Chapter 7

Games for Small and Large Groups

This chapter explores some multiplayer games. In some of the games, each player plays as an individual, competing against other individuals playing the game. This is typical in board games such as Monopoly or in the card game Hearts. In other games, such as pinochle and Bridge, teams compete against other. The rules of the game allow some sort of communication among the two or more members of a team in such a game. Often the allowable communication is quite limited, and part of the process of learning the game is learning how to communicate effectively subject to severe restrictions.

Monopoly

Figure 9.1. Piece of a Monopoly board. Copied from http://www.hasbro.com/monopoly/.


Monopoly is one of the best-selling commercial board games in the world. Players compete to acquire wealth through stylized economic activity involving the buying, rental and trading of real estate using play money, as players take turns moving around the board according to the roll of the dice. The game is named after the economic concept of monopoly, the domination of a market by a single seller.

According to Hasbro, since Charles Darrow patented the game in 1935, approximately 750 million people have played the game, making it "the most played [commercial] board game in the world."

There are a huge number of board games that have some of the characteristics of Monopoly. Monopoly has a square board, with each side having 10 squares on which a player’s piece can land. Each player has a marker—perhaps a figurine—to mark his or her position of the board. A player rolls a pair of dice and moves the total of the two dice. Randomness is also involved in the two shuffled decks of cards called Chance and Community Chest.

The play of the game involves making a variety of decisions, such as buying or not buying property, houses, and hotels, mortgaging property, making trades, and so on. Players are actively engages in receiving and paying out money from in buying and selling, and keeping track of their money and property. A player gradually learns effective strategies useful in becoming a better player. See, for example, http://boardgames.about.com/cs/monopoly/a/monopoly101.htm.
Many other board games have some of the same characteristics. Players deal a set of rules, with money, dice, making decisions, and striving to win the game. A substantial amount of learning occurs in such environments.

For example, a young child learning to play Monopoly, rolls the dice and laboriously counts the dots. A more proficient player or mentor helps the child learn to recognize without counting the number of dots corresponding to 1, 2, 3, 4, 5, and 6. The young child might then learn to count on (count upward) from the recognized number on one die, to add in the value of the second die. With still more instruction and practice, the child learns to mentally add the values of the two dice.

Somewhat similarly, the young child laboriously counts out each space of a move. Eventually a child’s number skills advance to a level where a dice total of 10 leads to moving 10 spaces (one fourth of the length of the board) without counting. A dice throw of 12 might be moved as 10 and two more, while a move of 9 might be made as a 10 and one less. Gradually the child develops a mental model of numbers used in moving around the board.

The money to be counted, paid out, and received provides a good environment for learning to deal with integer amount of money—up to $2,000 for the rent on the Boardwalk property with a hotel—or higher, if a player has accumulated a great deal of wealth.

The game involves some reading, such as following a simple instruction “Go to jail.” And following more complex instructions on the Chance and Community Chest cards.

Finally, the game involves following rules, taking turns, and interacting in a civil manner with other players.

When all of these learning and socialization opportunities are combined, the result is a very good learning opportunity. Learning how to play Monopoly has an added value of learning a game that your parents and perhaps your grandparents played. In some sense, Monopoly is part of the culture in many families and communities.

Hearts

Many multiplayer card games involve each player playing a card, and one player winning this round of play. Rules for what cards can be played and who wins the “trick” vary with the card game. Hearts is a good card game for learning about this type of card playing and trick taking.

Quoting from http://www.pagat.com/reverse/hearts.html:

Hearts is a trick taking game in which the object is to avoid winning tricks containing hearts; the queen of spades is even more to be avoided. The game first appeared at the end of the nineteenth century and is now popular in various forms in many countries. This page describes the American version first. Some remarks on other variations will be found at the end.

Hearts is usually a four-person game, although it can be played with fewer or more players. It is played with a standard 52-card deck, with the deuces being the lowest ranked cards and Aces the highest ranked cards. Lowest to highest within a rank are club, diamond, heart, and spade. Note that these rules tend to hold in many different card games, such as in pinochle, Bridge and many versions of Poker.

The dealer deals one card facedown per person in a clockwise direction, until each of the four players has 13 cards. Most players will sort their cards by suit and within suit by rank. This is not
required, but most people find that it reduces the cognitive load as they proceed in playing the game.

