge can also be a challenge). Develop a broad understanding of what is available so you can make suggestions for students to investigate.
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The Association for Educational Communications and Technology (AECT) is a professional association of thousands of educators and others whose activities are directed toward improving instruction through technology. AECT members may be found in colleges and universities; in the Armed Forces and industry; in museums, libraries, and hospitals; in the many places where educational change is underway. AECT members carry out a wide range of responsibilities in the study, planning, application, and production of communications media for instruction. The Association has become a major organization for those actively involved in the designing of instruction and a systematic approach to learning. aect.org

The National Technology Leadership Summit (NTLS) brings together national leaders from educational associations, as well as editors of educational technology journals, directors of non-profit foundations, federal policy makers, and corporate representatives. Recommendations and guidelines emerging from the summit are published in a range of educational technology journals and are featured on the programs of educational conferences. The goal is to accelerate the meaningful impact of digital technologies in education for the 21st century. ntls.info/

The Society for Information Technology and Teacher Education (SITE) is an international association of individual teacher educators, and affiliated organizations of teacher educators in all disciplines, who are interested in the creation and dissemination of knowledge about the use of information technology in teacher education and faculty/staff development. The Society seeks to promote research, scholarship, collaboration, exchange, and support among its membership, and to actively foster the development of new national organizations where a need emerges. SITE is the only organization that has as its sole focus the integration of instructional technologies into teacher education programs. site.aace.org

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