Decision Making: New Paradigm for Education

Schooling should focus not only on knowledge but on the decision-making skills students need to use knowledge intelligently.

Five hundred years ago people like us believed not only that the Earth was flat but that it was the center of the universe. Fifty years ago respected scientists ridiculed those of their number who suggested that continents might move on great plates. Both examples show one side of the nature of human progress, resistance to change. Fortunately, there is another side that responds when observations and beliefs no longer agree. That side is willing to consider a new paradigm.

Education stands at such a crossroads today. Some people believe or want to believe that education achieves what it promises. "This promise means that all children ... can hope to attain the mature and informed judgment needed to secure gainful employment, and to manage their own lives." On the other side are those who claim that these beliefs are misplaced, that education does not achieve its promise because schools emphasize factual knowledge and facts alone do not build judgment, secure employment, or manage lives. "The task," they say, "is to produce a changed environment for learning—an environment in which there is a new relationship between students and their subject matter, in which knowledge and skill become objects of interrogation, inquiry, and extrapolation. As individuals acquire knowledge, they also should be empowered to think and reason." These critics call for a new paradigm based on the thinking skills that make knowledge useful. "Schools must also expand the definition of what is basic to a quality education. We believe that definition should include the ability to think critically, to analyze issues, to formulate solutions to problems, and to ask and seek answers to questions." If critics have their way, the new basics of schooling will focus...
on both knowledge and thinking skills. But the pendulum can't swing toward a new paradigm based on thinking until appropriate skills have been defined.

Most employers want graduates who know how to anticipate consequences and make decisions. Decision making gives thinking a purpose. Through our decisions, which are based on what we have learned both in and out of school, we determine the course of our lives. We make decisions that affect both our success as workers and our success as people. Since this is the promise of education, it seems clear that the new paradigm should be:

Schooling focused on decision making, the thinking skills that serve it, and the knowledge base that supports it.

If education is to emphasize decision making, educators must understand the decision-making process. Our understanding would be enhanced if people thought out loud as they made decisions, but for most people thinking is both spontaneous and subconscious. At the Center for Guided Design, West Virginia University, we set out to learn what actually happens during those moments when the human brain outperforms even the best computer. We discovered that the basic decision-making process involves four operations: state the goal, generate ideas, prepare a plan, and take action (fig. 1). At first glance, our model of the decision-making process may appear to be fairly complex. However, once you learn the basic pattern for each of the thinking modes, the process is relatively easy to use. The characteristic activities in each decision-making-analysis (steps 1, 4, 7, and 10, fig. 1) are to visualize appropriate components and analyze to identify anything that might be, contribute to, or cause a problem.

In a similar way, each decision-making-synthesis (steps 2, 5, 8, and 11) has these characteristic activities: to imagine what could be and generate options; to integrate ideas and synthesize combinations.

And each decision-making-evaluation (steps 3, 6, 9, and 12) has these characteristic activities: to consider previous selections, specify constraints and assumptions, and anticipate con-
The house sure is quiet when the rest of the family is away. That's probably why I overslept. It's 7 o'clock already. I have to shower, dress, eat, and be at work by eight. I can't be late today; my meeting is much too important. The drive shouldn't take more than 15 minutes, if traffic cooperates.

1. I wouldn't be in trouble if I'd been up on time. Breakfast is the problem. I don't have enough time for breakfast, but I'll run out of energy by 10 o'clock if I skip it.
2. I'd better eat, but it has to be fast. "Have a nutritious breakfast," Mom would say. But what's wrong with quick energy? I could have a couple of doughnuts.
3. Mom is probably right. Given my schedule today I'll have something nutritious. But it has to be fast so I can get to work on time.
4. Finding something that is both nutritious and easy to fix and eat could be a problem.
5. Why about a peanut butter-and-jelly sandwich and milk; that's got all four groups. Or that leftover pizza. Why not a cheese omelet, toast, and juice? I could eat that here or at three or four fast food places on the way to work.
6. A cheese omelet, toast, and juice sounds good, but I don't have time to cook it here. I'll go out.

