White Paper:

Teaching Different Types of Knowledge Using On-Line Games

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Abstract

There are different types of knowledge that can be taught through games. These knowledge types include:

- Declarative Knowledge (Jargon, Facts)
- Concepts
- Rules
- Procedures
- Principles
- Problem-Solving

Games can be used to train people to acquire these different types of knowledge. These different types of knowledge all need to be taught using different types of game genres. This paper explores the different types of knowledge and describes the game genres that can be used for various types of knowledge.

The genres of games include:

- Declarative Knowledge and Labeling Games
- Concepts Games
- Board/Trivia Games
- Role Plays
- Environment/Simulation (Social Simulators)
Introduction

As on-line learners become more sophisticated and GenerationX gamers enter into the job market, the requirements of e-learning developers have become increasingly more difficult. Developers need to create fun, interactive learning activities and events. The traditional, static page-turning instruction is not enough any more.

Games employ powerful motivational elements such as competition, humor, and the satisfaction of winning through applying a skill. Designers must make a conscious effort to develop interactions that will utilize these elements to create experiences that learners enjoy and from which they gain knowledge.

What We Need to Learn

In any organization, there are different things that need to be learned to properly perform a job. Each new knowledge or skill builds from a previous knowledge or skill. A learner needs declarative knowledge (facts, jargon), for example, before he or she can understand concepts. A learner needs to understand basic principles before he or she can apply them to solve a particular problem. The flow of knowledge acquisition from one level to another is important for the overall learning process.

Consequently, games designed for learners need to be developed toward the appropriate level of learner knowledge. Learners who lack an understanding of the concepts needed to solve a particular type of problem cannot be immersed in a game to teach problem-solving skills. The image below shows how one type of knowledge ripples into another type and how each is dependent upon the previous knowledge.
The table below provides a list of the different types of learning along with a definition and an example of each type of learning.

<table>
<thead>
<tr>
<th>Type of Knowledge (Gagne’s Intellectual Skills)</th>
<th>Definition</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Declarative</td>
<td>An arbitrary association between two or more objects.</td>
<td>DPW represents the words Department of Public Welfare. These are typically Jargon and Facts.</td>
</tr>
<tr>
<td>Concept</td>
<td>Categories used for grouping similar or related ideas, events or objects</td>
<td>Customer service means not handing off the customer from one representative to another when the customer has a problem.</td>
</tr>
<tr>
<td>Rules</td>
<td>Relationship between two or more concepts.</td>
<td>Typically expressed as an If-then statement. i.e., If the customer is angry, then contact the manager.</td>
</tr>
<tr>
<td>Procedures</td>
<td>Ordered sequence of rules or steps a learner must complete to perform a task.</td>
<td>First type the customer name, then click &lt;next&gt;, then type customer address and click &lt;save&gt;.</td>
</tr>
<tr>
<td>Principles</td>
<td>Non-sequential guidelines for behavior or action.</td>
<td>There are five leadership principles to follow. Different situations call for emphasis or de-emphasis one or more of the principles (e.g., crisis leadership may be different than day-to-day leadership).</td>
</tr>
<tr>
<td>Problem-Solving</td>
<td>Learner is confronted with novel situation and must use previous knowledge to solve the problem.</td>
<td>Determine the best way to confront an employee who seems to be having personnel problems.</td>
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</table>
The next table shows the different types of games that are used to teach the different types of knowledge. Note that each game type can teach several types of knowledge. One of the elements that make games enjoyable is that they touch the learner on many different levels and challenge the learner to be involved.