In many games, the goal is to get as high a score as possible. There are some exceptions, such as in Hearts and golf. In Hearts, if you win a trick, then each heart in the trick adds one point to your score. If the trick contains the queen of spades, it adds 13 points to your score. Since your goal is to get as low a score as possible, the usual strategy is to avoid taking tricks that contain hearts of the queen of spades.

However, there is one rule that helps make the game interesting and provides a way to have your opponents make a large number of points. If you manage to take tricks containing all 13 hearts and the queen of spades, than you get a score of zero and each of your opponents gets a score of 26. This is called **shooting the moon**. Remember, your goal is to get as low a score as possible. Thus, shooting the moon, which gives a score of zero for you and 26 points for each of your opponents, is a highly desirable accomplishment!

After the cards have been dealt, each player selects three cards from his or her hand to give to one of the other players. On the first hand, each player passes the three cards facedown to the player to their left. When passing cards, you must first select the cards to be passed and place them facedown, ready to be picked up by the receiving player; only then may you pick up the cards passed to you, look at them and add them to your hand.

On the second hand, each player passes three cards to the player to their right. On the third hand, each player passes three cards to the player sitting opposite. On the fourth hand, no cards are passed at all. The cycle is repeated until the end of the game. The game ends according to some agreed upon rule, such as one player achieving a score of 100 or above.

There are a variety of strategies players following in making a decision of which three cards to pass. The strategies are designed to help you achieve as low a score as possible. For example, suppose your hand contains the queen of spades, and your analysis of your overall set of cards leads you to believe that you will not try to shoot the moon. The question is, do you pass the queen of spades, or do you keep it. If you keep it, can you avoid winning a trick with it? This thinking suggests two strategies:

1. I will keep the queen of spades, so I have some control over when it is played and who gets it. For example, if I can achieve a void (no cards) in one suit and have a couple of smaller spades, I will pass cards to achieve the void and I will keep the queen of spades. I will then be able to play the queen of spades when my void suit is led by an opponent. Of course, this planning might get messed up if the three cards I receive contain cards in the suit I am trying to void.

2. I will pass the queen of spades, and try to make sure that I do not win a trick that contains it. Thus, for example, in this case I probably do not want to keep the ace or king of spades in my hand. This strategy may be helped by having lots of low cards in my hand, and thus by also passing high cards from other suits.

The person who holds the 2 of clubs must lead it to start the play on first trick. In each trick, the other players, in clockwise order, must play a card of the suit that was led if possible. If they
do not have a card of that suit, they may play any card. The person who played the highest card of the suit led wins the trick and leads to start play on the next trick.

It is illegal to lead a heart until after a heart has been played (as a discard) to another trick, unless your hand contains nothing but hearts. Discarding a heart, thus allowing hearts to be led in future, is called **breaking hearts**. Suppose that you are in the lead (that is, get to play the first card in a trick) after hearts have been broken, and you are not trying to shoot the moon. A good strategy might be to lead a low heart with the expectation that one of your opponents will have to play a higher heart and win the trick.

The rules of Hearts are simple enough so that it doesn’t take very long to learn to make legal moves and thus to participate in playing the game. However, the strategies in selecting three cards to pass to an opponent, and in playing the tricks, are many and varied. Implementation of some strategies takes careful planning ahead, remembering the cards what have been played, remembering the cards you have received from an opponent (which might help you to know what your opponent’s plan is), and so on. Through study and practice, one can develop a high level of expertise in playing Hearts.

In Hearts, as in may other competitive games, there are a number of strategies that are specific to the game. Often several strategies are applicable in a particular situation as you do the thinking required to make a good decision. Over time, as you gain experience in playing the game, you will gradually develop insights into when a particular strategy is apt to prove fruitful. Your mind/brain, working at a subconscious level, will begin to learn patterns and then recognize the patterns in a manner that helps make good moves. This general occurrence is part of increasing your level of card sense expertise.

**Card Sense**

My 6/19/06 Google search on the quoted phrase “**card sense**” produced about 15,500 hits. Some aspects of card sense readily transfer from one card game to another. For example, a person learns some of the probabilities of occurrence of various combinations of cards, and these are applicable in many different card games. Other aspects of card sense are relatively specific to a particular card game. The two terms **card sense** and **intuition**, when applied to playing a card game, are closely related. Card sense, or intuition within a card game, comes from long hours of careful thinking (reflective analysis) while playing and studying a game. Other related terms include **horse sense** and **playing a hunch**.

