Chapter 8

Lesson Planning and Implementation

People often talk about strategy as if it were some kind of chess match. But in chess, you have just two opponents, each with identical resources, and with luck playing a minimal role. The real world is much more like a Poker game, with multiple players trying to make the best of whatever hand fortune has dealt them. (David Moschella)

If at first you don't succeed, try, try again. Then quit. No use being a damn fool about it. (W. C. Fields)

One of the focuses in this book is on developing and learning to use a repertoire of general-purpose problem-solving strategies. A strategy is a plan of action. Effective use of strategies requires understanding of the strategies and careful thinking while implementing the strategies.

A lesson plan is a strategy designed to help solve a teaching and learning problem. This chapter presents some ideas on developing and implementing game-based lesson plans. Such lesson plans will likely have several different goals. For example, a lesson may be designed to teach some general problem-solving strategies, to teach a specific game, and to help students experience the process of gaining an increased level of expertise in an area. Whatever the goals in such a lesson, they should be made explicit both in the lesson plan and to the students.

Roles of a Teacher

With the background you have gained by reading the previous chapters, you can now better understand roles of a teacher in helping students get better at problem solving. Students can discover strategies on their own, read about them in a book or from the Web, or be told them by a fellow student, parent, or teacher. However, without explicit instruction, few students will attempt to generalize such strategies for possible inclusion in their repertoire of high-road transfer strategies.

For an informal environment to be fully effective as a learning activity, it often must be augmented by tutorial guidance that recognizes and explains weaknesses in the student's decisions or suggests ideas when the student appears to have none. This is a significant challenge requiring many of the skills analogous to those of a coach or laboratory instructor. The tutor or coach must be perceptive enough to make relevant comments but not so intrusive as to destroy the fun inherent in the game. (Burton and Brown, 1982)

The teaching technique emphasized in this book is a combination of seizing the teachable moment and teaching for high-road transfer. Whatever you are helping students to learn, keep problem solving in mind. Each teaching/learning situation is an opportunity for students to get better at problem solving:
• Within the specific domain, discipline, or activity being studied.

• In a manner that cuts across many domains, via high-road transfer of learning.

You want to help your students to increase their repertoire of domain-specific and domain-independent problem-solving strategies. High-road transfer to increase a student’s repertoire of general-purpose problem-solving strategies consists of:

1. Identify a strategy and give it a short, descriptive, easy to remember name.

2. Help students to understand the strategy in the context of the learning and problem-solving situation they are currently engaged in.

3. Help each student to identify personal applications of this strategy to other problem-solving situations. The goal is to help each student to develop (construct) a personally relevant understanding of uses of the strategy in a variety of situations.

4. Repeat steps 1-3 frequently, both for new strategies and for strategies that have already been introduced. Whatever you are teaching, use it as an opportunity to reinforce student understanding and use of underlying problem-solving strategies. Provide students with multiple opportunities to reflect on strategies that they are using. Get your students used to the idea of identifying, learning, and explicitly, reflectively using such strategies.

Some teachers will immediately jump to the approach of having students memorize a long list of strategies. They will make use of fill in the blank, matching, and other short answer techniques to assess this memorization. Please do not do this!

This approach misses the whole idea of reflective thinking, situated learning, personal construction of knowledge and understanding, and high-road transfer of learning. Think instead about what might make a significant, lasting contribution for a student. Suppose a student really masters one new strategy per month. For many students, this would more than double their repertoire!

Based on research in adding to a student’s functional vocabulary, a good approach might be to introduce three or four strategies per month, with substantial repetition in their use. You should not have an expectation that each student will learn all of the strategies that are introduced, nor that most of the students will learn the same strategies. The strategies that a particular student will learn depend considerably on the individual student and past learning. You should consider it a considerable success if a student “masters” one new strategy per month.

Learning to Learn

Your mind/brain knows how to learn. Learning is an ongoing, automatic process. When we talk about learning to learn, we are talking about how to make the learning process better. One of the goals of education is to help students learn to learn more efficiently and effectively.