<table>
<thead>
<tr>
<th>Game</th>
<th>Definition</th>
<th>Example</th>
<th>Type of Knowledge Taught</th>
</tr>
</thead>
<tbody>
<tr>
<td>Declarative Knowledge and Labeling Games</td>
<td>Game that provides matching, labeling or question answering based primarily on knowing facts.</td>
<td>Word Search, Free the Road Runner, Drag and Drop Exercises</td>
<td>Declarative, Concepts, Rules</td>
</tr>
<tr>
<td>Concept Games</td>
<td>Game that requires learner to understand concepts and apply those concepts in limited situations.</td>
<td>Bop the Fox, Race Games</td>
<td>Declarative, Concepts, Rules</td>
</tr>
<tr>
<td>Board/Trivia Games</td>
<td>Game that requires the learner to move a piece around a board or to answer questions when provided some type of stimulus.</td>
<td>Jeopardy, Who Wants to Be a Millionaire, Wheel of Fortune, Hollywood Squares, Monopoly, Risk</td>
<td>Declarative, Concepts, Rules</td>
</tr>
<tr>
<td>Role Plays</td>
<td>Situation in which the learner is asked to play a role.</td>
<td>Role Play of a Character, First-Person Shooters</td>
<td>Principles Limited Problem Solving Principles, Problem-Solving</td>
</tr>
<tr>
<td>Environment/Simulation (Social Simulator)</td>
<td>Situation in which the learner is placed into an environment in which he or she must interact. Environment changes based on learner actions.</td>
<td>Flight Simulator, Roller Coaster Tycoon</td>
<td>Principles Limited Problem Solving Principles, Problem-Solving</td>
</tr>
</tbody>
</table>
Learning Declarative Knowledge

In most organizations the two basic types of knowledge that must be learned can be classified as declarative knowledge and concept knowledge. These are the two lowest levels of Robert Gagne’s Intellectual Skills (Gagne, 1985). While these two types of learning are important, they are not always the most exciting categories of information.

The first type of knowledge, declarative knowledge, deals with facts. Facts involve memorization of information. Every organization requires its members to learn facts to be productive and to communicate with one another. Information to be memorized can be divided into four categories. These categories are

- Names
- Jargon
- Facts
- Acronyms

Often, in on-line learning modules, the information is presented as text followed by a multiple choice or true/false question. These conventions do provide some level of interactivity for teaching facts and concepts but offer little enjoyment, excitement or motivation for the learner.

Facts are required to be learned, so designers have developed a number of strategies to help learners to memorize facts. There are typically three strategies used. While each of these methods are effective, if they are not presented properly the learner can be come disinterested and distracted.

Chunking

Overwhelming students with items to memorize is a counterproductive practice. When students are given large doses of information, they master only a small percentage. So designers of information to be memorized typically provide it to the learners in small pieces or chunks. Study after study has indicated that the average adult can learn best if presented with information in a logical group of approximately 5-7 items.

Once a chunk of information is learned, it must be reviewed regularly. A regular review of chunked information helps student to grasp the information without a need to stop and think about the term.

Mnemonic

Another technique that can be used to help memorize information is a mnemonic. Mnemonics are tricks to help enrich the information to be memorized and therefore make the information more easily retrieved when needed. Research indicates that the more richly we encoded information to be memorized, the more easily we can retrieve the information when needed.

Mnemonics should be given to the learner at the time the information is presented. One common type of mnemonics are acronyms. An acronym is simply the first letter of
the information to be learned arranged in an order so it forms a word. A basic example is the pronunciation of the word “WIP” pronounced “whip” which is a word formed from the first three letters of the words Work-In-Process. Another example is the word PERT which is the first letter from each of the words Program Evaluation Review Technique. PERT is a method for project management in many different environments.

Drill and Practice

The old “drill and practice” technique is another method used for memorization. Drill and practice involves repeating the same information over and over again until the learning has occurred. While this method is effective, it tends to bore the learner and can contribute to the high drop out rate encountered in on-line learning.
Declarative Knowledge Games

To help overcome the boredom associated with chunking, mnemonics, and drill and practice, we have developed several educational games that interject game elements into the e-learning process. Three of these utilize drill and practice as well as chunking to achieve learning goals.

Word Search

An effective game for drill and practice and chunking of information is a word search. This on-line game helps students recognize terms and jargon as well as learn the definition of the jargon or term. The game is delivered using a Macromedia Flash 6.0 game engine that separates the content from the organization of the content.

This strategy, used for all the game engines, means that the content can be easily changed or adapted to the particular needs of the organization. Developers can quickly change words and definitions within the word search without having to rewrite a new Flash movie every time. This means that development times are drastically reduced. The educational strategy is to add the element of competition with the computer and the learner. The learner tries to find the words and compete with his or herself to complete the task.

The word search format is familiar to learners and they are comfortable with the completion of the game. As shown in figures one and two below, words are circled with the mouse instead of a pencil, as is done in traditional, classroom-based learning..

Figure one: Word search used to teach declarative knowledge.
Another game developed to teach declarative knowledge is a version of the popular hangman game. Instead of simply guessing a word by providing a bunch of letters, the learner is given a definition and must guess the term. The idea is that the learner will think about the definition and associate the definition with the term or jargon as they determine the letters for the blank word.