The game of Hearts, like each of the relatively challenging games discussed in this book, helps to illustrate the overall process of learning and developing an increasing level of expertise within a particular domain. There is the initial challenge of learning some of the rules, enough of the rules so that one can participate in a game. There is the challenge of dealing with playing poorly relatively to one’s opponents who have had much more experience and have achieved a higher level of expertise. There is the rapid growth in expertise level that comes through the first few hours of playing the game. This growth is helped by having helpful mentors (friendly opponents) who help you by sharing their insights and by teaching you some initial strategies.

Many games are complex enough so that a player will continue to gain in expertise even after hundreds or thousands of hours of playing and studying the game. Here is a personal example. By the time I began college, I had lots of experience playing many different card games. My dad
taught me how to play Poker, and I played a lot of Poker with my siblings and friends. I thought I was a good Poker player.

In college, I became friends with a fellow student through a sequence of physics and math courses that we took together. He told me that he sometimes played Poker for real money (at a gambling place where this was legal). With my usual self-confidence in academic things (being a math and physics major), I challenged him to a game of Poker. It was fortunate that we were not playing for real money. He massacred me! Although I was at least as smart as him in physics ad math, he had a far higher level of expertise in Poker playing. There is much more to being a good Poker player than just knowing the rules and being good at math. If you are interested in one person’s pathway to becoming a successful professional Poker player, see http://www.bostonphoenix.com/archive/features/98/08/06/CARD_SHARK.html.

Oh Heck: A Trick-Taking Card Game

Hearts is an example of a trick-taking card game. There are a large number of card games that involve trick taking. The Wikipedia site http://en.wikipedia.org/wiki/Category:Trick-taking_card_games lists 42 different games, including Hearts, Oh heck, and Bridge. Oh Heck goes by a variety of names and is quite easy to learn to play.

Playing Oh Heck involves bidding (trying to make a good estimate of how many tricks you will take) and playing to take or not take tricks. The taking or not taking of tricks is done exactly as in Hearts.

Bidding is an important and challenging dimension in trick-taking games that have bidding. It takes considerable knowledge and experience to become accurate at bidding. This topic is discussed more in the section on Bridge.

There are many different variations of the rules. The following common set of rules is adapted from http://en.wikipedia.org/wiki/Oh_Hell.

The Deal and Play

Oh Heck can be played with almost any number of players although 4-7 is considered optimal. The game is played using a standard 52-card deck, with ace being the highest rank, two the lowest.

The first hand is played with one card dealt to each player. On each succeeding deal, one more card is dealt out to each player, until there aren't enough cards for another round. After this, the number of cards per player decreases by one every round. The game is complete when the last round (with one card per player) has been played. For example, a four-player match of Oh Heck consists of twenty-five deals, from hand size 1 up to 13 and back down to 1.

The dealer deals out the cards one by one, starting with the player to the left, in a clockwise direction, until the required number of cards has been dealt. After the dealing is complete, the next card is turned face up, and the suit of this card determines the trump suit for the deal. (If there are no unused cards, the largest hand is played without a trump suit.)

Each player is now obliged to bid for the number of tricks he believes he can win. The player to the left of the dealer bids first. Bidding is unrestricted except that the total number of tricks bid cannot equal the number available. That is, the last bidder (the dealer) must make a bid so that the total number of bids is different from the number of cards each player has received. For example, if five cards are dealt to each player, and the first three bids are two, zero, and one, then the dealer may not bid two. However, if five cards are dealt, and the first three bids are three, one, and two, then the dealer is free to make any bid.

When every player has made a bid, the player to the left of the dealer places the opening lead. Play then proceeds as usual in a trick-taking game, with each player in turn playing one card. Players must follow suit,
unless they have no cards of the lead suit, in which case they may play any card. The highest card of the lead suit wins the trick unless ruffed (trumped), when the highest trump card wins. The player who wins the trick leads for the next trick.

**Scoring**

There are a variety of ways to score the game of Oh Heck. A simple way to score the game is by use of a single scoring rule, such as:

Each player scores the number of tricks he or she takes. A player that wins the exact number of tricks bid receives an additional 10 points for making the contract

A variation on this is:

A player who makes the exact number of tricks bid scores 10 plus the amount bid. Players who overbid or underbid score nothing.

