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ABSTRACT

A conceptual framework derived from formal and behavioral theories was used to describe and evaluate a sample of the best developed programs for teaching decision making to adolescents. The internal validity of the programs was evaluated in terms of the adequacy of their coverage of the normatively prescribed steps to good decision making. The degree to which a program's pedagogy was sensitive to the descriptive research about the process of intuitively making judgments and decisions was also evaluated. Generally speaking, the programs covered the prescriptive steps fairly well, but largely ignored the descriptive research. The external validity of the programs was analyzed in terms of evaluation studies of the programs. Many of the curricula had considerable face validity: their underlying principles seemed plausible. Implementation of curricula was often imaginative. It is noted that the fact that the programs have gotten as far as they have shows enormous commitment and ingenuity. However, before a strong case could be made for adopting any of the programs, the program in question would need to give greater attention to its pedagogical underpinnings and the measurable impacts of the program on behavior. Programs reviewed used decision making and general thinking skills curricula. Life skills and social skills programs were also reviewed. Citations number 146. (RH)

TEACHING DECISION MAKING TO ADOLESCENTS: A CRITICAL REVIEW

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Teaching Decision Making to Adolescents: A Critical Review

ABSTRACT

In a rapidly changing world where individuals have great autonomy, citizens must be able to make independent decisions effectively. This is especially true for adolescents who face such important decisions as whether to smoke cigarettes, drink alcohol, stay in school, follow their parents' advice, and hangout with different crowds. To meet this challenge, many programs have recently been developed to teach decision making to adolescents. In some cases, better decision making is an end in itself. In other cases, it is a means toward encouraging particular choices (e.g., to avoid sex, to stay in school).

A sample of the best developed of these programs is described and evaluated here, with in a conceptual framework derived from formal and behavioral theories of decision making. The internal validity of these programs is evaluated in terms of how adequately they cover the normatively prescribed steps to good decision making and how sensitive their pedagogy is to the descriptive research into how people intuitively make judgments and decisions. Generally speaking, the programs cover the prescriptive steps fairly well, while largely ignoring the descriptive research. The external validity of the programs is analyzed in terms of the evaluation studies that have been performed on each. A typical evaluation involves asking participants whether they endorse various principles of decision making (e.g., "I am the sort of person who lists a lot of alternatives before I make a decision."). Although improvement in this sense does show that students have listened to the curriculum, it provides no guarantee that they are actually behaving differently or even have different attitudes -- as opposed just to saying what they think their teachers want to hear. These questionnaires also use a technical vocabulary that control subjects could not know (and use), even if they had the same attitudes.

Many of these curricula have considerable face validity Their underlying principles seem plausible. Their implementation is often imaginative Many of the classes seem as though they teach useful lessons and would be fun to take The fact that they have gotten as far as they have shows enormous commitment and ingenuity However, making a stronger case for adopting any of these programs requires greater attention to both their pedagogical underpinnings and their measurable impacts on behavior.

INTRODUCTION

"Problem solving and comprehension," "The complete problem solver," "A decision making approach to sex education," "Decision skills curriculum," "A curriculum for thinking," "Personal decision making,' "Decisions and outcomes," "The decision-making book for children," "Learning to think and choose," "Power and choice" - all are curricula aimed at improving young people's decision-making skills. Moreover, these are just a small subset of the many programs now on the market. Some teach only decision making, while others teach decision making as one of many general thinking skills. Some teach decision-making skills in general, while others teach decision making in specific contexts. Their target age varies from kindergarten to college, with a few concentrating on adults.

This proliferation of programs is one response to a widely perceived need to improve higher-order thinking skills in general and decision-making skills in particular, so that adolescent can meet the challenges of today's world (Resnick, 1987). Here, we take a step back and look critically at the products of this enterprise.

Our review begins by defining decision making in terms of normative approaches describing what constitutes adequate performance. We then review the reasons that have been advanced for teaching decision making. The following section offers a set of criteria for evaluating programs which is then applied to several of the better evaluated ones. We end with conclusions and recommendations.

As mentioned, there are many decision-making programs. The best-known ones usually owe their recognition to publications in which they are described and sometimes evaluated. They typically have been developed by academics, sensitive to the need for publication and evaluation. Other programs have been developed by practitioners, in response to such specific needs as inducing adolescents not to smoke or drink. These programs are seldom evaluated in any systematic way or mentioned in the scientific literature. In the course of assembling materials for this review, we quickly realized that there is no way to identify all potentially relevant programs, much less to secure copies of them. Many practitioners are not organized for disseminating materials, some seemed not eager to have outsiders examine their hard-earned experience As a result, we decided to concentrate on those programs for which we had access to curricular materials and evaluation reports We further constrained our focus to programs directed at adolescents. Obviously, this strategy may lead to overlooking as-yet-untested programs that are superior to those that have been evaluated, as well as programs directed at other ages

that might be usefully adapted to adolescents.

Decision Making: Definition and Normative Models

Decision theorists define decision making as the process of making choices among competing courses of actions (Raiffa, 1968; von Winterfeldt & Edwards 1986). For the developers of curricula, the expression "problem solving" often accompanies, or even replaces, "decision making" (as can be seen in the list of titles opening this article). In the psychological literature, however, the two have somewhat different definitions.

A "problem" is a task whose solution is not immediately perceived. Problem solving is identifying a course of action that closes the gap between the present situation and a desired future one (Newell & Simon, 1972). That process requires being able to tell whether the gap has been closed, that is, whether the solution that one currently favors is acceptable. Decision makers must also identify a solution. However, they often face conflicting objectives, whose relative importance must be weighed before the relative adequacy of different possible solutions can be determined. As a result, one must often compare alternative solutions with regard to how well they maximize one's goals, rather than being able to stop once an adequate solution has been found. In addition, many decisions are made under conditions of uncertainty, so that decision makers cannot feel exactly which consequences will follow from their choices. Observers should, in principle, be able to tell whether a proposed solution meets the constraints of a problem. Observers of decisions face the additional challenges of having to discern what goals decision makers were trying to achieve or what role fortune and misfortune play in what happens to them. As a result, the "normative" theory of decision making is couched in terms of the processes that people should follow in order to have the best chance of reaching their goal. The most widely accepted normative models of optimal decision making were developed by philosophers and economists and, then, adopted by psychologists for the descriptive study of human decision making (Coombs, Dawes, & Tversky, 1970; Edwards, 1954). These models prescribe the rules that people should follow when making decisions, given their beliefs and values.

According to the most general normative model, a person facing a decision should (a) list relevant action alternatives, (b) identify possible consequences of those actions, (c) assess the probability of each consequence occurring (if each action were undertaken), (d) establish the relative importance (value or utility) of each consequence, and (e) integrate these values and probabilities to identify the most attractive course of action, following a defensible decision rule. People who follow these steps are said to behave

in a rational way. People who do so effectively (e.g., they have accurate probability estimates, they get good courses of action into their list of possibilities) are said to behave optimally. Thus, if one does not execute these steps optimally, one can be rational without being very effective at getting what one wants.

Why Train for Decision Making?

Cognitive psychologists have studied decision making for some 30 years, revealing a mixture of strengths and weaknesses in people's performance (Abelson & Levi, 1985; Fischhoff, 1988; Fischhoff, Svenson & Slovic, 1987; Slovic, Lichtenstein & Fischhoff, 1988). The identification of systematic biases has spurred an interest in "debiasing" techniques of the sort that could be incorporated in training programs for decision-making (Fischhoff, 1982; Kahneman, Slovic, & Tversky, 1982; Nisbett, Krantz, Jepsen, & Kunda, 1983).