The theme was changed to one of “freeing the road runner” as opposed to hangman to avoid any issues concerning violence or killing of a fellow human being. This means that no one will be offended by the game and become distracted from the learning. The road runner wants the learner to guess the word before a cage is built around him, as shown in figure three.
Again, the terms and definitions are not within the content of the Flash movie so they can be changed easily. The graphics can also be changed so that the roadrunner could become a parakeet or some other animal depending on the needs of the organization.

The game element in this case is timing and number of correct answers. If the learner answers all of the letters correctly, the road runner is freed and a time is given (e.g., one minute and 15 seconds to get the correct answer.) If the answers are incorrect, the road runner is captured and the learner loses the game.

**Drag and Drop Exercises (Labeling Items)**

Many times learners are required to name or label the parts of a machine or process in order to have a common language when discussing work related topics. One effective e-learning method of labeling items is to have a drag and drop exercise in which the learner drags, with his or her mouse, the term or term’s meaning to the proper location on a diagram. Figure four shows an example of a drag and drop for a nuclear reactor.
In the drag and drop exercise, the idea is that the learner is required to recognize the location of various parts of the equipment or process and properly label each item. The exercise typically has more answers than labels to test the learner’s knowledge and not simply allow the learner to guess at the proper location of each term or definition.

Another example would be to use a drag and drop exercise to learn definitions of different terms such as the symbols on the periodic table. Figure five below provides an example.
To add game elements to a drag and drop exercise, we add timers or an indicator of the “number of chances.” These two elements help to make a simple drag and drop exercise into a game. It is also possible to add, for correctly completing a drag and drop, rewards such as a small, entertaining video clip related to the content being taught or several “tokens” that can be collected. In the latter case, the learner with the most tokens wins some type of group competition.
Learning Concepts

Another type of basic learning that is required within most organizations is the acquisition of concepts. According to Robert Gagne, a concept is a rule that classifies an object or event. Many polices, procedures and other information within organizations must be classified to be acted upon properly.

For example, a call center employee needs to classify the type of customer request in order to handle it properly. A worker on the manufacturing floor needs to understand how to classify different types of defect when conducting a quality inspection. Teaching concepts involves two general strategies.

Examples and Non-Examples

The first strategy is one in which the learner is presented with examples and non-examples of the concept and he or she is then prompted to induce or “discover” the concept. The learner, in other words, is presented with an example and must indicate if it illustrates that concept or not.

Best Example

A second method of teaching concepts is to first provide a “best example” of the concept and then discuss its attributes and characteristics. Learners are then asked to develop their own examples of the concept.

An illustration of this method would be an e-learning module that discusses the concept of “value-added” by providing model examples of value-added processes and one or two example of non-value-added work. Following the examples and non-examples the module would present the attributes and characteristics of the concept of "value-added". The e-learning would ask the learners to compose their own example of value-added work when given certain situations.

While the two above methods of teaching concepts are effective, if they are not presented correctly in an on-line environment they can lead to boredom and disinterest. Fortunately, there are several types of games which can provide interactivity and enjoyment for the learner who is required to learn concepts online.

Concept Games

Bop the Fox

A popular child’s game is called “Bop the Fox,” in which a person tries to hit as many foxes as possible with a rubber mallet or other device. Sometimes, the animal changes, but the concept is the same, score points by hitting the animal on the head.

An effective modification of this game for teaching a concept is to present an example of a concept and then ask the learner to classify the concept. For example, in a bop the fox game to teach the attributes of acids and bases, the foxes are labeled as
“acid” or “base” and the learner clicks on one of the choices based on the attribute stem provided, as shown in figure six.

This game can be used to classify any type of information or list any attributes or characteristics of a concept. Game engines can be programmed to provide both examples and non-examples to the learner. The learner can determine the proper categorization by clicking on the correctly labeled object. Additionally, the “foxes” can be changed to any type of graphical image by simply inserting a different Macromedia Flash movie or image in place of the fox.

Figure six: This is an example of teaching the attributes of the concept of “winter.”