It turns out that—on average—the easiest bid to make is a bid of zero. Thus, sometimes the following scoring rule is added to which ever of the two rules given above is being used:

Making a zero contract scores only five points.

**Whist: A Trick-Taking Card Game**

The Horatio Hornblower series of seafaring books by C.S Forester have provided me with a great deal of reading enjoyment. These stories take place starting about 200 years ago and including many exciting sea battles and other adventures. The protagonist, Horatio Hornblower, enjoys playing a card game named Whist. I have included the game here just for my own edification.


Whist (a trick-taking game) is a classic card game that was played widely in the 18th and 19th centuries and was a development of an older game Ruff and Honours. Although the rules are extremely simple, there is enormous scope for scientific play and since the only information known at the start of play is the player's thirteen cards (plus possibly the turned up trump card from the dealer's hand), the game is difficult to play well.

In its heyday, a large amount of literature was written about how to play Whist. Edmond Hoyle, of "according to Hoyle" fame, wrote an early popular and definitive textbook. By the late 19th century an elaborate and rigid set of rules detailing the laws of the game, its etiquette and the techniques of play had been developed that took a large amount of study to master. In the 20th century, Bridge, which shares many traits with Whist, has displaced it as the most popular card game amongst serious card players. Nevertheless, Whist continues to be played in Britain, often in local tournaments called "whist drives".


Whist is a four-player played with a standard 52-card deck of cards. The cards in each suit rank from highest to lowest: A K Q ... 4 3 2.

The four players play in two partnerships, with the partners sitting opposite each other. Players cut or draw cards to determine partners and the first dealer.

The deck of cards is shuffled and cut. The dealer deals the cards one at a time so that each player has thirteen cards. The final card, which belongs to the dealer, is turned face up to indicate the trump suit. This card remains face up on the table until it is dealer's turn to play to the first trick.
The player to the dealer's left leads to the first trick; any card may be led. The other players, in clockwise order, each must follow suit by playing a card of the suit led if they have one. A player with no card of the suit led may play any card from his or her hand. The trick is won by the highest card of the suit led, except if a trump is played. In that case, the highest trump wins. The winner of the trick leads to the next trick.

After all 13 tricks have been played, the side that has won the most tricks scores one point for each trick in excess of six. Thus, only one team scores for the play of a hand, and the most points a team can score is seven.

All of the skill in Whist is shown in the play of the cards, attempting to take as many tricks as possible. Since there is no bidding, the only information available to players before the play of the first card is the trump suit and one trump card that the dealer has. The dealer has the advantage of having at least one trump card (some players may have none), and the other three players gain a slight advantage by knowing one of the cards in the dealer’s hand.

As the play proceeds, the players gain information from each card played. A good Whist player will remember every card played and the order in which each card is played. If a player is talented in this task, then the memorization occurs with little or no conscious effort. This information will be combined with card sense (information) to help make good decisions during the play.

Many competitive games, including Whist and poker, involve learning to “read” opponents. A 6/20/06 Google search of the quoted phase “reading your opponent” produced nearly a thousand hits. There are a number of books on this topic, covering topics as diverse as poker, marital arts, and basketball. Learning to read a human opponent is, of course, quite different from learning to read a computer (opponent). However, there are likely to be some characteristics built into a computer program (some patterns of playing behavior) that can be learned by careful analysis of the play.

**Bridge: A Trick-Taking Card Game**

Bridge is a four-person card game in which a team of two players competes against another team of two players. Bridge was derived from Whist and uses a standard 52-card deck of playing cards. While the taking of tricks is the same as in Whist, bridge includes a sophisticated system of bidding that occurs before the play.