In many ways, the decision-making literature echoes general themes in contemporary psychology. One such theme, introduced by White (1959), is the concept of "competence," defined as "an organism's capacity to interact effectively with its environment." Guilford (1959) talked about "social intelligence," believing that socially intelligent people were more "fluent" in thinking about the behavior of others and more flexible in analyzing human problems. A common view (e.g., D'Zurilla & Goldfried, 1971) is that interpersonal competence requires active problem-solving and decision-making behavior, whereby one defines a problematic situation, searches for possible alternative solutions, selects the best alternative, and then verifies its suitability by observing the consequences of its implementation. This approach relies heavily on Bandura's (1977) social learning theory, according to which people who experience social difficulties are less able to set appropriate goals in social situations and to generate possible ways to achieve those goals (Argyle, 1969). The social learning approach holds, however, that these competencies can be acquired through counseling or training. For example: "Life Skills counseling equips adolescents to handle current problems, anticipate and prevent future ones and advance their mental health, social functioning, economic welfare and physical well-being." (Schinke & Gilchrist, 1984, p. 13)

In addition to social learning theory's concern with competent behavior, various professions (e.g., clinical and counseling psychology, social work) have been concerned with the cognitive and social processes leading to deviant behavior. Such behaviors could be viewed either as the result of social incompetence or as the competent pursuit of socially unacceptable goals. Jessor and Jessor's (1977) problem behavior theory provides a cognitive psychosocial approach to reducing the incidence of socially

undesirable behavior. Its advocates attempt to improve personal and interpersonal functioning through training in social and thinking skills in general and in decision making in particular.

Jahoda (1958) was among the first to emphasize the relationship of effective interpersonal problem solving to social and emotional adjustment. In one early study advancing this position, Spivack and Shure (1974) found that both more aggressive and more inhibited youths are less competent in solving problems and making decisions. Delinquents, appear to be particularly deficient in social problem-solving skills (Kennedy, 1984; Little & Kendall, 1979), although it is unclear to what extent delinquency is caused by the lack of these skills and to what extent it keeps youths from acquiring them.

In education, the field of instructional psychology (Glaser, 1982) promotes cognitive competence, usually conceptualized as engineering the transition between learners' current skill states and that desired by educators (Lockhead & Clement, 1979). This emphasis on thinking skills has focused research on how children think, rather than on what they know. Focal topics have included the intuitive understanding of physical concepts such as movement (e.g., McCloskey, Caramazza & Green, 1980), energy (Solomone, 1983), time (Levine, 1983) and density (Strauss et al., 1983); of statistical concepts, such as the arithmetic average (Strauss et al.,1988) and probability (e.g., Kahneman & Tversky, 1973); of biological concepts such as natural selection (Brumby, 1984); and of deductive reasoning (e.g., Evans, 1983). In each case, the goal has been to identify cognitive deficiencies that might be corrected through instruction. This concern for intuitive thought processes reflects a belief that education must consider where children are coming from, cognitively, as well as where one wants them to be.

No explicit training is needed, of course, if a skill develops by itself to its full potential at a reasonable pace. Thus, speaking need not be taught to a hearing child who has the normal chances to practice that skill. For many years, thinking and decision making were perceived as skills that did not have to be taught. It was assumed that "mental competence" develops like language skills through biological maturation, social interaction, and conventional learning. However, various evaluations (e.g., National Assessment of Education Progress, 1983) have found that many students fail to develop basic thinking skills. A number of investigators concluded that high school students often could not deal effectively with problems requiring abstract thinking (e.g., Renner & Stafford, 1972) and that as many as 50% of incoming college students operate below Piaget's level of formal thinking (Gray, 1979). These results, too, suggested that thinking skills have to be taught.

In addition to the growth of cognitive psychology, and, with it, the more precise ability to measure thinking skills, increased sensitivity to the changing nature of modern society has also prompted interest in teaching thinking skills. In a world full of novel situations (Chen & Novik, 1984; Ellul, 1963) and information overload (Bell, 1978; Carroll, 1971), one cannot teach just facts. By the time students have mastered one set of facts, it may be outdated by new developments. Such rapid changes require people to think for themselves and by themselves, and educators to provide these general skills (Fletcher & Woodell, 1981; Simon, 1980). The comparable change in counselors' roles has been to emphasize personal responsibility and maturity in decision making (Wrenn, 1962), that is, counselors should be helping clients learn how to make better decisions (Gelatt, 1962).

As expressed by Nickerson et al.(1985, p 4), "Most of us who live in developed countries in the free world have a much greater range of options than did our grandparents, whether we are choosing what to have for dinner, what to do for entertainment, where to go for a vacation, or how to spend a life. It seems reasonable to expect this freedom of choice to continue to increase. But options imply the burden of making decisions and living with them; and the ability to choose wisely assumes the ability to assess the alternatives in a reasonable way." Accordingly, Lewis (1983) argues that it is necessary to teach students to "analyze information, synthesize it and apply it in a value-oriented way."

Cassidy and Kurfman (1977) specifically advocates teaching decision making in the social studies curriculum, claiming that: "Decision making as an educational goal derives its justification from two values which underlie our American social-political system. One of these is belief in popular rule, and the other is respect for the individual. From the democratic value of popular rule comes support for developing skill in making decisions about public issues. From the value of individual dignity comes support for making sound decisions about personal problems" (p. 3).

In addition to the general challenges of living in a modern society, adolescents face particular challenges, placing severe demands on their decision-making abilities Adolescence is characterized by rapid physical, cognitive, affective, and social development. As they become more autonomous, adolescents must make more decisions about their lives. In doing so, they must cope with the often conflicting demands of parents, schools, peers, and jobs (Hartup, 1979; Utech & Hoving, 1969).

One significant category of such decisions are those involving risk-taking behaviors, such as smoking cigarettes, drug use, school dropout, and sexual activity. The long-term consequences of the

behavioral choices made here, for both individual youths and society as a whole, are well known. Rather less is known about the processes leading to them. Although incurring these risks may reflect ineffective decision making, it may also represent a deliberate choice, say, to let the short-term benefits of conforming to peer pressure dominate the long-term health risks of smoking. Awareness of the complexity of the decisions that youths face has led to statements like, "...knee jerk prescriptions such as just say no, while perhaps appropriate developmentally speaking for the 5-10 year old...are unlikely to fortify developing early adolescents against unhealthy behavior, nor give him the tools to function autonomously...the just say no approach fails to respect the child as an active processor of experience..." (Zamansky Shorin et al., 1988, p. 15). (See also Duryea, 1986; Mahoney & Thoreson, 1972.)

With so many advocates and so many reasons for training in decision making, it is not surprising that much effort has been directed at developing such programs.

Decision-Making Training: A Classification

Programs that provide training decision-making can be classified according to: (a) their focus: social or cognitive, and (b) their scope: general or specific (where scope is defined somewhat differently for the two foci).

General social programs teach skills for solving interpersonal problems, such as coping strategies, assertiveness techniques, and decision-making methods. Specific social programs focus on particular problems like smoking, peer and family relationships, sexuality, physical and psychological health, vocational and career goals, or societal adaptation. Many are designed for particular populations as well. Proponents of these latter approaches argue that general cognitive abilities are necessary, but not sufficient for dealing with social problems. Rather, adolescents need substantive social knowledge as well as the interpersonal skills needed to deal effectively with others, what are often called "life skills."

In cognitive programs, thinking skills are the focus of interest and not just mediating variables. General cognitive programs teach decision making as one of many thinking skills; specific cognitive programs teach decision making per se.