**Race Games**

Most people enjoy some form of racing and are motivated by a racing challenge. To teach concepts, two game engines were developed that challenge the learner to get the right answer in order to progress as if they are in a race. If the learner gets more answers correct than incorrect, he or she “wins” the race. If they get more answers incorrect, then the computer wins the race.
One game involves two goats climbing up a mountain. The goal is to beat the computer by answering correctly. If the user progresses up the hill faster than the computer’s goat, the user wins, as shown in figure seven.

A similar version is a race track shown in figure eight. Once again, the user races the computer by getting answers correctly, except instead of going up a mountain, the race is for a finish line.

Figure seven: This is a game where the user races the computer up the mountain.
Figure eight: This is an example of racing engine for answering questions against the computer.
Learning Rules

Rules are statements that express the relationships between concepts. Rules provide parameters dictating a preferred behavior with predictable results. For example, “i before e except after c” is a rule that provides predictable results. In retail businesses, there are rules for determining when to re-order new product.

Rules can be used to predict the outcome of events and explain why certain events occur. Understanding the rules governs the operation of computer systems and governs many corporate policies and procedures. In fact, many organizations are simply a set of rules by which members of the organization agree to function and operate.

State Rule and Provide Multiple Examples

One method for teaching rules is to state the rule and then have the learner work through several examples of it. When teaching a rule, it is necessary to ensure that the learner knows all of the prerequisite concepts to understand and apply the rule correctly. When a learner is having difficulty learning a rule, often it is because he or she has not fully grasped the prerequisite concepts.

Provide Multiple Examples and Have Learner State the Rule

A second method for teaching rules is to provide the learner with examples of the rule and allow the learner to determine the rule from those examples. This technique is not unlike the technique for teaching concepts. Many rules can be learned by playing a “game.” When the learner is penalized or rewarded for a certain action, he or she begins to form an idea about what the “rule” is for the situation. This can be used when developing games.

Board/Trivia Games for Teaching Rules

A type of game can help teach rules and focuses on existing learning such as concepts and declarative knowledge is the use of Board or Trivia Games. These types of games can be a quick and easy method of teaching basic rules and are useful because they are representations of well known games. Examples would include games based on:

- Jeopardy
- Who Wants to Be a Millionaire?
- Wheel of Fortune
- Hollywood Squares
- Monopoly
- Risk
The games like Jeopardy, Who Wants to Be a Millionaire, and Wheel of Fortune all follow the format of the original games. The games ask for declarative or concept knowledge (sometimes in the form of a question) and the learners provide the correct answer. The designer can add more complex relationships to help to teach rules.

For example, a Jeopardy question could be something like “The JIT method for re-ordering product requires what prerequisites?” The learner responding to the question has to understand the concept of “JIT” and of “re-ordering” and know how the two interact.

Also board game designs like Monopoly or Risk can be effective. The rules that need to be learned (don’t keep a customer on hold for more than two minutes) can be incorporated into the rules of the game or they can be “taught” as the learner moves around the board. The designer of the game can input chance or other factors through different cards or through “game” conventions like having the player virtually roll the dice.

The manufacturing game below teachers the learners about inventory control concepts by having them answer questions from the “Inventory Issues” stack of cards or the “Production Problems” stack of cards to advance around the board. Common inventory problems are provided to students in the form of the question and they have to answer correctly as they move around the board before another player answers the question. The learner takes turns “rolling” the dice by clicking on them.
Learning Procedures

When a series of rules are to be followed in a specific order, it is called a procedure. A procedure is a set of steps that must be completed to perform a task and achieve the desired results. Procedures are a vital element in the daily functioning of an organization. Perhaps the most visible example of following a procedure is in software applications. Most applications require a step-by-step sequence of screens to correctly complete a procedure.

While it is initially difficult to learn step-by-step procedures, over time most people internalize procedural knowledge and are able to perform the procedure fluidly without thinking of the discrete steps.

Overview of Procedure

The best tactic for teaching procedures is to first provide an overview of the procedure and its desired outcomes and then to break the procedure into smaller steps and then teach each step. Finally, the instruction must focus on putting the steps back in order so the learner can follow the procedure as it would happen on the job. Learners should have practice completing the entire procedure and evaluating the results a number of times. With a complex procedure, the practice might, after initial instruction, involve only simplified cases. However, after instruction with more complex cases, the practice should review a range of procedural variations.

Practice Simple and Complex

Practice exercises should involve situations that require the simplest or most common path and some that require a more complex and extensive path. After learners have practiced executing a procedure, it is critical that they practice recalling the sequence and nature of its steps. In addition, they should be able to recall critical keywords to ensure that they do indeed denote the entire procedure to the learner.