The bidding process begins with the dealer. It leads to the determination of the trump suit (or, that there will not be a trump suit) and a goal of meeting or exceeding the number of tricks specified in the highest bid. In brief summary, quoting from [http://www.bartleby.com/65/br/bridge-crd.html](http://www.bartleby.com/65/br/bridge-crd.html):

After all cards are dealt, so that each player holds 13 cards, the dealer begins the auction, which proceeds in rotation to the left. Each player must bid, pass, double (increase the value of the previously stated contract), or redouble (only after a double, further increasing the point value of the contract). A bid is an offer to win a stated number (over six) of tricks with a named suit as trump or with no trump. The lowest bid is one, the highest seven. Each bid, i.e., “one diamond,” “one no-trump,” “four hearts,” must be higher than the preceding bid, with no-trump ranking above spades. Artificial bids are those that convey certain information to a partner and are not meant to be taken literally. The highest bid of the auction becomes the contract after three consecutive passes end the bidding. The player who first named the suit (or no-trump) specified in the winning bid becomes the declarer. The player to the left of the declarer leads any card face up, and the next hand, that of the declarer’s partner, is placed face up on the table, grouped in suits. This is known as the
dummy, and the declarer selects the cards to be played from this hand. The object of the game for both partnerships is to win as many tricks as possible, a trick being the three cards played in rotation after the lead. Suits must be followed, but a player who has no cards in the suit led may play any card. Highest trump or, if no trump card is played, highest card of the suit led wins.

Each bid conveys some information to your partner and to your opponents. Over the years, a number of quite sophisticated bidding conventions (sets of agreed upon meanings for bids) have been developed. A specific bid in two different bidding systems may convey different information. For example, in one bidding system an opening bid of “one club” may mean: “I have a reasonably good hand and clubs is my best suit.” In a different bidding system, the same first bid might mean: “I have a very strong hand and later in the bidding I will indicate my strong suit or suits.”

The general rules of Bridge require a team to explain their bidding system to their opponents. If a team is using a widely used bidding system, they can convey this information by merely naming the system. If they have developed a variation of a widely used system, or if they have developed an entirely new system, then they must provide the details to their opponents. Needless to say, a good memory and the ability to quickly learn the meaning of one’s opponents bidding system are essential to playing Bridge well.

The scoring in Bridge is more complex than in Whist. In Whist, each trick won in excess of six tricks counts one point. In Bridge, each trick won in excess of six may count 20 points or 30 points—with the exception of a no-trump contract in which the first trick above six counts as 40 points and each subsequent trick counts as 30 points. Scoring is also affected by whether a contract has been doubled, or doubled and redoubled, and by a number of other considerations. In total, learning to score in Bridge is a significant challenge.

Bridge is far more complex, challenging (and fun) than Whist because of the bidding and because of differences in scoring. The game is played competitively at local, regional, national, and international levels. A ranking system has been developed so that a player can achieve a competitive rank through the accrual of points in certain sanctioned Bridge-playing events. For some details on this, read about American Contract Bridge League (ACBL) master points at the http://www.acbl.org/about/masterpoints.html.

Massively Multiplayer Online Games (MMOG)

My older daughter, Beth Moursund, spends a great deal of time playing various Massively Multiplayer Online Games (MMOG). One of my reasons for writing this book was her continually pointing out to me some of the educational values of games, and the educational implications of MMOGs.

If you own and use a credit card, you are a participant in a massively multi-user online financial system. If you use email, you are a participant in a massively multi-user online communication system. If you use the Web, you are a participant in a massively multi-user online virtual library system. If you make online purchases from Amazon or other large online businesses, you are a participant in a massively multi-user business.

Nowadays, it is no big deal for many thousands of people to be making simultaneous use of a computer system that processes business transactions, communication transactions, or game moves. In such a game, a player controls one or more virtual characters. Some of the games that have been developed can have tens of thousands of simultaneous players.
In many online games, players organize themselves into teams. A team, consisting of cooperating humans each running an individual character within the game, carries out activities that may include fighting or in some other way competing against other teams being run by human players, against teams being run by a computer, or perhaps just in overcoming major challenges being generated by the computer system.

It is easy to draw parallels between this and a team of workers in a company competing against workers from other companies and participating in the overall world of business to develop products that capture market share and make profit for the company. It is now common for a team of researchers, located throughout the world, to work together on a project. Indeed, it is now common for certain types of jobs to be filled by telecommuters located thousands of miles from their employers and customers.