EVALUATION

Following Nickerson (1975), we will distinguish between "effectiveness" and "logical soundness," as criteria for evaluating decision-making (and, hence, the impact of decision-making curricula). A decision-

making process is "effective" to the extent that it produces desired outcomes. That is usually determined easily after the fact. Decisions are "logically sound" to the extent that the decision makers' choices are consistent both with their values and with the information available to them at the time of decision.

Although logical soundness is much more difficult to evaluate than effectiveness, it is also a more essential criterion. The outcome of a decision is often determined by factors outside the decision maker's control, whereas a logically sound decision is one that makes the best of a situation. Over the long run, logically sound decisions ought to be more effective. However, that assumption need not hold in any particular instance, so that a sound decision may have an unhappy outcome.

Nonetheless, it appears temptingly simple to evaluate decision makers by how well individual decisions worked out. Not only do people have a fascination with such effectiveness (Baron & Hershey, 1988), but it seems so easy to evaluate. By contrast, assessing logical soundness requires answering such difficult questions as, What information was available to decision makers at the time of the decision? What were their preferences? What were their subjective probabilities? How did they combine that information to reach a decision? (Blackshaw & Fischhoff, 1988) Rather than addressing all these features, attempts to evaluate logical soundness have typically concentrate on just one or two components (e.g., how people list alternatives, how they estimate probabilities).

Whatever criterion is used, it should be assessed through detailed observation of the processes followed in actual decisions. As might be expected from the difficulty of such research, few such efforts have been mounted. A more modest (and more common) evaluative criterion is that participants in a program learn principles of good decision-making, under the assumption that such conscious knowledge is necessary for better behavior. An even more modest criterion is that a program at least teach these principles. This criterion can be applied to any curriculum, regardless of what data have been collected. Decision theory's normative rules are described in the following section.

Of course, presenting merely the principles of good decision making carries no assurance that they have been learned. A pedagogically sound curriculum should be built on available scientific knowledge regarding how people make decisions and how they can be helped to improve their decision making. A brief summary of these descriptive results appears below.

Normative Principles

As mentioned, philosophers and economists have developed various normative models of optimal decision making (Raiffa, 1968). All these models, whatever their complexity, include some basic steps that any decision maker should follow (e.g., listing alternatives), as well as some steps that are specific to particular circumstances (e.g., evaluating probabilities in uncertain situations).

Table 1 offers one characterization of the normatively prescribed steps that a decision maker should follow (and that a decision-making curriculum should teach if they do not come naturally). These are:

1. Distinguishing between decision situations calling for different decision-making models (e.g., decisions under certainty, risk, and uncertainty)
2. Identifying and defining a decision-making situation
3. Listing action alternatives
4. Identifying criteria for comparing the alternatives and the possible consequences of each alternative
5. Assessing the probability of possible consequences (when necessary)
6. Assessing the utilities of possible consequences (when necessary)
7. Evaluating each alternative in terms of its attractiveness and probability
8. Assessing the value of collecting additional information
9. Evaluating the decision-making process

Descriptive Principles

Choosing what to teach and how to convey it requires an understanding of what students know already and how they intuitively approach decision-making tasks. Without such understanding, one is imposing a foreign perspective, rather than taking students from their current state to a more sophisticated one.

The professional literature contains many assertions like "adolescents are risk takers," "adolescents decision making is all emotion," or "adolescents have a limited time perspective." However, these statements seem to be grounded primarily in anecdotal observation. As a result, even if they are accurate, they provide little insight regarding the details of adolescents' psychological processes. In the absence of systematic evidence, the most relevant empirical basis for training adolescents may be research with adults. This approach is supported by Harmoni et al.'s (1987) literature review finding no demonstrated differences between the decision-making processes of older adolescents and adults, and

only a few differences between younger adolescents and adults. The latter include Rowe's (1984) finding that 14-year-olds generated fewer potential alternatives than did 18-year-olds when asked to structure decision problems, and Lewis's (1981) findings that 12th graders produced both more possible future consequences of their actions and a higher portion of negative items than did 7th graders. Contrasted with younger children (grades K to 4), adolescents have been found to have a "reflective tempo" which is better suited to cognitive tasks than the more "impulsive tempo" of younger children (Eska & Black, 1971; Kagan, 1965, 1967; Mann 1973; Yando & Kagan, 1970). Other investigators have found that greater anxiety leads to shorter and less effective decision processes (Keinan, 1987; Keinan, Friedland & Ben-Porat, 1987; Messer, 1970). The stresses of adolescence might make this threat particularly great. Ironically, drinking and drugs, common ways to reduce stress, distort decision-making processes in their own way (Wills, 1985).

Even though the research base with adolescents is limited, most steps in the decision-making process have been studied some with adults. These studies reveal something about how people approach these tasks, how well they do, and what difficulties they face. Systematic overviews can be found in Abelson & Levi (1985), Fischhoff (1988), Fischhoff, Svenson & Slovic (1987), Slovic, Lichtenstein & Fischhoff (1988), and von Winterfeldt & Edwards (1986).

Two examples might suggest the implications of such research for curriculum development:

(a) Uncertainty is a basic element of many decisions. Research with adults has found a common tendency to underestimate the uncertainty in situations, reflecting, among other things, failure to realize how complex they are (Fischhoff, Slovic, & Lichtenstein, 1977; Lichtenstein, Fischhoff, & Phillips, 1982). If, as is often claimed, children have simplistic views about many things, then their thinking, too, should be characterized by unwarranted certainty (Sieber, Clark, Smith & Sanders, 1978). As a result, uncertainty ought to be a main concept in curricula, touching topics like what is uncertainty, what are the different kinds of uncertainty, and what is the relationship between uncertainty and amount of information.

(b) The starting point for any decision is the definition of its basic components (the alternatives, consequences, sources of uncertainty). Observers have hypothesized that adolescents often behave as if they have no choices, meaning that their definitions of decision situations have no alternatives (or the single, simple alternative of resignation to fate). A related result with adults is the inability to generate alternative courses of action, or to realize how adequate (or impoverished) one's source of alternatives is

(Fischhoff, Slovic, & Lichtenstein, 1978; Gettys, Mehle & Fisher, 1986; Mehle et al., 1981). If this is the case, then curricula must teach students to consider multiple alternatives and to specify those alternatives clearly enough that they can be evaluated. To that end, they should be taught generic techniques for generating options and generic options such as delaying decisions and seeking help.

Similar analyses must be made for each step of the decision-making process, beginning with the curricular implications of the existing behavioral literature. In the absence of relevant research, curricula can at best be treated as informed guesses at how to teach these skills. A detailed analysis will raise additional design questions, such as:

1. At which age should various decision-making skills be taught?
2. What lower-order skills constitute the building blocks on which higher-order decision-making skills are based?
3. To what extent are there general decision-making skills, as opposed to skills related to specific contexts? Studies of problem solving strongly indicate that expertise reflects domain-specific schemata (Larkin, 1983; Simon & Chase, 1973). Others, however, believe that there are some basic cognitive skills (Baron, 1985).
4. How can transfer of training be maximized? According to Sternberg (1983), for example, transfer is more likely when students experience decision making rather than just learn about it. According to Brown, Campione & Day (1981), an understanding of what a program does, how it does it, and why is also necessary (also Vye et al., 1988).

