

A Complex Selection Process:  
Choosing Instructional Games Wisely

Thomas Bell

Utah State University

### Abstract

Commercial gaming is infiltrating our society and engulfing the youth of this generation. This is a change many youth have embraced, welcomed, and even spurred. Today's net generation youth would rather live and play in a virtual world. The question is asked can this virtual world include games where net generation youth are engaged in learning. Instructional games have a stigma that states, "They aren't fun." Research shows that this stigma is long standing; however it is incorrect. The options with in this niche market have blossomed and there are now vast arrays of possibilities. Ever growing it provides instructors, teachers, and trainers with a platform to engage their students in a multi-sensory, and multi-modal way. Exploring these options with in a consistent framework will allow educators to choose where and when to use instructional games. This framework or rubric will make games a viable, effective, and efficient instructional strategy. Aiming for a standardize rubric will give instructors the foundation to choose an instructional game that will help them improve learning outcomes.

### **A Complex Selection Process: Choosing Instructional Games Wisely**

There exists a gap between instructors and students in the way they process the world around them (Prensky, 2001). The youth of the digital generation are bombarded with technological influences that weren't present when their “digital immigrant” (Prensky, 2001) teachers were in school. One such technology that is growing everyday is recreation or online social games. Their popularity is quite far reaching. It is reported that five out of every ten Americans play recreation games in one form or another (Beck & Carstens, 2005).

Net generation youth willingly adopt and find enjoyment in playing recreational digital games (Prensky, 2001). With something so pervasive and generally enjoyable it is hard not think that games may have potential in areas other than recreation. Of the many branches of games, the one that has struggled and that has seen mixed reviews is instructional games. It is being looked at very intensely, as a viable approach to motivate, teach and engage students (Annetta, 2007; Barab, Thomas, Dodge, Carteaux and Tuzun, 2005; Beck et al., 2005, Becker 2007; Dickey, 2005, 2006; Gros, 2007; Kelly, 2005; Pannese & Carlesi, 2007; Schwartzman, 1997).

However instructional gaming is one area of technology that is most misunderstood by teachers (Becker, 2007; Dondi & Moretti, 2007). Teachers aren't able to grasp the appeal of instructional games and how they can be used to improve learning (Becker 2007; Gros, 2007). Many teachers are confused by the question “Can instructional games have a positive effect on learning?”

There are compelling reasons to adopt games as an instructional strategy. There is empirical research that supports the use of instructional games in a variety of learning environments (Annetta, 2007; Barab et al., 2005; DeKanter, 2005; Gros, 2007; Kelly, 2005; Pannese et al., 2007; Schwartzman, 1997). Many have found they are effective in reaching the growing net generation (Annetta, 2007; Beck et al., 2005). Findings support instructional games foster motivation (Barab et al., 2005; Dickey, 2007; Klein & Freitag, 1991; Schwartzman, 1997), and retention (Cruickshank & Telfer, 2001).

There are numerous studies that show the effectiveness of instructional games in a variety of learning environments (Annetta, 2007; Barab et al., 2005; DeKanter, 2005; Gros, 2007; Kelly, 2005; Pannese et al., 2007; Schwartzman, 1997). This aside the adoption rate of instructional games is slow (Becker, 2007)

Two major contributing reasons instructional games aren't seen as a viable method of learning are one the lack of accessible research. And the second major reason, the lack of time on the part of the instructor to select the appropriate game for their learning environment (Becker, 2007; Gros, 2007).

Instructional game based research is growing. But, the growing body of research can only be found in academic journals that are not accessible to teachers (Becker, 2007). There are several frameworks that can aid an instructor (Annetta, 2008; Becker, 2007; Cruickshank et al., 2001; Dickey, 2005; Dondi & Moretti, 2007; Garris, Ahlers & Driskell, 2002; Gros, 2007; Gunter, Kenny, & Vick, 2007; Liu & Lin, 2009; Westra, Nadolski, Hummel & Wopereis 2008). With each outlining a rubric that assists in the complex process of selecting an instructional game that has a dramatic affect on learning goals and outcomes (Klein et al., 1991).

Accessing this research is a problem. These frameworks aren't provided to the average teacher on their first day. Neither, are they in a form that is open to teachers when preparing lessons for class (Becker, 2007).