The following quoted paragraph from Young et al. (2006) provides insight into MMOGs in education:

Yes, video games are mainly for play and fun. But video games are educative as well as interesting and engaging—something that we all hope that more classrooms could be. Many of today's students spend more time playing video games than they do watching television, reading books, or watching films. Massively multiplayer online games (MMOGs)—long and surprisingly complex gaming environments that normally require over forty hours to get beyond novice levels (Squire 2004)—represent the latest development in the history of video game technology (Exhibit 1). Success in a MMOG requires developing new literacies, understanding intricate and intersecting rule sets, thinking creatively within constraints, collaborating with other participants towards shared goals, and perhaps most importantly, taking on new identities as players (via their avatars) inhabit game spaces (Gee 2003). Such properties offer significant potential for educational contexts, as indicated by the emergence of MMOGs specifically designed to enable student interactions and centered on instructional topics (e.g., Quest Atlantis, AquaMoose 3D, and RiverCity). [Bold added for emphasis.]

Notice the “forty hours” in the bolded part of the quoted material. Research suggests that many game players enjoy the challenge, the many hours of learning, and the resulting level of expertise that results from such dedication. Players of such games become thoroughly immersed in the game. They talk about characters in the game (such as their characters) in the same way they talk about other people in their lives.

I enjoyed reading the following newspaper article:

Regan, Tom (June 14, 2006). What if civics class were an online game? The Christian Science Monitor. Retrieved 6/14/06: http://www.csmonitor.com/2006/0614/p17s01-cogn.html.

Quoting from the article:

My 10-year-old son belongs to an online community called Runescape, a world that resembles something you might find in "Lord of the Rings." Runescape is an MMORPG—a massively multiplayer online role-playing game. He and his friends often race home after school to "meet" one another online, in the guise of the characters they have created. Unlike single-player games, MMORPGs create a "persistent world," one in which the online community continues to evolve and grow even when your character (or my son's, in this case) is not online.

I checked out the community before allowing my son to join it. Bad language is forbidden, as is abusive conduct and a slew of other obnoxious or dangerous behaviors. There is a method for reporting those who break the rules, if they are not noticed by the game's operators first.

In other words, if you are going to be a citizen of this online world, you must follow certain rules. True, this online society is not one you'd find in the "real" world, but the code of citizenship in Runescape is similar to
traditional ideas of what it means to be a good citizen (along with all the dragon and goblin fighting, of course).

As suggested above, a virtual reality learning-environment can be effective even it is not quite close to the real reality. However, there are many virtual reality learning-environments that are essentially indistinguishable from real reality. Good examples are provided by the simulators used to help train astronauts, airplane pilots, military tank crews, and a surgeon learning to perform complex laparoscope surgery, perhaps working in cooperation with a sophisticated robot. There are a steadily growing number of such educational simulations.

As might be expected, as more jobs require working through and with a computer-based game-like interface, there is some incidental transfer of learning from game playing into such jobs. A good example is provided by laparoscopic surgery.

All those years on the couch playing Nintendo and PlayStation appear to be paying off for surgeons. Researchers found that doctors who spent at least three hours a week playing video games made about 37 percent fewer mistakes in laparoscopic surgery and performed the task 27 percent faster than their counterparts who did not play video games. (Dobnik, 2004)

There is a growing body of research on the value of learning communities. The Bill and Melinda Gates Foundation has been making major financial contributions designed to divide large schools into smaller, community-like schools. The teams in a MMOG have some of the characteristics of a small learning community. More generally, it is now common in distance learning to have groups of students working together via the Internet. In some sense, a group of students working together in a distance learning course become a community.

Small learning communities tend to place considerable emphasis on the social dimensions of education. Some game researchers are taking a similar approach. Quoting from Terdiman (2006):

The PARC team--Bob Moore, Nicolas Ducheneaut and Eric Nickell, plus Stanford's Nick Yee--have spent the better part of three years studying the social dimensions of so-called massively multiplayer online games (MMOs) to better understand the design challenges behind creating satisfying face-to-face avatar and other interactions in such environments.

But along the way, the group says, it has encountered one substantial hurdle: conventional wisdom in the games industry that development resources should be spent on content, since content is what players want.

"When faced with the decision, 'Do I put in another dungeon or do I improve the experience for (groups of players)?'" said Ducheneaut, publishers often say "I'll put in another dungeon." I think that's incredibly shortsighted."

Star Trek’s Holodeck

I have been a Star Trek fan since its early days. I am particularly enamored by the Holodeck, because it provides an interesting vision of the future of education. In the Star Trek science fiction, a Holodeck creates a virtual reality in which one can interact with virtual people, places, and things. For example, a student could talk with Albert Einstein, take piano lessons from Ludwig van Beethoven, be a player on a sports team made up of great figures from the past, and so on.