Review of Programs: An Overview

Our review of programs begins with a description of each program's goals and approach. We then focus on whatever attempts have been made to evaluate it. Evaluating a curriculum manipulation is like evaluating any other behavioral intervention. Its impact must be compared to that of no manipulation at all (i.e., letting education take its natural course) or to that of alternative curricula. Ideally, such comparisons would involve random assignment to treatment groups and appropriate pre- and post-treatment measurement of the dependent variables (Campbell & Stanley, 1963). Even though some evaluation has been performed for every study discussed here, none approaches these ideal standards. As a result, we must evaluate the evaluations, focusing on the nature of each manipulation and the behavioral measures used to assess its impact:

The curriculum manipulations. Unless a curriculum is clearly defined and faithfully applied, any improvement can be attributed to other causes, while any failure can be attributed to the curriculum having been improperly implemented. Thus, evaluating a curriculum requires asking questions like: Was

it clear what was training in decision making and what was training for other abilities? Do we really know what was done during the training (i.e., how structured was the training? how much control did the experimenter have over how it proceeded?)?

Analogous questions must be asked about any comparison groups. One must also ask whether the non-instructional aspects of their treatments were equivalent to those of the curriculum group. For example, did they receive as much attention and motivational encouragement? As a result, the top half of Table 2 characterizes evaluation studies according to each curriculum's degree of structure, its duration (in hours of instruction in decision making), and the nature of the control groups. We distinguish three levels of structure. Counseling programs typically have low structure, while programs with a student textbook and a detailed teacher's manual usually are high structure.

The behavioral measures. The ultimate goal of decision-making curricula is improving decision-making skills. As a result, changes in those skills provide the appropriate measure of a curriculum's effectiveness. However, for life skills and social skills curricula, decision-making skills are intervening variables. Their ultimate goal is changing some behavior, like cigarette smoking.

Whatever variables interest the creators of a curriculum, evaluation is possible only if they can be defined operationally. Because of the difficulty of measuring actual behavior, most curricula have focused on verbal expressions, such as expressed attitudes toward smoking or knowledge about the stages of sound decision making. Unfortunately, knowing what to say on a knowledge or attitude test need not mean accepting those responses as personal belief nor implementing them in one's personal life. Several thoughtful reviews exist for the impact of social and life skills programs on behaviors like smoking and drinking (Biglan & Ary 1985; Cook, 1985; Glasgow & McCaul, 1985). The present review focuses on measures of decision making. The second half of Table 2 characterizes each evaluation study in terms of what decision-making measures were used and how soon after the training they were administered. We had planned to classify the measures along two dimensions--what they measured (knowledge, attitudes, or behavior) and how they measured it (by observed behavior or verbal reports in questionnaires) However, we found that all measures were verbal reports of either knowledge or attitudes.

Other issues. In addition to these specific measurement issues, the studies reviewed here face the routine methodological issues any curriculum evaluation. These include how subjects are sampled, how they are assigned to conditions, and how results are analyzed. Particular criticism has been leveled at

evaluations that have used pupils as their unit of analysis when it is actually whole classes that have been assigned to treatments (Cook, 1985). There is also constant concern over generalizing results beyond the kinds of classes that have been studied. Acknowledging the practical problems facing evaluators, reviewers typically call for identifying common trends among a set of imperfect studies, rather than demanding a single perfect study. The present review constitutes such a look for overall patterns.

We begin our review with programs focused on decision-making skills alone, proceed to the decision-making portion of programs devoted to thinking skills in general, and then consider that aspect of social and life skills programs. Table 1 characterizes the content of each program in terms of how it treats nine normative issues (reflecting the steps a good decision maker should take). We had planned to indicate here the attention paid by each curriculum to the descriptive literature regarding how people intuitively perform each step. However, such attention proved so infrequent that there was little to indicate.

PROGRAMS FOCUSED ON DECISION MAKING SKILLS

Decision-Making Curricula

GOFER - A high school course on decision making

Goal: This course, which was developed by Mann, Harmoni and Power (1988a, 1988b), is based on Janis and Mann's (1977) conflict theory of decision making under stress. That theory identifies several distinctive responses to difficult decision situations, such as vigilance (careful appraisal of options and consequences), hypervigilance (rapid and impulsive choice), defensive avoidance, and complacency (e.g. adherence to simple courses of action). It offers a comprehensive account of the requirements for good decision making, as well as a coherent explanation for poor decision habits. GOFER embodies this theory in a general course in decision making intended to reinforce students for applying appropriate decision-making skills to a wide range of problems in their lives, including vocational and curriculum choice.

Level: The course is designed for 15 year-olds whom the authors claim want and are able to learn decision-making skills (Harmoni, Mann & Power, 1987).

Duration: GOFER provides a program of readings and exercises designed to be taught over 40-50 hours during at least a year.

Course content: GOFER stands for five steps of sound decision making - Goals clarification, Option generation, Fact finding, consideration of Effects, Review and implementation. According to Mann et al. (1988a):

> The course materials consist of two books: "Basic principles of decision making" and "Decision making in practice." The first book contains three parts: "What is decision making?" deals with the concept of decision making and how decision tasks change according to age, the GOFER strategy as a sequence of steps to follow for making sound decisions, and the consequences of missing a step on the quality of decisions. "Understanding how decisions work" explains the relationship between self esteem and decision making; the concept of a "batting average" in decision making, poor patterns of decision making (known as "Goofers") such as "drift on," "follow the leader," "cop out" and "panic"; and how to recognize tendencies to use "Goofers" and what to do about them. "Making decisions work for you" discusses techniques to assist each step of sound decision making. Students learn how to recognize and define decision problems; how to clarify the goals and values involved in major choices; how to generate options; how to check the reliability of information; how to assess risks; how to compare options; and how to "hatch" decisions, including announcement, selling the decision, implementation, fine tuning and, if necessary, undoing mistakes. In the second book, "Decision making in practice," principles of decision making are applied to several problem areas of importance to adolescents. There are five parts: Decision making in groups, Friendships and decision making, Subject choice, Money! Money! and Beyond GOFER. (p.6)

The two books are supplemented by student workbooks with exercises and a teacher's manual.

As indicated in Table 1, GOFER addresses most of the main steps of decision making, but does not explicitly treat probabilities, utilities, or value of information. Of all the programs we have reviewed, GOFER builds most explicitly on results from descriptive research. This empirical base is drawn from Janis & Mann's (1977) research on affective barriers to effective decision making. The behavioral decision theory literature on cognitive barriers to sound decision making apparently did not play a role in GOFER's formulation. These barriers tend to affect people's ability to execute particular stages in the decision-making processes, unlike the affective barriers which affect people's ability to make deliberate decisions at all.

Evaluation: GOFER has been evaluated in two studies. The first had 40 experimental subjects and 51 controls who received no treatment at all. Both were tested only after the course had been taught to the experimental subjects. In the second study, the 152 experimental subjects were also pretested, but not the 220 control subjects. Instruction lasted 16 to 20 hours, so that less than half of the full course was taught. Three questionnaires were used as dependent variables:

(a) The Flinders Adolescent Decision Making Questionnaire contains 30 Likert-type items, anchored at "almost always true" and "not at all true for me." Six items refer to each of five topics:

Decision Self Esteem (e.g., "The decisions I make turn out well"), Vigilance (e.g., "I like to think about a decision before I make it"), Panic (e.g., "I can't think straight if I have to make a decision in a hurry"), Cop Out (e.g., "I don't like to take responsibility for making decisions"), and Complacency (e.g., "When faced with a decision, I go along with what others suggest").

(b) The Virgil Questionnaire attempts to measure competence in GOFER'S five steps of good decision making. For each of twenty pairs of hypothetical individuals, students are asked "which kind of person are you most like" (e.g., "a person who goes through with plans to get to know some people better" or "a person who doesn't go through with plans to get to know some people better").

(c) The Decision Knowledge Questionnaire contains 24 multiple-choice and 6 open-ended questions related to knowledge about three aspects of decision-making: person knowledge (e.g., what makes someone a really good decision maker?), task knowledge (e.g., what is the difference between a simple decision and a thinking decision?), and strategy knowledge (e.g., you want to teach a younger student how to make a decision; what advice could you give the younger student?)