It stands to reason in order for these barriers to be alleviated and make the selection process for the average teacher easier there need be a framework. This framework would need to be accessible, consolidated, and consistent. If provided to the average teacher in a convenient way there will be an impetus for mainstream adoption of instructional games as a teaching methodology. In turn this will help ease the "technology tension" some teachers feel and (Becker, 2007; Garris et al., 2002; Gros, 2007) in many ways this will bridge the technology gap that exists between students and instructors.

The existing frameworks are discussed and synthesized in the hopes that it clarifies the subject. And that it will improve a teacher's ability to include games in current methodologies and learning environments.

### **Framework Comparison**

Several frameworks have been suggested for the selection of instructional games. Comparing these frameworks will provide a foundation upon which a consolidated framework can sit. A systematic analysis of each framework will be presented. Synthesizing the most effective criteria described in these approaches will inform and result in a new framework.

#### **Liu & Lin's Indicators.**

Liu and Lin (2009) list a helpful description of the elements of games. They suggest games include graphics, sounds, graphical user interfaces, game play, and storyline (Liu & Lin, 2009). These important factors provide a baseline, which narrows what is accepted as a game. Proposing these acceptability factors 196 games were chosen and tested under the Delphi technique (Liu & Lin, 2009). Research resulted in a comprehensive list of 43 evaluative criteria sectioned into five categories (Liu & Lin, 2009). The five evaluative indicator categories Liu & Lin (2009) proposed are: game information, multimedia, interface design and structure, content and feedback. Each of these categories has five to ten indicators associated with them. Which are questions a teacher can ask to inform game selection. For example, "Is the feedback provided in a timely manner?" is listed under the category of feedback (Liu & Lin, 2009).

These indicators would supply a deep analysis of an educational game. However this in-depth analysis may be outweighed by "selection time." None of the indicators address the concern; at what time cost is this to the instructor (Becker, 2007). Prioritizing and consolidating the evaluative indicators will help reduce the time cost involved. Making comparisons to other researched methods makes consolidating this list possible.

**Becker's Advice.**

Becker (2007) outlined a framework by giving insights in to what teachers should know before selecting instructional games. Becker (2007) stated teachers must be able to locate games and instructional resources that surround these games. Currently there are no standard protocols for choosing a game and peer-reviewed resources are limited. These resources are ever increasing but Becker (2007) suggested there is room for improvement.

Creating such a resource is one-way Becker (2007) supplies to address the “selection time” concern. The foundational resources need to be made available to teachers and kept up to date (Becker, 2007). Becker (2007) recommended a shared resource where teachers can network. Places where games are reviewed according to a standard and where supporting materials are provided. This would decrease “selection time” and increase adoption (Becker, 2007).

Becker (2007) defined another problem. Teachers view games as a distraction. They see them in a very limited scope of application. Becker (2007) again suggested a way to combat misconceptions in much the same way as the following concern. Resources should be provided to instructors with up to date research on the positive effect of instructional games. Attitude adjustment is one way to increase mainstream adoption (Becker, 2007).

Defining the scope of an educational game is helpful in their selection as well. There are several stakeholders in a child's education: parents, school administration, and the immediate teachers peers. These stakeholders will become concerned in the event games are used inappropriately. Curriculum designers and teachers must clearly outline the decision behind the selection process so stakeholders understand (Becker, 2007).

Becker (2007) affirmed that teachers should not be forced or coerced in the use of technology and especially instruction games.

To assuage this concern Becker (2007) advised and emphatically recommended:

It is absolutely essential that teachers be allowed and encouraged to play games. The objective is clearly not to turn all teachers into gamers, but rather to play with a critical eye – to be able to assess whether a specific game might be useful for them in the classroom, and, if so, under which conditions. (p. 486)

As compared to Liu & Lin (2009), Becker (2007) did not outline evaluative indicators. Becker's approach was loose and flexible. It addressed the "selection time" concern of teachers by advocating the creation of peer-reviewed selection lists and suggests teachers play the game and decide whether or not it will produce the necessary learning outcomes. Then shared this with their peers. This advice is helpful but not categorized in to a specific context. The selection process is informed and this advice is important to keep in mind. Many teachers are concerned about these very topics. Becker (2007) capably addressed these concerns. But an evaluation of the indicators that inform the selection process it is still needed. Liu & Lin's (2009) framework is vast and inaccessible to teachers because of the time that it would take to make these evaluations. There need be a refinement of the list.