The totality of human knowledge is huge and is growing very rapidly. A person has no hope of learning everything. Indeed, it is now a major challenge just to develop a high level of expertise in one or two disciplines.
Thus, as you work to educate yourself and others, you need to think carefully about what to
learn and how to use learning time and effort efficiently and effectively. Let’s use science as an
element. Science encompasses many different disciplines, such as biology, chemistry, geology,
physics, and so on. In any of these disciplines, it is possible to earn a doctorate, specializing in a
small part of the discipline.

Science is all around us. Thus, each of us learns a lot of science at a subconscious level, just
by functioning in the world and processing the steady stream of input to our senses. One of the
interesting things that educational researchers have found is that each person constructs their
own mental models and theories of various aspects of science. Some of these models are correct
enough so that they require little change over time, as we learn more and more about the science
aspects of the world we are growing up in. Others do not fit well with what we observe as we
grow older and with what is being taught to us in school.

Piaget used the terms assimilation and accommodation to describe how some new
information can be assimilated into the models and theories we have already developed, while
other information and ideas requires developing new mental models. Thus, one important aspect
of learning science is to develop general mental models that are robust enough to assimilate the
science we will encounter in our future experiences and more formal learning opport
unities.

As a very young child, you certainly did not have an inherent understanding that a key aspect
of science is developing very accurate descriptions (for example, of things that one sees in
nature) and predictive/descriptive theories (for example, that the moon rotates around the earth
and reflects light from the sun). Our informal and formal educational system has helped you to
develop an internal (constructed collection of mental models) that you bring into play as you
think about the meaning of science, what scientists do, and so on.

Our educational system faces the challenge of helping each student develop a general
understanding of science, learn some specific science, and learn to learn science. In the past, our
educational system has tended to place considerable emphasis on the first two challenges, and
less emphasis on the third. Even as our understanding of the theory and practice of learning has
grown, we have tended to expect that students will figure out on their own how to learn a
particular discipline. After all, each person is unique; each brain/mind is unique. Each brain/mind
knows how to learn and can assimilate new learning challenges into its repertoire of learning
skills.

While each student will indeed learn to learn whatever we attempt to teach in school, many
students will develop quite ineffective and inefficient methods for learning. Moreover, they will
not even be aware that they are developing ineffective and inefficient methods. A Here is a two-
part approach to solving this teaching/learning problem:

1. Incorporate the best of our learning to learn theory and practice into teaching
   in each discipline area.

2. Actively engage all students in the study of their own learning styles,
capabilities, and limitations. Over the years of formal schooling, help each
student to gain a steadily increasing understanding of themselves as a learner
and how to become a more effective and efficient learner.
There is a lot of research and practice literature on learning to learn. A Google search using the term “learning to learn” will give you hundreds if thousands of hits.

Games provide a good environment in which to help students learn about learning and learn about themselves as learners. This one of the justifications for making use of games in education. As you help students learn a game, you can make it clear that a game has rules that must be learned. You can make it clear that there are a number of learning and playing strategies that are useful both in lots of different game settings and in lots of different non-game settings. You can make it clear that each game tends to have some specific strategies that make a significant contribution toward increased expertise in playing the game. You can make it clear that the same “specific strategies” situation holds for developing an increased level of expertise in each discipline.

One of the advantages of a game environment is the relatively short period of time required to move from a being a person first being exposed to a game to a person with a reasonable of expertise in playing the game, who can play for enjoyment and for learning while playing. This is in marked contrast to much of traditional learning in school.

Lesson Plan Ideas
Each of the preceding chapters includes some activities for teachers and others who are using this book in a course or for independent study. In addition, each contains activities to be used with students. Thus, by browsing these chapter materials, you may come up with a number of ideas for lesson plans.

Another starting point is to browse a modest length list of goals of education, looking for big ideas that you feel need increased emphasis in your curriculum.

The research on use of games in education strongly supports the value of having clear learning goals in mind and of specifically teaching to these goals. Here is a short list of possible goals for making educational uses of games in a classroom setting.

1. To help students learn more about themselves in areas such as:
   a. Learning to learn and understanding how concentrated effort over a period of time leads to an increasing level of expertise.
   b. Learning about one’s cooperative versus independence versus competitive inclinations both in learning and in demonstration or use of one’s learning.
   c. Learning about oneself as a giver of feedback to others, and as a receiver of feedback from others. This includes learning to do and make use of both self-assessment and peer-assessment.