As expected, treatment subjects reported engaging in more appropriate behavior for all five topics in the first questionnaire. There were, however, no differences in self descriptions on the second questionnaire, which measured competence in GOFER. The third questionnaire revealed differences in a "strategy knowledge subscale," but only for the first study.

In summarizing their results, Mann et al. (in press) claim that the course effectively improves adolescent decision making in the 12-16 year-old age range because students report using vigilance as a decision strategy. They further claim that the course is acceptable to most students and increases their self esteem as decision makers. They admit, however, that the absence of differences in competence on the five steps of vigilance is problematic. They blame the measure, since "all other measures suggest that the course produced changes." (p. 16)

Evaluating the evaluation: As noted in Table 2, one critical limitation to this evaluation is the fact that the control group received no treatment at all. As a result, improvement in measures like reported self-esteem might just reflect the greater attention paid to the treatment group (Battjes & Bell, 1985). A second limit is that all the measures involved questionnaires regarding knowledge of the course material. The authors themselves note that reliance on questionnaires leaves open the question of the course's

impact on behavior. Thus, the program's apparent success may simply reflect students having learned the right answers to the self-report questions. For example, a student who has seen 16-20 hours of coursework ought to know the "right" choice between, "I like to think about a decision before I make it" or "When faced with a decision, I go along with what others suggest."

One aspect of the knowledge conveyed in GOFER (and other curricula) is the meaning of specific terms about decision making. Youths in the control condition, who had not learned those terms, might fail the test even if they understood the underlying concept. Indeed, the authors report that 50% of the control subjects in the first study did not attempt the task and strategy knowledge items. They conclude that "These findings are of interest as they suggest that about one in two control students may have lacked the knowledge to attempt the task and strategy items, and they also suggest that the obtained group difference might have been greater if more control students had attempted the items." (p. 12) An alternative speculation is that the difference between groups might have been much less had more accessible phrasing been used in questions like, "What is the difference between a simple decision and a thinking decision?" A course's ability to teach terms is much less interesting than its ability to teach concepts or, ultimately, to affect behavior.

Finally, one might be concerned by the fact that the course's greatest impact was in increasing students' confidence in their decision making (whether this refers to process or outcome is hard to know from the report). Although the authors cite this as a sign of success, it might be a sign of failure if confidence was increased without a corresponding increase in competence (especially if people are overconfident to begin with) (Lichtenstein & Fischhoff, 1977; Oskamp, 1962).

Personal Decision Making

Goal: Personal Decision Making (Ross, 1981a) conceives of the decision-making process as involving five steps: (a) identifying a set of alternative courses of action, (b) identifying appropriate criteria, (c) evaluating alternatives by these criteria, (d) summarizing information about alternatives, and (e) self evaluation. The program is based on an explicit descriptive theory of how untrained individuals approximate the skills used by sophisticated decision makers, identifying five developmental stages for each of these five steps (Ross, 1981b). For example, the five stages for identifying alternatives were: single alternative, a small list of alternatives, brainstorming alternatives, constructing alternatives by classification, and constructing alternatives using criteria. The program then offers a sequence of

exercises for traversing these stages.

Level: A condensed version of the program has been prepared for seventh graders and an advanced version for eighth graders (Ross, Boutillier, Gutteride, & North, n.d.-a, n.d.-b).

Duration: The instructional package contained ten lessons, each requiring about one hour of class time.

Course content: Detailed, virtually scripted lesson plans were constructed containing directions for teachers and students. "The first lesson consisted of a pretest and a teacher-directed analysis of a typical problem designed to identify the five steps of decision making. Two lessons were devoted to each of the first three [steps] and one lesson was given to each of the remaining [steps]. The ninth and tenth lessons consisted of a review of the five [steps] and posttest." (Ross, 1981a, p. 238)

As summarized in Table 1, this program covered many of the elements of decision making, but did not mention probability, utility, or value of information. Although some of the example problems involved uncertainty, that topic was not treated directly. The program relies heavily on descriptive studies claiming to show that unskilled decision making is but a simple version of skilled decision making (Ross, 1981(a)). Instead of listing all possible alternative courses of action, for example, unskilled individuals list but one or two. This theoretical orientation is at odds with that holding that unskilled performance is fundamentally different from that of experts.

Evaluation: The curriculum was assessed in three studies in which treatment students were pretested and posttested on an instrument involving one forced-choice test for each of the five decision-making steps. The five possible answers corresponded to Ross's five skill levels. Two sets of items were prepared, one for smoking decisions, and one for a career choice decision. The first served as a pretest,

while the second was a posttest.[1]

The first study involved experimental and control classes in the same school, with the latter receiving no treatment at all. The second study had no explicit control group, using instead pretest norms established in the same school system one year earlier. The third study involved one teacher with four classes which constituted a Solomon Four-Group Design (Campbell & Stanley, 1963). This design crosses whether groups receive the treatment and whether they receive a pretest (or just a posttest) (Solomon, 1949).

Findings from the three studies were very consistent. The program substantially improved students' performance on the skills of identifying alternatives, assessing alternatives, and summarizing information. More modest improvements occurred for the skill of self-evaluation. The program actually appeared to leave students less capable of selecting criteria.

Evaluating the evaluation: Ross's measures are noteworthy for their sophistication. Nonetheless, they, too, test primarily whether subjects have learned the right answers to questions. They, too, reward knowledge of specific terms taught in the course.[2] A problem more specific to Ross's measures is forcing subjects to choose the correct answers from sets of alternatives that are not mutually exclusive.[3] Ross himself expressed dissatisfaction with these measures and, in a recent paper (Ross, 1988), used open-ended items requiring subjects to solve decision problems and describe their strategies. These were then coded in terms of the levels for each step.

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[1]For example, to test the skill level for identifying alternatives, subjects were told: Sarah is a student in a school where a lot of students smoke cigarettes. She is trying to make up her mind about smoking. The first thing she does is to try and make up a list of all the choices about smoking that she could make. Directions: Here are some things that Sarah could do to find out what choices she could make. If you were Sarah what would you do? Circle the letter of your answer.

1. Sarah should make up a list of all the choices that are possible by asking her friends in school, her adult friends, and her relatives, [level 3, brainstorming]
2. Sarah should make up a list of all the choices that she can think of. [level 2, small list]
3. Sarah should think about this problem very carefully, then she should write down what is the best thing to do [level 1, single alternative]
4. Sarah should make up a list of all the choices she can think of. She should divide this list into groups Then Sarah should think of new choices that could go in each group. She should add these to her list. [level 4, classifying]
5. Sarah should make up a list of all the choices she can think of. Then she should add new choices by thinking about the things to consider when making up her mind [level 5, using criteria]

[2]For example, the level 5 item of the skill "summarizing the information" is: You gave a weight to each consideration that showed how important it is. Then you multiplied the value of each choice by the weight of each consideration. You added up the total points for each choice. You picked "never smoke" because it had the highest total score.

[3]In the example of footnote 1, although brainstorming is only an intermediate level, it is not a wrong strategy when done along with more sophisticated ones.

General Thinking Skills Curricula

Introduction

In their review of approaches and programs to teach thinking skills, Nickerson, Perkins and Smith (1985) divided programs into five broad categories: (1) those that focus on basic cognitive skills held to be essential to intellectual competence (e.g., Feuerstein et al.'s [1980] Instrumental Enrichment Program); (2) those that emphasize explicit methods, like problem-solving heuristics, that are presumably applicable to a variety of cognitive tasks (e.g., Whimbey & Lochhead's [1979] Problem Solving and Comprehension); (3) those that promote formal operational thinking within conventional subject matter courses (e.g., Schermerhorn et al.'s [1982] COMPAS - Consortium for Operating and Managing Programs for the Advancement of Skills); (4) those that emphasize symbol manipulation skills (e.g., Feurzeig et al.'s [1969] Logo computer language); (5) thinking about thinking approaches (e.g., Lipman et al.'s [1980] Philosophy for Children).