When the procedure is software related it does not simply involve the users’ memorizing a series of function key commands without thought to the purpose behind the function. Users need to know why they are performing a step in a procedure as much as they need to know how to perform the step. If a step is not well understood within the procedure, it tends to be ignored or changed to suit the needs of the employee. While the employee may be accommodated, the overall manufacturing data collection effort or customer service process could be compromised.
Procedural Games

There are not many procedural games. Often when a procedure is taught online the instruction is for a software procedure and the information is presented as an online simulation of the software. For example, the screen capture below shows a mock up of a screen the learner would encounter and then provides instruction to “walk” the learner through the screen.

As an evaluation the learner must enter correct information into a series of screens. The program tracks what the learner entered and in what screen. The software that the learner uses for learning and evaluating is virtually identical to the actual software he or she will be using on the job.

For this type of instruction, the only game element to be added is the element of timing. This is typically not done since the learners of software are generally interested in learning the software and a game is not needed for motivational purposes.

Figure nine: Here is an example of a screen capture from a software simulation.
Learning Principles

Principles, non-sequential guidelines for behavior or action, deal primarily with the development of communication, leadership, ethics, team building, and other social skills or what some call *soft skills*. The need for teaching principles is critical for an organization’s long-term success. The inter-relationship between people is what makes an organization effective.

An example would be the principle of leadership. Sometimes a leader must act as a coach and sometimes he or she must step up and take absolute control. When and how to do those different actions changes depending upon the situation, personalities involved and criticality of the outcome.

Simply memorizing guidelines for a particular principle does not mean the learner has learned anything. To teach principles the learner must be placed into the context in which the principles must be applied. The learner then needs to apply what he or she thinks is the right principle and observe the results.

Leadership, for example, is learned by leading…not by reading about it on a screen. While it may not be possible to place every employee in a real-life leadership position and hope they turn out to be a leader, it is possible to place employees in “virtual” leadership positions and teach them the desired reactions. This is one of the advantages of using WBT to teach principles.

Basic Instructional Framework (Four Step Method)

Principles are best taught using a four-step method. The first step is to present a model of the desired behavior to the learner. For example, in an opening lesson on team building the steps of *forming*, *storming*, *norming*, and *performing* would be presented or modeled. The modeling of the skills to be learned could be presented as written information but is more effective if shown through motion or activity. A short video clip or a montage of moving images on team building could show the interaction of a successful team and how it was able to function effectively to solve a difficult issue. Principles have a variety of intricacies that must be observed first-hand to be fully understood and appreciated.

The second step is for the learner to develop a mental checklist of the key behaviors of a particular principle. For example, in team building, the skill of active listening is important. Active listening involves paraphrasing, acknowledgement, and understanding how something was said in addition to what was said. It is best when learners are asked to deduce those behaviors from the video model presented in step one. While this poses a problem in WBT, it can be overcome by including a “Frequently Asked Questions” button or link or a button that says something like “What the Expert Would Do” or “Ask the Expert.”

The third step is to provide numerous examples of the applied principle in the form of scenarios. This usually involves case studies of the skills being applied in a variety of situations. It can also involve discussion of what the learner would do if
confronted with a situation in which the particular principle was required. This is the place where Frequently Asked Questions can assist.

Step Four is that the learners need to have the opportunity to practice the principle in an environment that provides feedback on their actual behavior. This can involve role-plays and playacting of a particular scenario that is likely to occur.

**Analogies**

Analogies can be an effective methodology for teaching principle-based instruction. Analogies are most helpful when they directly tie to the new principle being learned and when the learner has no prior experience with the principle. In addition, the analogy must contain at least one element that is within the prior knowledge of the learner. The other elements may be new to the learner.

**Including the Attitudinal Aspects in Principle Learning**

Attitude and employee morale play a large part in the learning of any principle that needs to be applied in a corporate environment. Organizations most devote some of their resources to teaching the correct attitude toward issues like ethics and compliance.