2. To help students better understand problem-solving strategies and to increase their repertoire of and use of problem-solving strategies.
   a. Learning about low-road and high-road transfer of learning, especially as they apply to problem solving.
   b. Learning how to recognize/identify a problem-solving strategy and explore its possible use across many different problem domains.
c. Learn how to do high-road transfer of learning of problem-solving strategies that cut across many domains.

d. Increase fluency in making effective use of one’s repertoire of domain-independent problem-solving strategies.

3. To help students learn some games and increase their understanding of historical and current roles of games and game playing in our society. This includes:

a. Learning games as an aid to social interaction in small and large groups.

b. Learning games as part of the culture and history of a family or community.

c. Learning games as environments that facilitate communication, collaboration, and peer instruction.

d. Learning how to help other people learn a new game. (Think of the idea that every student plays both learning and a teaching roles in life.)

Development of a game-based lesson plan can begin with the selection of an age-appropriate game, or it can begin with the selection of some specific learning goals such as those listed above. Thus, for example, you may think of a game that you thoroughly enjoyed playing as a child. You may decide that your students or children would likely enjoy learning to play the game. Before introducing the game to your students or children, think about your educational goals. If you are a parent, for example, you might decide the main goal is to help your students understand a bit of your childhood and the culture/environment that you grew up in.

If the beginning point is a learning goal, such as learning about a particular strategy and high-road transfer of this strategy, then the next step is to identify an appropriate game or set of games that employ the strategy. Be sure to think about how you will use this teaching/learning situation to help students learn to recognize strategies, make use of strategies, and learn high-road transfer of domain-independent strategies.

In all teaching/learning situations, a lot of incidental learning goes on. As a teacher or parent, when you see a good example of such incidental learning, make it explicit to the learners. For example, suppose that a teacher is making use of the following instructional strategy:

Begin the lesson by role modeling the idea of thinking out loud as you solve a couple of different puzzles. Then divide your class into groups of two or three, and provide each group with a variety of developmentally appropriate puzzle problems. One member of the group thinks out loud while attacking a puzzle problem. The other member or members of the group are silent observers, perhaps taking notes on what they observe. If the puzzle solver successfully solves the puzzle, the observers than lead a debriefing interaction, talking about what they observed and why they learned in the overall process. If the puzzle solver gets stuck, a short debriefing occurs, and then another member of the team takes over and works to solve the puzzle problem. Remember, only one person works on the puzzle at a time. The other members of the team are silent observers, possible taking notes on what they are observing and their own person thoughts about what is going on.

As you (the teacher) wander around the classroom observing the various teams at work, you may happen to see an observer taking good notes and writing down a suggestion of a strategy he or she would use. That would be a good time to interrupt the class. Point out the good activity you
observed, and suggest that observers may want to think about and write down strategies that they see being used and their suggestions of other strategies that they feel would be useful.

Note that the same set of ideas can be used in any problem-solving activity. That is, the problem need not be a puzzle problem. The activity could be based on a science problem, a social science problem, a math problem, and so on. (Note to teachers: Probably you have already thought of this. If not, here is a good chance to practice high-road transfer of learning. The teaching/learning strategy illustrated can be called the *think out loud strategy*. It is useful in group problem-solving settings, and it is a useful component of many lesson plans.

**More Specific Educational**

The table in Figure 9.1 lists some of the possible specific learning goals that might be applicable to a student engaging in playing a game. As you explore learning goals, keep in mind one of the overriding principles of good educational practices: Lessons should be challenging and rigorous. Thus, as you think about a specific goal, think about how your lesson will approach this goal in a challenging and rigorous manner. The next section of this chapter provides additional ideas on challenge and rigor.