Although there are many programs devoted to thinking skills, very few have a decision-making component. Possibly, decision making is perceived as a higher-order, complex thinking skill which can be taught only after the more fundamental, lower-order skills have been acquired. Beyth-Marom, Nevik and Sloan (1987) analyzed the normative decision-making process from an instructional point of view, showing the numerous cognitive abilities and educational objectives upon which it is based. This might explain why the few examples of decision-making units within thinking skills programs are in curricula aimed at college students (e.g., Hayes, 1981; Wheeler & Dember, 1979). The one program that we found for adolescents is Odyssey -A Curriculum for Thinking.

Odyssey - A Curriculum for Thinking

Goal: The program was initiated by the Venezuelan government, and created by researchers at Harvard University and Bolt Beranek and Newman, Inc. Odyssey attempts to improve students' performance in a wide variety of intellectually demanding tasks.

Level: The course materials were developed for Venezuelan 7th grade students and have been translated into English (Adams, 1986).

Duration: There are approximately 100 45-minute lessons, making for 75 hours of direct instruction.

Course content: The course's teacher's manual contains six series of lessons, each treating a different topic: the foundations of reasoning, understanding language, verbal reasoning, problem solving, decision making, and inventive thinking. Each lesson has its rationale for inclusion, its objectives, target abilities (for students to acquire), products, materials, and classroom procedures.

The decision-making section has three units, each divided into several lessons, for a total of 10 lessons:

Unit 1: Introduction to Decision Making: Decision Situations, Anticipating Outcomes, and Alternatives with Unknown Outcomes.

Unit 2: Gathering and Evaluating Information to Reduce Uncertainty: Assessing the Likelihood of Outcomes, Deciding Whether Information Is Relevant, Deciding Whether Information Is Consistent, Deciding Whether Information Is Credible, and the Importance of Double Checking Information.

Unit 3: Analyzing Complex Decision Situations: Expressing Preferences and Weighting Dimensions.

This curriculum is very structured, with a detailed teacher's manual including guidelines as to what the teacher might say and how students might react. There is also a student guide. The 10 lessons devoted to decision making cover 8 of the 9 topics in Table 1. They present uncertain situations and the concept of probability. They deal with preferences and how to weight them. Three lessons deal with properties of information: credibility, relevance, consistency. There is, however, little direct reference to any descriptive literature regarding intuitive decision-making processes.

Evaluation: Three matched pairs of Venezuelan schools participated in the experiment, with four classes in each school. Twelve of the classes (463 students) were experimental classes, while 12 (432 students) were control classes. The experimental classes met four days a week during an entire academic year, while the control classes had their normal curriculum. Only 56 of the 100 lessons (5 out of the 10 in decision making) were taught because of time constraints. They were chosen to represent the full set of 100.

A variety of standard ability tests were administered to all students before the beginning of the course, after its completion, and, in some cases, at various points during the year. In addition, six Target

Abilities Tests (TATs) (one for each unit) were created to test for the abilities that the lessons were intended to teach. Detailed results appear in the project's Final Report (Harvard, 1983) and in Herrnstein, Nickerson, Sanchez, & Swets (1986). Both experimental students and controls showed some improvement in test scores over the year of the experiment. In most cases, students in the experimental group showed greater gains than those in the control group. Not surprisingly, differences were much greater in the TATs than in the general ability tests. No specific effects on decision making were reported.

Evaluating the evaluation: Herrnstein et al. (1986) summarized their evaluation by pointing to some major unresolved issues: (1) Only short-term results are available at present. It is unclear whether the effects will fade without additional training. (2) It is difficult to know whether beneficial effects were due to specific aspects of the course or simply to the motivational effects of receiving such great attention. To these concerns, we would add the possibility that the TAT tests (which showed the greatest impact) measure primarily the acquisition of specific terms and facts. These tests are particularly vulnerable to charges of training to the criterion because the explicit objectives of many study units were to enhance the comprehension and use of terms used in the test questions.

PROGRAMS TEACHING SOCIAL AND LIFE SKILLS

Both social skills and life skills programs are based on the same theoretical orientations: Bandura's (1977) social learning theory and Jessor & Jessor's problem behavior theory (1970). According to these approaches, personal and social competence depend on two main factors: people's general cognitive skills and their ability to interact effectively with their social environment.

"Life skills counseling equips adolescents to handle current problems, anticipate and prevent future ones and advance their mental health, social functioning, economic welfare and physical well being" (Schinke & Gilchrist, 1984, p. 13). Typically, courses attempt to achieve these very broad goals through improving certain (behavioral) skills relating to a specific problem in a predetermined target group. Hence, there are life skills programs designed to prevent smoking, drug abuse, alcohol abuse, and early pregnancy, as well as to improve adolescents' peer and family relationships, to help them cope with stress, etc. By contrast, social skills programs attempt to improve social behavior in general. In practice, though, every life skills program has some social component. Nonetheless, we will follow the distinction made by curriculum developers. We look only at those curricula that address decision making explicitly.

There is, of course, the theoretical possibility that improved decision making will be a byproduct of training for other skills.

Life Skills Programs

Schinke et al.'s Life Skills Counseling

Goal: According to Schinke and Gilchrist (1984), personal and social competence can be acquired through life skills counseling. This counseling involves six components: (a) giving accurate and relevant information, (b) building internal control by "self-instruction counseling through modeling and rehearsal," (c) teaching adaptive coping techniques, (d) shaping effective communication schemas, (e) encouraging the building of "Cognitive interpersonal and environmental systems of support," and (f) improving the process of decision making. These interventions are called "counseling" rather than programs, reflecting a flexible, less structured process. No structured curricula have been published.

Level: Schinke and his colleagues have worked with a wide range of ages, including elementary school children preparing for junior high school, sixth graders concerned about smoking, and high school students dealing with their sexuality and the risk of pregnancy.

Duration: The substance abuse prevention programs consist of 8 twice-weekly sessions. The program preparing students for junior high school lasted for 8 hours over two months, as did an intervention for stress management (Schinke, Schilling & Snow, 1987). The decision-making component of these programs takes only an hour or two of the total time.

Course content: Generally, Schinke and his collaborators' counseling is directed at specific problems such as interpersonal relationships (e.g., Schinke & Rose, 1976), preventing teenage pregnancy (Schinke, 1982), preventing the use of alcohol, cigarettes, and drugs, and reducing unemployment (e.g., Schinke & Blythe, 1981), or preparing students for junior high school (Snow et al., 1986).

Problem solving is the component of these programs that is the most relevant to decision making. Schinke's general instructions to counselors usually describe the following steps to good decision making: define the problem, generate solutions, evaluate the solution, select the best one, and plan to implement it. Examples from students' personal experience are used to teach these various steps. Student are encouraged to pose questions like: What's the problem? Who's got the problem? What happens if the

problem goes on? How did you get into this mess? Who can get you out of it? What can you do to solve the problem? Can you order your options from the most to the least attractive solutions? Can you tell what will happen if you use each solution? Students are also taught assertive communication skills through role playing designed to provide them with practice in sticking to tough decisions, dealing with risky situations (and influential people), and exercising self-control. A combination of modeling, feedback, reinforcement, and coaching are utilized to teach these skills. Homework assignments provide additional practice.