By comparing Becker's (2007) flexible approach and Liu & Lin's (2009) defined list of evaluative indicators an importation factor becomes apparent. Teachers need to evaluate instructional games by playing. Findings should be correlated and shared on a standardized peer-reviewed list of instructional games arranged according to a limited set of evaluative indicators. The question arises how should Liu & Lin's list be refined. Looking at other research we find there are several frameworks supporting a controlled set of Liu & Lin ideas. One is described below.

#### **Dondi & Moretti's Methodological Proposal.**

While Liu & Lin (2009) provide us with a specific overview of the elements of games. They did not describe their express purpose within an education setting.

Dondi & Moretti's (2007) defined instructional games as:

By learning games we mean games that have a didactic purpose and that can by used, adapted and

adopted for supporting, improving and fostering learning processes within formal, nonformal, and informal learning scenarios. (p. 508)

With this definition Dondi & Moretti (2007) outlined four criteria that make a ‘good game’ (Dondi & Moretti, 2007). First, is three-fold and is directly linked to the nature of game play. Does it support engagement and fun, are the rules clearly outlined, and are the games environment and settings transparent. Two, that the context of the game has a direct role in successfully perpetuating the learning outcomes. Three, any multimedia should correlate with the content and be used solely for learning in the context. Four, Quality is detectable and objective. This allows educators to overcome prejudices and shows the game as serious, reliable and effective (Dondi & Moretti, 2007).

With these four factors, the viability of the game can be better assessed and the current list of evaluative indicators can be narrowed. A proposed list will now include:

From Dondi & Moretti (2007)

- Clarity and Engagement
- Context perpetuates learning outcomes
- Multimedia usage as a support for learning
- Objective Quality

From Becker (2007)

- Research is provided or distributed as a peer-reviewed selection list

From Liu & Lin (2009)

- In game dynamic timely feedback
- High degree of teacher customization

Many of the factors listed by Liu & Lin (2009) and synthesized by Dondi & Moretti (2007) correlate with the specifics of game play and they address points that only apply to the nature of the

game. You can select games upon their own merit, but the question still remains are the games appropriately suited for the learning environment.

The selection processes can be greatly informed by the context in which the game is used (Gros, 2007; Dondi & Moretti, 2007). If teachers address the context first and the game second the game will correlate with the learning outcomes. Therefore a more in depth analysis of context is given by Gros (2007).

### **Gros's (2007) Guidance.**

Gros (2007) stated that there are four important factors that should be discussed when selecting a game and using it in context. Gros's (2007) fundamentals are as follows: experimentation, reflection, activity, and discussion. For Gros (2007) games are selected to provide students with a rich interactive learning environment not to replace formal learning. It is necessary to provide contextual support and resources around the game (Cruickshank et al., 1997). It has been suggested that games as a stand-alone approach do not facilitate the acquisition of new knowledge (Gunter et al., 2007). Gros (2007) notes that formal instructional methods and providing context is significant.

Gros (2007) pointed out:

This is an important issue because formal learning transforms the experience of the player making specific experiences relevant in a broader context through the concepts used during the exploration of the game.

In more detail Gros (2007) explained that students would generally need one or two experimental gaming sessions. During which students are asked to make note of the decisions that they take and their results. Reflection is a process of evaluation. After gaming sessions, strategies are analyzed and results are gathered. Gros (2007) advises the use of an out of game activity that correlates with the game. During this activity the game may not be played, other materials are specified that can be used such as: books, Internet searches, etc. Finally Gros (2007) explains

throughout the process of an instructional gaming experience the teacher should facilitate discussion. Discussion is helpful in the acquisition of new knowledge (DeKanter, 2005).

Having now several selection factors and discussing some in detail, it becomes clear that it is necessary to expound upon the rest. In the course of this discussion, other frameworks will relate and it becomes apparent where to refine each factor, combine them, or add. The goal is a consistent consolidated framework that can be made available to teachers.

Liu & Lin's (2009) evaluative indicators are part of the most structured framework to this point. They are organized and categorized but are not correlated with an action or a learning context. Many are just what a 'good game' should contain. These factors will be even more helpful if organized in a structured context.