<table>
<thead>
<tr>
<th>Goals: Students will learn:</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Declarative knowledge about the game—rules, vocabulary, objectives, history.</td>
<td></td>
</tr>
<tr>
<td>2. Procedural knowledge about the game—using procedural thinking in making good moves. Knowledge and understanding of algorithmic and heuristic procedures relevant to making good moves.</td>
<td></td>
</tr>
<tr>
<td>3. How to learn a game. How expertise increases through gaining improved declarative and procedural knowledge, through practice, through metacognition, and through reflective analysis.</td>
<td></td>
</tr>
<tr>
<td>4. How to obtain and use feedback from oneself, the computer (if playing in a computer environment), and one’s fellow players (if playing with and/or against others). Often this requires careful record keeping and then reflective analysis of moves made in a game.</td>
<td></td>
</tr>
<tr>
<td>5. To practice the high-road transfer of learning heuristics of developing an overall long-range strategy and making use of look ahead.</td>
<td></td>
</tr>
<tr>
<td>6. How to appropriately interact with fellow players and opponents. This includes learning the culture and social skills of game playing in general, as well as for the particular game being played.</td>
<td></td>
</tr>
<tr>
<td>7. The thrill of victory, the agony of defeat (if it is a competitive game).</td>
<td></td>
</tr>
<tr>
<td>8. How to help others learn to play the game; how to be a teach/mentor in a game learning and game playing environment.</td>
<td></td>
</tr>
<tr>
<td>9. Self assessment and peer assessment. Receiving and giving feedback from oneself and others that can be used to improve the level of one’s expertise.</td>
<td></td>
</tr>
<tr>
<td>10. Etc.</td>
<td>100</td>
</tr>
</tbody>
</table>

**Figure 9.1. Goals in a Game-playing “Lesson”**

You may think it was rather silly of me to provide a column for points. The purpose is to encourage some quantitative thinking. Suppose, for example, you are developing a lesson plan with four goals. Are all goals of equal importance from your point of view or from your students’
points of view? If you don’t provide your students with information about the relative importance of various goals, how will the students self-assess or do peer assessment?

It is useful to analyze some of the possible goals and to think about the nature of learning that might occur in a gaming environment.

1 and 2. A gaming environment tends to have less clutter and complexity than the school environment typically available as one studies a traditional school discipline. Thus, a gaming environment may be well suited to helping a student learn about declarative and procedural knowledge, and procedural thinking. A procedure can be classified as an algorithm (proven to solve a specific type of problem or accomplish a specific type of task), or heuristic (such as a rule of thumb that is designed to solve or help solve a problem, but is not guaranteed to be successful). Learn more about procedures and procedural thinking in Chapter 4 of Moursund (2005).

3 If you are a person who is apt to be learning many different games during a lifetime, it is beneficial to learn to learn games. In addition, many non-game problems have much in common with game problems. Thus, there can be considerable transfer of learning from the process of learning a game to the process of dealing with such real world problems.

4. Feedback is important in any learning and problem-solving situation. Part of the learning process is to develop skill in obtaining and using feedback from self, others, the problem-solving situation, and so on. This is the basis for an important high-road transfer of learning heuristic. When attempting to solve a problem, make a list of possible sources of feedback that can provide information on the progress you are making in solving the problem.

5. Game playing often ends itself to developing and using a long-range strategy. Long-range strategic planning is such a widely useful heuristic that it should be part of the problem-solving repertoire of all students. A similar statement holds for the look-ahead strategy. Such strategies can be learned in a widely applicable manner through appropriate teaching for high-road transfer. (Note also that a person can learn to recognize opportunities for high-road transfer and then do the steps needed to help increase high-road transfer—a teacher may be helpful, but certainly is not a necessary requirement. TAG students tend to be good at this.)

6 There are many different learning theories. Lev Vygotsky’s learning theory (http://chd.gse.gmu.edu/immersion/knowledgebase/theorists/constructivism/vygotsky.htm) is called social constructivism. It is a social development theory, quite a bit different than Piaget’s cognitive development theory. The social aspects of a learning situation are a key aspect of social constructivism. Many people play games because they enjoy being in the social setting that the environment provides. In an educational setting, metacognition might help game players learn some things about their social skills, likes, and dislikes.
7. Some games are competitive, some are collaborative, some are both (a team working together, competing with another team), and so on. Many games provide an opportunity to experience the thrill of victory and the agony of defeat—and to learn about how one deals with winning and losing.