Evaluation: Many of these life skills interventions have undergone some evaluation, typically involving pretest and posttest evaluations with experimental and control groups. Botvin and Wills (1985) and Botvin (in press) have reviewed the impact of these programs on substance abuse; Snow, Gilchrist, and Schinke (1985) have done so for smoking prevention. These evaluations have often shown significant changes in these focal behaviors. Schinke and Gilchrist (1983) reported, for example, a 79% reduction in experimental smoking. The occasional attempts to measure social and cognitive mediating processes have produced less clear-cut results.

Evaluating the evaluations: A general problem in evaluating counseling interventions is operationalizing the independent variable. As life skills training is not structured, it is very difficult to know exactly what is done and, hence, what aspects of a program cause any observed changes in behavior. In only one case (Schinke & Gilchrist, 1986), has an attempt been made to vary the features of programs across experimental groups.

Schinke and his colleagues have been concerned about the validity of their behavioral measures. Early studies often used self-reports as their dependent measures, running the risk that subjects will report what they believe to be desired answer, rather than their actual attitudes or behavior. More recent studies have collected saliva or breath samples prior to collecting self-report data.

Unfortunately, these evaluations have produced little reliable information regarding cognitive and social variables (such as assertiveness, locus of control, social anxiety, decision making, and problem solving), hypothesized to have mediated these changes. Some evaluation studies ignore these mediating cognitive skills (e.g., Snow, Gilchrist, Schilling, Schinke & Kelso, 1986; Schinke & Gilchrist, 1986). Others mention that general problem-solving ability was measured, but provide few details how this was done beyond general references to skills such as perspective taking, means-end thinking, and anticipation of

consequences (e.g., Schinke & Gilchrist, 1985; Schinke, Gilchrist, Snow, & Schilling, 1985). Schinke and Gilchrist (1984) describe two of these measures. With regard to means-end thinking, "counselors supply adolescents with the beginning and the end of a social situation and youths must detail what happens in the middle. Youths' responses are scored for realism, interpersonal sensitivity, recognition of possible obstacles and for how well and how directly they are able to link the beginning to the end." (p.30) With regard to anticipating consequences, "A written or verbal prompt from the counselor outlines a situation containing a temptation. Adolescents are asked to list everything that might be going through their minds while they decide what to do, what they choose to do, and what happens." (p. 30) The reliability of the scoring for these tasks and their relevance to specific decision-making skills is unclear.

Botvin's Life Skills Training - A Self-Improvement Approach to Substance Abuse Prevention

Goal: To prevent tobacco, alcohol, and drug abuse through the development of general coping skills, as well as skills and knowledge specifically related to resisting social influences. A central feature of the program is teaching cognitive skills for enhancing self-esteem (e.g., goal setting), resisting persuasive appeals (e.g., formulating counterarguments), coping with anxiety (e.g., relaxation techniques), and improving communication and decision making.

Level: The program is aimed at middle or junior high school students.

Duration: The full course takes about 15 hours.

Course content: Compared to Schinke's counseling program, this training program has the markings of a curriculum. There is a structured student guide, as well as a detailed teacher's manual. The curriculum is taught using a combination of instruction, modeling, rehearsal, feedback and reinforcement, and practice through homework assignments.

The curriculum contains 5 major components (Botvin, 1983):

1. A cognitive component intended to present information concerning the short- and long-term consequences of substance use, prevalence rates and social acceptability, and the process of becoming dependent on tobacco, alcohol, or marijuana.
2. A decision-making component intended to foster the development of critical thinking and responsible decision making.
3. A component intended to provide students with techniques for coping with anxiety.
4. A social skills training component, including both general coping skills and assertiveness techniques which can be used to resist direct peer pressure to smoke, drink, and use drugs.

5. A self-improvement project designed to provide students with techniques for changing specific personal skills or behaviors.

Each component contains two to six lessons. Each lesson is divided into 12 units, containing a major goal, measurable student objectives, content, and classroom activities.

The decision-making unit (two lessons) is called "Decision making and independent thinking." The goal of the unit is that "Students will gain understanding of how group pressures and persuasive tactics influence their decisions." Its objectives are: (1) identify everyday decisions; (2) describe how important decisions are made; (3) present a 5-step normative model for making decisions; (4) demonstrate how decisions are influenced by group pressures; (5) discuss reasons why people are influenced by group members; (6) identify persuasive tactics (flattery, appeal to authority); (7) identify ways of resisting persuasive tactics (Botvin, 1983). Thus, five of Table 1's nine decision-making skills are taught. Descriptive behavioral research is reflected in only one social aspect of the program, how group pressure affects decision making.

Evaluation: Five studies are reported in the literature and several more are underway (Botvin, Eng & Williams, 1980; Botvin & Eng, 1980; Botvin & Eng, 1982; Botvin, Renick & Baker, 1983; Botvin, Baker, Renick, Filazzola & Botvin, 1984; Botvin et al., 1984). Each involves an experimental and a control group, receiving pre- and posttests. The test questionnaire asks for self-reported smoking status, knowledge about cigarette smoking, assertiveness, psychosocial knowledge, locus of control, coping strategies, self-esteem, social anxiety, attitudes toward smoking, personal efficacy, interpersonal control, academic confidence, decision-making autonomy, problem-solving confidence and need for group acceptance. It has been administered in studies varying implementation schedule (5 to 15 weeks, with or without "boosters"), implementers (staff members, peer leaders, regular teachers), and length of follow up (from one to 24 months). All studies show a decrease in the number of new smokers in the experimental group and a decrease in regular smokers when subjects are tested again after a year or two. Furthermore, experimental subjects were found to have greater knowledge about substances, psychosocial processes, and advertising. They also reported greater decision-making autonomy.

Evaluating the evaluations: Botvin is quite self-critical about his evaluations, even incorporating a manipulation check to see whether the implementation was proper. Recognizing the weakness of self-report measures of the dependent variable (smoking or other substance use), he added a saliva sample

in later studies.

Botvin and his collaborators measure social and cognitive mediating variables with 112 forced-choice questions, mostly of the Likert type. Seven relate to decision making (e.g., "I think about the different choices that exist before I take any action," "I think about which of the alternatives is best"), while eight relate to confidence in solving problems (e.g., "Many of the problems that I face are too hard to solve," "I have the ability to solve most problems even though at first it looks as if there's no solution"). As elsewhere, one must ask whether these questions encompass the full set of skills which the program attempts to teach and whether the behavior reported in them is actually adopted or is just a learned "right answer."

Spitzhoff et al.'s Decision Skills Curriculum

Goal: This program (Spitzhoff, Stephen & Wills, 1982) is based on a theoretical orientation, supported by empirical evidence, which views addictive behavior as a stress-reducing factor (Shippman & Wills, 1985). However, as such, addictive behavior is a destructive copying pattern. Wills (1985) showed that constructive coping patterns (such as decision making and cognitive coping) are negatively correlated with substance use. They presumably act to increase resistance to internal and external pressures to use such distinctive behavior. The program was designed to affect mediating coping variables presumed relevant to deterring smoking initiation, specifically, decision-making ability, internal locus of control, knowledge about the negative consequences of smoking, and assertiveness skills.

Level: The curriculum is taught to seventh graders.

Duration: The full program takes two weeks.

Course content: The program has an intermediate level of structure. It contains eight modules including teachers' worksheets, slides, role-playing exercises, and video cassettes which teachers are apparently free to use in different ways. There is no student textbook.

Its eight modules are:

1. A values clarification exercise which focuses on leisure activities.
2. Decision making: Students are encouraged to bring up many decisions and are introduced to 6 normative steps of decision making.
3. Social influences through the media: Students consider the effects of the media on their

health behavior, particularly on the onset of smoking.