Do I think I'll start for work and keep my eye peeled for a fast food place that is not too busy.
7. Traffic might be a problem. Finding a place that is not too busy this time of the morning will be a problem too.
8. Let's see, Wendy's is not too far away. McDonald's, Hardee's, and Burger King are closer to work.
9. To be sure I get there on time I'd better eat close to work. I can judge the crowd by the number of parked cars.
10. Do I have my keys, wallet, and money? Oh, oh! I didn't know it had started to rain. That will slow traffic.
11. Traffic is a mess; I'd better reconsider my options. I'll use a drive-in window if necessary.
12. Even though I had to eat at work, that was a good breakfast. And I made my meeting on time. Next time I'll get up earlier.

Decision makers must answer questions necessary to analyzing and solving problems through their own resources, by gathering information sequences; to evaluate and select what should be.

Everyone has internalized an informal decision-making strategy, usually an eclectic approach derived from experience and observing other people. Our research findings can best be explained by examining a slow-motion picture of someone making a decision. We will examine a familiar scenario. Almost every morning each of us must face the four “gets”: get up, get dressed, get breakfast, get to work. Imagine a complication: our decision maker overslept and must be at work on time for a very important meeting. Figure 2 is a chronological narrative of the thoughts of a person getting up, realizing he is late, and attempting to come to grips with a way to make up time and eat a nutritious breakfast to deal with this problem systematically, he can apply the decision-making process built on the thinking modes of analysis, synthesis, and evaluation. The three-part pattern is used in sequence at each decision-making operation: in step 1 the focus is on analysis, step 2—synthesis, step 3—evaluation, and so on, as shown in figure 3.

Before our decision maker can begin to apply these three thinking modes, though, he must define the problem-situation. The decision maker must "see" what's involved before he begins the first step in the goal operation. If he has not personally experienced the actual situation, he may have to construct an image in his mind's eye. The first paragraph in the Breakfast Problem (fig. 2) serves that function.

Decision makers must answer questions necessary to analyzing and solving problems through their own resources, by gathering information
from the library or other media, from experts, or through experimental
work. All of this work toward defining the
problem-situation has one purpose: it allows decision makers to
identify difficulties in the analysis step
that follows.

To return to the Breakfast Problem,
let's look at another pattern that is
revealed when we examine each set of
three steps (fig. 4). Each set of steps
has a focus and a result. When the four
operations shown in figure 4 are com-
bined with the three thinking modes
in figure 3, the result is the complete
decision-making process, the 12-step
model of figure 5.

Analysis
The key to beginning each of the four
operations is a visualization of what
was selected in previous steps so that
anything that might be, contribute to,
or cause a problem can be identified.
In step 1 (fig. 5) problems are identi-
fied by probing the consequences de-
defined in the situation. The other three
analysis steps differ because they are

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**Define the Situation**
* Observe or visualize the situation that exists and analyze to define the actors, props, action, scene, cause, and consequences.

**State the Goal**
1. Identify Situation Problems. Analyze to define what is about the consequences of the situation that might be, contribute to, or cause a problem.
2. Create Goal Options. Imagine what could be and generate goal options that solve each problem. Integrate ideas and synthesize goal statements.
3. Select the Goal. Specify musts and wants, constraints and assumptions, anticipate future consequences, evaluate, and select the best goal.

**Generate Ideas**
4. Identify Goal Problems. Analyze to define what is that might be, contribute to, or cause a problem if the goal is to be achieved.
5. Create Idea Options. Imagine what could be and generate idea options that solve each problem. Integrate ideas and synthesize combinations.
6. Select Ideas. Consider the goal, specify additional constraints and assumptions, anticipate future consequences, evaluate, and select the best combination of ideas.

**Define the New Situation**
* Visualize the situation that results if the selected ideas are implemented and analyze to define the actors, props, action, scene, cause, consequences plus any construction, operation, and the cost/benefits.

**Prepare a Plan**
7. Identify New Situation Problems. Analyze to define what is it about the new situation that might be, contribute to or cause a problem.
8. Create Plan Options. Imagine what could be and generate plan options that solve each problem. Integrate ideas and synthesize detailed plans.