Some aspects of a Holodeck now exist. Quoting from the http://en.wikipedia.org/wiki/Virtual_reality:

Virtual reality (VR) is a technology which allows a user to interact with a computer-simulated environment. Most virtual reality environments are primarily visual experiences, displayed either on a computer screen or through special stereoscopic displays, but some simulations include additional sensory information, such as
sound through speakers or headphones. Some advanced and experimental systems have included limited tactile information, known as force feedback. Users can interact with a virtual environment either through the use of standard input devices such as a keyboard and mouse, or through multimodal devices such as a wired glove, the Polhemus boom arm, and/or omnidirectional treadmill. The simulated environment can be similar to the real world, for example, simulations for pilot or combat training, or it can differ significantly from reality, as in VR games. In practice, it is currently very difficult to create a high-fidelity virtual reality experience, due largely to technical limitations on processing power, image resolution and communication bandwidth. However, those limitations are expected to eventually be overcome as processor, imaging and data communication technologies become more powerful and cost-effective over time.

I find it interesting to try to separate the digital graphics effects in films from the rest of a film. Is it real water in a real storm, or is it computer-generated water in a computer-generated storm? Nowadays, real humans in a video may have both a (human) stunt double and a computer graphic double. The DVD videos that I buy or rent often contain a “behind the scenes” section that provides detail on how the computer graphics used in a film have been generated.

As the compute power available in computer games continues to grow rapidly, the characters and actions that must be generated in real time get better and better. However, the field of artificial intelligence has a very long way to go before a human participant will be able to physically participate in a game and carry on oral conversations with computer-generated characters in the game, as is common on a Holodeck.

Final Remarks: Moursund’s 7-Step Advice

Some of the ideas from game playing carry over to general problem solving and decision-making. In many situations, there is the learning that can occur in advance of being faced by the problem, and the learning or data gathering that occurs immediately at the time of the problem or during the process of attempting to solve the problem. In summary, here is Moursund’s 7-step problem-solving advice. A good problem solver:

1. In problem-solving situations involving working with or in competition with other people, draws upon and cultivates the ability to “read” people, to collaborate, and to compete.
2. Knows his or her problem-solving strengths and weaknesses. Draws upon the strengths and circumvents the weaknesses.
3. Brings to bear general knowledge as well as general problem solving strategies and experience.
4. Brings to bear domain-specific knowledge as well as domain-specific solving strategies and experience.
5. Draws upon and develops an ability to quickly assess the problem situation and begin gathering relevant information.
6. Draws upon and develops an ability to acquire new information during the problem-solving activity and integrate it with all of the above.
7. Recognizes the need for and value of experience in all phases of problem solving and in many different problem-solving situations and environments. This experience, along with reflective thinking, helps to build intuition (card sense, horse sense, hunch sense, etc.)
This is a high-road transferable strategy or set of advice that is applicable in a wide range of problem-solving situations. As a teacher, you will want to help your students acquire this strategy and incorporate it into their general approach to learning and using their learning.

**Activities for the Reader**

1. Think about the ideas of card sense, horse sense, intuition, and hunch. They are all related to decision making where there is uncertainty. Reflect on when you make decisions under uncertainty, and the role these four terms (four ideas) play. Then reflect on or discuss with a partner what you want students to learn about these ideas and why.

2. Take another look at Moursund’s 7-step strategy for getting better at problem solving. Identify one topic that you feel is one of your strengths and one that you feel is one of your weaknesses. Suggest some reasons why the one seems so much more useful or relevant to you than the other.

**Activities for use with Students**

1. Find out from your students which ones have seen a Star trek episode in where the Holodeck was used. Then have these students explain what a Holodeck is, including its capabilities and limitations. Finally, engage the whole class in a discussion of whether Holodeck is just “pure” science fiction, or whether some aspects of Holodeck now exist.

2. Have the whole class work together to develop a list of card games that various members of the class have played, and how many have played each of the games. Then select one of the more popular games. Lead a whole-class discussion on why this game is popular and what one learns by playing the game. Repeat for a second game and a third game as time permits.

3. Many card games begin with shuffling the deck. Have your class work in teams to figure out a research method for determining how well shuffling actually randomizes the cards in a deck.