While most of the time we do not think of teaching attitudes, organizations like Habitat for Humanity and the United Way attempt to teach attitudes toward helping other people who are not as fortunate. Advertisers attempt to teach attitudes toward certain products. Public awareness groups teach attitudes toward smoking, drugs, and unsafe behaviors. Many of the same techniques used by these groups can be used to help influence the attitudes of employees on topics like ethics.
Role Play and Role Play Games

A role play is a dramatized situation in which learners are asked to act the parts of other people. The primary interactions of the role-play are programmed so the learner proceeds through the instruction in a rather linear fashion. He or she can respond to input from the software or to questions that the software poses for them to answer.

A role play, in and of itself, is not actually a game. It is actually a scenario which the person walks through. Game elements can be added by having dire consequences occur as a result of a poor decision on behalf of the person running the role-play.

The image below shows a role play where the learner is part of a team and has to interact with each team member and then answer questions at the end of each section. Tips are provided upon learner request.

Figure ten: Here is an example of a screen capture from a team-based role play.
Teaching Problem-Solving

In educational terms, problem solving is the application of previously learned rules, procedures, memorized information and concepts to remedy a previously unencountered situation or problem. Problem solving is different from rule or procedural learning because it involves the simultaneous consideration of multiple rules and procedures, the selection of the appropriate rules, and finally the proper sequencing of the rules and procedures to achieve a satisfactory answer.

Teaching problem solving requires three elements. The first is to teach the underlying rules and concepts that can be generally used to solve problems. The second is to teach students how to look at the interrelated nature of problems. The third is to provide practice for the students to rehearse problem solving in a non-threatening environment.

The first element of problem solving is actually the teaching of names, jargon, facts, acronyms, concepts, rules, and procedures. A learner must have prerequisite knowledge if he or she is going to be able to effectively solve problems. Most effective problem solving involves the decomposing of the problem into its sub-elements. In fact, a common mistake among novice problem solvers in an area of expertise is their ability to correctly identify the problem. Without fundamental knowledge of the environment in which the problem is occurring, identifying and eventually solving the problem becomes extremely difficult if not impossible.

The second element of problem solving is to understand the interrelatedness of the elements of the problem. Most problems are difficult to solve because of the quantity of and interaction among variables. When one variable decreases, the other increases; when one process is in balance another is out of balance; when one element is favorable another is unfavorable.

The trick to problem solving is to understand how variables react with one another and consideration of multiple reactions prior to presenting a solution. The analysis of how variables react is important to the final answer to the problem.

The third element in teaching problem solving can be summed up in three words: practice, practice, and practice. Errors in problem solving by novices frequently result from their unfamiliarity with the type of problem they are attempting to solve [13]. Experts have less trouble solving a variety of problems because, most likely, they have encountered that type of problem before.

An expert problem solver in a particular area first reflects on the new problem and then uses existing knowledge to construct a solution. This means that instruction designed to teach problem solving must involve the presentation of a number of situations in which the learner has an opportunity to practice solving problems they are likely to encounter. It also means that the novice must be taught the skills necessary to learn how to reflect upon both the new problem and previously encountered and solved problems.
Build an Environment

Building an environment involves working with material that closely approximates an actual situation that a learner will encounter while on the job. Material to build the environment typically can be found in three formats, factual or true information, disguised information, and completely fabricated information. Case studies are a good foundation for building an interactive environment.

Research indicates that each of these types of materials can be effective as long as the incidents occurring in the environment could actually occur to the employee on the job. The fidelity of the environment can be relatively low and still achieve the desired results.

A learner can know he or she is at a computer terminal, participating in a “staged” environment, yet still achieve the desired learning outcome because he or she can “suspend disbelief.” Suspending disbelief is the concept that a person can be emotionally and mentally drawn into a situation they know is contrived or false because they choose to be drawn in. This phenomenon occurs when someone is reading a book and gets really involved in the characters and even starts crying although, they know it is just a book.

In a learning environment, learners are presented with a complex but realistic problem environment in which they need to make decisions. The learners are given specific details of the problem to be addressed. They must then use the information available within the environment to solve the particular problem they are encountering. For example, the problem might be to determine if the shop floor has enough capacity to take on a large order from a new customer and still meet the needs of existing customer orders. The learner may have access to floor plans, customer order due dates, voice mail messages, email messages and even access to his or her supervisor.

Solving problems in a safe environment provides the learner with a high level of comfort when he or she actually encounters a similar situation on the job. It also allows the learner to practice data gathering techniques and other behaviors in an environment with no real repercussions. The learning environment provides the learner with practice and experience.
Environment/Simulation Games

Environments or Simulations provide learners with the “experience” of being in an actual situation without ever having to really be in that situation. These are sometime referred to as “social simulators.” The “game” in this situation is for the learner to solve a problem by going through the simulation and interacting within the environment as if the learner was actually in the environment.