**Take Action**
10. Identify Plan Problems. Visualize or rehearse the plan. Analyze to define what it is that might be, contribute to or cause a problem when the plan is implemented.
11. Create Action Options. Physically implement the plan. Imagine what could be and generate action options that solve each problem if necessary.
12. Select the Next Action. Compare the results of the action with the goal, the selected ideas, and the plan. Specify constraints and assumptions, anticipate future consequences, evaluate, and select the best future action.

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Fig. 4. Four Operations

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Fig. 5. The Decision-Making Process
Based on selections made by the decision maker. In step 4 the goal that was selected must be pictured and analyzed to identify what might be, contribute to, or cause a problem when it is implemented. Step 7 is still more complex because the decision maker must visualize and analyze the implementation of the ideas he believes will best solve the problem. In step 10 the visualization may be a mental or physical dry run or rehearsal of the plan that has been selected.

If the selected plan is to accomplish something, the decision maker can identify problems by asking, “What might prevent this from being achieved?” If, on the other hand, the plan is to prevent or reduce something, he might ask, “What might contribute to or cause a problem?” This focus on “problems” is extremely important because each problem serves as the basis for the synthesis step that follows.

**Synthesis**

To begin each synthesis step, the decision maker identifies the mirror image of each problem. If the problem is not having enough time for breakfast, then the mirror image is to have a “fast” breakfast. If the problem is running out of energy by 10 o’clock, the mirror image is to have a “nutritious” breakfast. In each case the mirror image serves as the basis for generating options. The decision maker imagines what could be and generates options that might solve the problem; he visualizes the future. Some people use a divergent thinking technique such as brainstorming, synectics, or lateral thinking to enhance the imagination required to generate alternatives.

The options must now be integrated and synthesized to produce tentative **goals** (step 2), **ideas** (step 3), **plans** (step 5), and **actions** (step 11). The goals, ideas, and plans are tentative because they must still be judged in the evaluation step that follows. The actions in step 11 are different in that tentative actions must be incorporated into the physical synthesis of the system—the plan is implemented—and while options exist, the result is a product—building, process, operation, invention, machine, concept, book, poem, song, or painting.

**Evaluation**

Before tentative goals, ideas, or plans can be evaluated, any constraints and assumptions that apply to the situation must be specified. The constraints may be limitations of people, money, equipment, time, or technology. Assumptions may be made to offset these problems. Then the implemented idea must be visualized so the consequences of each alternative can be anticipated. It is the combination of all these factors that must be considered in the evaluation step that follows.

In step 3 the evaluation of the goal is based on specified constraints and assumptions and anticipated consequences. In step 6 these factors plus the chosen goal must be considered when combinations of ideas are evaluated. In step 9 the detailed plan is checked against all of these factors plus the selected combination of ideas. After all the alternatives have been evaluated, the best one is selected. In step 12 it is not just options that are evaluated, but the implemented plan that is judged against the goal and the chosen ideas. The selection made here is of the best future action that should be taken.

**Schooling Focused on Decision Making**

The judgment people bring to their decisions depends on many factors. Critical thinking skills are among the more important. Critical thinkers are able to objectively think. They weigh, reconcile, and assess contradictory arguments and points of view through dialogue, discussion, and debate. They make assumptions and recognize the assumptions made by others. They make inferences and judge the truth or falsity of those made by others. They interpret statements and decide if the conclusions follow logically. They evaluate arguments and decide if the assumptions that were made are relevant and provide strong or weak support. They use deduction to determine if the logic involved in a statement is correct. And they demand evidence.

But there is more, much more to decision making than analysis and evaluation. As shown here, effective decision makers need to be able to visualize situations, ask appropriate questions, and get answers from a variety of sources in order to determine the actors, props, action, scene, cause, and consequences of a solution. They can distinguish symptoms from problems and identify the problems that must be considered. They can generate options, use techniques such as brainstorming, synectics, and lateral thinking, and can synthesize ideas. They can specify the constraints that apply to a situation, make assumptions, consider the consequences of each proposal, evaluate ideas, and select the goal, idea, plan, and future actions that are appropriate. Decision making requires many enabling skills.

**A Worthy Focus**

Decision makers play the roles of philosopher, scientist, designer, and builder. Schooling focused on decision making, the developmental and critical thinking skills that serve it, and the knowledge base that supports it, will allow students to learn these roles, to claim their capacity to think and their heritage as human beings.


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