#### **Gunter et al., (2007) RETAIN Model.**

The Gunter et al., (2007) approach is concretely structured. It contains a rubric that can be utilized to rank instructional games. The basis of the rubric is a combination of three learning theories: Bloom's taxonomy, Pagiet's concept of 'equilibration' and Gange's nine events (Gunter et al., 2007). And it is ultimately based on Keller's ARCS model. It contains six criteria and has four levels of performance indicators. The six criteria are as follows: relevance, embedding, transfer, adaptation, immersion and naturalization. The performance indicators are level 0 – level 3 (Gunter et al., 2007). Each criterion will be explained in depth. This process will inform and provides a structure for several factors already discussed. Relevance is taken from the ARCS model and indicates the relevance of the content to the learner, their needs, and to other instructional units in the learning environment. The more relevant the topics are to the learner the greater potential for learning (Gunter et al., 2007). Embedding assesses how closely the academic content is coupled to the games content (Gunter et al., 2007). Transfer evaluates the transferability of the knowledge learned in game. Can knowledge learned from the game context transfer and apply in a real world context (Gunter et al., 2007)?

Adaption is the process of going beyond transfer and applying knowledge learned from the game.

Adaption also relates to discovery of new concepts founded upon concepts learned in game (Gunter et al., 2007). Immersion is a measure ranging from simple interaction to fully engaged and intellectually invested in the game context (Gunter et al., 2007). Naturalization refers to the fluency of certain tasks and actions. If games are engaging and stimulating, players will play regularly and develop automaticity (Gunter et al., 2007).

What can be drawn from the combination of the existing indicators and this concrete structure?

Naturally, the existing indicators of the sample framework fit with in this structure. Reviewing the existing indicators it is found that clarity and engagement fit within the criteria immersion. Context perpetuates learning outcomes is supported by relevance. There are other indicators that do not fit so tightly in to the structure. Take the following as examples objective quality, in game dynamic timely feedback and high degree of teacher customization. More research is needed to find the full implications of the indicators that do not fit. However it can be suggested that these new indicators be added or a new criteria be add to the proposed rubric of Gunter et al., (2007).

In doing so the current short list of indicators is combined with the rubric. It is also advised the rubric is consolidated. Two factors that naturally combine and rely on each other are transfer and adaption (Gunter et al., 2007). Carefully outlining embedding and immersion it is found that they intricately depend on each other as well. The new proposed set of criteria would include: congruity, assimilation, impact, and performance. Congruity is defined as how well that concepts of the game align with the learning environment. This incorporates relevance, multimedia usage and context. Assimilation is the combination of transfer, adaption and naturalization. Impact, is a measure of how the game impacts the end user. Impact, is numerous factors, indicators and criteria synthesized, namely, clarity, engagement, embedding, and immersion. The final proposed criterion is performance, which is an amalgamation of clarity of content, feedback, and operational performance. This rubric is a

consolidated set of many factors and can serve as a framework for the selection of instructional games.

### **Conclusion**

The current rubrics are time consuming because they are either vague or much too expansive and broad in their application. Selection resources such as peer-reviewed reactions to instructional games and how they can be use in a learning environment are quite limited.

The framework provided above is short and is therefore easily tested. There are only four factors. The framework addresses many of the concerns of teachers. For example it provides depth with out being time consuming. Its goal is to overcome the barrier of time when selecting a game. It is founded on many of the available selection frameworks. This means it has a solid foundation but further stability is needed.

The rubric is stable enough to be used in its current state. It is necessary to remember thought that this rubric is untested. The validity of each factor and how it informs the selection process will need to be thoroughly researched and tested before any of these conclusions can be fully justified. The main goal of this framework is accessibility and time. Therefore the four criteria were kept to a minimum. There may however be a need to refine, develop or cut any of these factors. All of this necessitates testing. The four criteria will need to be explained and tested individually in a dynamic learning environment.

Further research into how each criterion effects the selection of the game is needed as well. Then once the game is selected its relevance to the learning outcomes and learning environment will need to be validated.

To this end cases studies are recommended. Each case study needs to heavily test each factor of the rubric individually. An analysis of the learning environment, game context and learning outcomes are important. Each case study will need a controlled learning environment. Preferable each study is performed in the same environment with the same students.

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