A social simulator accomplishes for the principle-based and problem-solving training what a tank or flight simulator accomplishes for military training. The key feature of a tank simulator is that the soldier is allowed to practice a skill in an environment that mimics the real world as closely as possible, except that in the simulated environment, it is OK to make a mistake. In an actual tank battle that same mistake may kill the soldier.

While not teaching life and death skills, a social simulator can play a valuable role in teaching principles and problem-solving. Social simulation software offers a work environment in which the employee can interact with simulated characters through conversations and online discussions. As learners move around in the simulated world from the shop floor to the customer’s place of business, images of the scenes and characters provide visual realism.

The learners using the social simulator can use multiple-choice options, clickable hot spots or pull down menu choices to interact with screen characters like an angry manager or an upset customer. Characters visually respond to the user though digitized video displays or still photographs showing a range of emotions and feelings regarding the choices of the virtual employee of the simulation. One common interface that many social simulators have in a corporate environment is that of an office.

The office provides access to key communications, is familiar to the learner, and closely resembles the environment in which the learner will need to function. For an effective office environment within a social simulator, the following guidelines are good to follow.

- Use case problems and examples
- Give learners the opportunity to seek advice from experts while applying the principle
- Use the instruction to compress time so consequences of actions can be experienced sooner than in “real-life”
- Give feedback that tends to play out consequences and stresses tradeoffs rather than present right or wrong alternatives.
- Provide learners with the opportunity to try again.
- Have the gaming elements be time- or point-based.

While the environment or social simulator is not a game, competitive elements can be added to make it a game. The learners could compete against each other or against themselves to solve the problem. They could be rewarded for solving the problem with tokens, money or some other convention.
Figure eleven: Example of an interactive office environment for teaching how to solve problems related to managing an e-learning project.
Conclusion

The creation of on-line games helps apply instructional strategies to online learning without boredom. The games hold the learners’ interest and encourage them to interact with the materials.

Creating the engines in a format that allows for easy interchangeability of both content and graphic means that the engines can be used in a variety of courses for a variety of topics. Savvy designers will utilize reusable game engines to provide interactivity and excitement to their online course.

The chart below shows a combination of the different types of learning and the gaming strategies that can be used.

<table>
<thead>
<tr>
<th>Type of Knowledge</th>
<th>Definition</th>
<th>Example</th>
<th>Gaming Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Declarative</td>
<td>An arbitrary association between two or more objects such as DPW represents the words Department of Public Welfare. These are typically Jargon and Facts.</td>
<td>• Declarative Knowledge/Concepts Games • Board/Trivia Games</td>
<td></td>
</tr>
<tr>
<td>Concept</td>
<td>Categories used for grouping similar or related ideas, events or objects Customer service means not handing off the customer from one representative to another when the customer has a problem.</td>
<td>• Declarative Knowledge/Concepts Games • Board/Trivia Games</td>
<td></td>
</tr>
<tr>
<td>Rules</td>
<td>Relationship between two or more concepts. Typically expressed as an If-then statement (e.g., If the phone rings, answer within three rings).</td>
<td>• Declarative Knowledge/Concepts Games • Board/Trivia Games</td>
<td></td>
</tr>
<tr>
<td>Procedures</td>
<td>Ordered sequence of rules or steps a learner must complete to perform a task. First type the customer name, then click &lt;next&gt;, then type customer address and click &lt;save&gt;.</td>
<td>• Declarative Knowledge/Concepts Games • Board/Trivia Games • Object/Software Simulation • Role Play</td>
<td></td>
</tr>
<tr>
<td>Principles</td>
<td>Guidelines for behavior or action that are not sequential. There are five leadership principles to follow. Different situations require emphasizing or de-emphasizing certain of the principles.</td>
<td>• Role Play • Environment/Simulation</td>
<td></td>
</tr>
<tr>
<td>Problem-Solving</td>
<td>Learner is confronted with novel situation. They must use previous knowledge to solve the problem. Determine the best way to confront a employee who seems to be having personnel problems.</td>
<td>• Role Play • Environment/Simulation</td>
<td></td>
</tr>
</tbody>
</table>
Author Bio

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References