8. I believe that all people are “naturally” both learners and teachers. Through informal and formal education, we all get better at learning and teaching. Game-playing environments tend to provide a good opportunity to help others learn. For example, a game player might be engaged in both teaching and learning why asking another player a question such as, “Can you explain to me what you had in mind when you …(question asker describes a particular move or action by the other player)?

9. Learning to self-assess is an important goal in education. Games provide an environment in which one can practice self-assessment, peer assessment, and giving and receiving feedback based on such assessments.

The types of learning goals listed in Figure 9.1 are not automatically achieved by students who play games. Quoting from Conati and Klawe (2000):

> These results indicate that, although educational computer games can highly engage students in activities involving the targeted educational skills, such engagement, by itself, is often not enough to fulfill the learning and instructional needs of students. This could be due to several reasons.

> One reason could be that even the most carefully designed game fails to make students reflect on the underlying domain knowledge and constructively react to the learning stimuli provided by the game. Insightful learning requires meta-cognitive skills that foster conscious reflection upon one's problem solving and performance [2, 4, 24], but reflective cognition is hard work.

**Goals of Education: Rigor on Trial**

As a teacher, I often have trouble thinking about my lessons from a student point of view. Thus, I was impressed by the work being done by Tony Wagner and others as they explored lesson plans from a student point of view (Wagner, 2006). The emphasis in this work was on exploring the rigor of classroom instruction and learning. Quoting from Wagner’s article:

> We began to realize that rigor has less to do with how demanding the material the teacher covers is than with what competencies students have mastered as a result of a lesson. We were able to agree on this because, in our journey, we had gone from creating a series of teacher-centered observations to reaching consensus on a set of questions we would ask students. … The seven questions that emerged from this work are the following:

1. What is the purpose of this lesson?
2. Why is this important to learn?
3. In what ways am I challenged to think in this lesson?
4. How will I apply, assess, or communicate what I’ve learned?
5. How will I know how good my work is and how I can improve it?
6. Do I feel respected by other students in this class?
7. Do I feel respected by the teacher in this class?

One of the most important goals in education is to help students learn to take a steadily increasing level of personal responsibility for their own education. The list of seven questions
given above is a piece of an overalls strategy for doing this. When you (as a teacher) develop and use a lesson plan, do a whole class debriefing at the end of the lesson. Engage your students in questions such as those given in the list. Help them to learn that these are good questions to use any time—at the beginning of a lesson, during a lesson, or at the end of a lesson. Use this activity to learn to become a better teacher!

**Rubrics**

Almost all teachers make use of rubrics as they assess student work and provide feedback to students. Typically, a rubric is aligned with goals in a unit of study, a lesson, or a specific assignment. Sometimes a rubric is designed just for the use of the teacher. At other times, a rubric is designed for use both by the teacher and by the teacher’s students.

In the latter case, it is essential that the students be able to understand the rubric and to self-assess. There is considerable literature on the value of involving students in the development of rubrics. Such involvement may increase student motivation and serves as a good approach to helping students understand a rubric.

Teachers know that students vary widely in their backgrounds and interests. In a teacher-centered curriculum, the teacher and higher-level components of the school system are apt to specify rubrics and relative weights to be given to the assessment of various components of a graded activity.

An important variation on this is to facilitate students in developing their own rubrics. Within a range of goals decided upon by the teacher (or, teacher and students working together), each individual student might develop their own specific rubric or a part of a rubric to fit their own individual interests and needs.

**Activities for the Reader**

1. Do some quick brainstorming, either individually or in a small group. Brainstorm goals of education that you feel might be approached through use of games.

2. Do some quick brainstorming, either individually or in a small group. Compile a list of games, each accompanied by an appropriate educational goal that might fit well in a lesson based on the game.

3. In a small group, share your thoughts on allowing students to help develop rubrics and perhaps even individualizing a teacher-developed or whole class-developed rubric to better fit his or her interests and needs.

**Activities for use with Students**

1. Reread the section *Goals of Education: Rigor on Trial* given earlier in this chapter. Then try out the ideas of this section with your students.

2. Experiment with the idea of involving your students in developing rubrics, and with the idea of individualization or rubrics to fit the interests and needs of individual students.