4. Social influences through peer pressure and how to counteract those influences.
5. Assertiveness training.
6. Stress management: a four-step process to deal with stress.
7. Stress management: how to incorporate stress management techniques into one's life style, focusing on progressive muscle relaxation.
8. Health consequences of smoking.

The decision-making module includes two lessons. They introduce the topic, provide examples, describe six steps of normative decision making, and present practice on hypothetical situations.

Evaluation: An intervention program was conducted with the entire seventh grade in three junior high schools which initially showed similar levels of reported smoking. The two schools in the experimental condition received the full smoking prevention program that year and a followup program the next year. Evaluation data were obtained with a simple questionnaire which was administered in school classrooms by project staff at the beginning and end of each school year. The items were divided into eleven factors (by previous factors analyses): decision making, adult social support, cognitive coping, peer social support, substance use, physical exercise, aggression, social entertainment, individual relaxation, parental support, and prayer. The decision-making portion of the questionnaire contained nine items beginning, "When I have a problem, I...." and ending with one of nine completions: think about which information is necessary, think about choices before taking any action, get information needed to deal with the problem, think about which alternative is best, think about risks in different ways, think about possible consequences of alternatives, compromise to get something positive from a situation, change an attitude that contributes to the problem, change behavior that contributes to the problem. The 5-point response scale was anchored at "never" and "usually."

In one of the two experimental schools, the program increased decision-making skills and internal health locus of control, while decreasing stress and smoking initiation. In the other experimental school, however, there was no effect on any variables, dependent or mediating. Wilis (1985) describes some aspects of the latter school's atmosphere that may have blunted the treatment.

Evaluating the evaluation: The control group received no treatment at all, while the treatment program was relatively structured, raising the risk of attentional effects. There is also the risk of training to the criterion in the self-reports of decision making. The study was unique in testing long-term impacts on

the mediating variables.

Social Skills Programs

Pellegrini and Urbain (1985) have evaluated 19 training programs aimed at improving "interpersonal problem-solving skills," perhaps the most systematic and comprehensive of which have been developed by Myrna Shure, George Spivack, and their colleagues at the Hahnemann Medical College in Philadelphia (e.g., Shure & Spivack, 1971; Spivack & Shure, 1974). Details on the content, duration, and level of these programs can be found in Pellegrini and Urbain's review, which also provides an instructive summary of potential methodological problems.

Shure and Spivack concentrated on developing and integrating three skills: (1) alternative thinking: the ability to generate multiple solutions to interpersonal problems; (2) consequential thinking: the ability to foresee both short-term and long-range consequences of different alternatives; (3) means-ends thinking: the ability to develop a plan of specific actions to attain one's goals, anticipating and overcoming potential obstacles. The program uses a sequential series of scripted games and group exercises.

Although they are potentially relevant to improving the decision-making skills of adolescents in general, the social skills programs covered by Pellegrini & Urbain's review were all directed either at pre-adolescent children or at special populations, such as delinquent or aggressive/impulsive youths (Zahavi & Asher, 1978). In addition, there was no specific measurement of decision-making abilities. Therefore, we will not summarize this review.

SUMMARY & CONCLUSIONS

Content

As shown in Table 1, most of the programs reviewed here provide training in 4 to 6 elements of the normative process of decision making. The Odyssey program is exceptionally comprehensive. It alone teaches how to distinguish among different decision situations and conveys ideas about probability and utility. However, there is more to decision making than even these steps.

Most of the curricula that we have reviewed are equally incomplete in their treatment of the research literature regarding decision-making processes. Although GOFER and Personal Decision Making are significant exceptions, each has a fairly narrow perspective. GOFER builds on research regarding the obstacles that stress poses to cognitive functioning in general and to decision making in particular. The importance of those factors is suggested by Zakay and Wooler's (1984) finding that the

improvement generated by a training program for adults disappeared when decisions had to be made under time pressure (which reduced the performance of trained and untrained subjects to the same low level). By contrast, Personal Decision Making is based on research that claims to show that intuitive decision-making processes are only a simplified version of the normatively correct ones. Neither of these programs considers the research central to the other. Neither they nor any of the other thinking and decision-making curricula are sensitive to the research on peer pressures and socialization which is central to the life and social skills program. Finally, none of these programs demonstrate more than a passing familiarity with the cognitive literature of behavioral decision theory. Studies there provide some insight into how people intuitively perform each component of the decision-making process, where they need the most help, and what interventions are most effective (e.g., Fischhoff, 1982).

Educational programs ought to reflect all that we know about how people behave. Thus, the content of decision-making programs must be faulted unless it either incorporates this literature or demonstrates its irrelevance (just as behavioral decision-making researchers might be faulted for not having translated their results with adults into programs for adolescents). A legitimate claim can be made that no program has enough time to teach everything. However, that is no excuse for not making what is taught sensitive to research regarding those topics.

Evaluation Studies

An evaluation is meaningless unless one knows just what has been done. Unfortunately, defining the manipulation or treatment is a recurring problem with most of the life and social skills programs, much more so than with the more structured thinking skills and decision-making programs. Where the exact procedures can be discerned, they often appear to be somewhat at odds with the programs' proclaimed goals of improving decision-making and problem-solving skills. Namely, "many programs in this area teach students how to behave as opposed to how to think. That is, alternative ways of responding to interpersonal problem situations are often modeled by the teachers or therapists and then children are often coached and given social reinforcement for their behavior. The problem this creates is that it becomes difficult to separate out the effects of the cognitive aspects of the training from the effects of role modeling, coaching and social reinforcement." (Adsit, 1988, p. 28)

The brevity of most programs (line 2, Table 2) must raise some doubts about the possibilities for changing anything so fundamental as general decision-making skills. It would be hard to expect such changes from students who bring with them no bad habits, much less from students who already have

inappropriate intuitions which must be unlearned. The relatively short duration of these interventions could be contrasted with the much greater class time invested in teaching a skill like addition, where it is much easier to give clear-cut feedback. The last row of Table 2 shows the absence of long-term follow-up studies. Considering the modest size of the present interventions, we suspect, regretably, that such studies would show little effect on decision-making abilities. We would be similarly reserved about the prospects for showing generalization beyond the context within which tests were made (Glasgow & McCaul, 1985).

In almost all cases, training programs were compared to control groups receiving no treatment at all. Where present, control groups typically received no attention at all (or even negative attention, if they knew that other classes in their school were receiving special treatment). An attention manipulation is particularly important considering the exhortation to work hard which is part of most curricula (e.g., list many alternatives, think about many criteria). That pressure might by itself produce improvement on test tasks, regardless of the other features of a curriculum. This may be particularly true when, as was typically the case, the test was no more than a self-report. It is relatively straightforward to tell teachers what they want to hear about one's behavior. Learning right answers may be a necessary condition for better decision making. However, it is clearly not sufficient. All too often, whatever support can be found for a curriculum may reflect no more than training to the criterion. Moreover, even that learning may be somewhat illusory where a significant part of the training involves teaching a special vocabulary--so that test questions may only be meaningful to course takers. Thus, control group subjects might behave similarly but simply not recognize the terms in which behavior is described. Some of those problems can be avoided. Where the critical kind of behavior is a form of overt "risk taking," like smoking, then it may be possible to take supplementary measures like urine or saliva samples. Where decision-making processes are the dependent variable, direct observation is much more difficult. A final source of concern is that despite teaching relatively similar steps of decision making (Table 1), every program studied uses its own set of dependent measures (Table 2, middle section), with no cross-referencing or psychometric studies. Thus, this critical aspect of evaluation is quite undeveloped.

One particularly suspect measure used in several evaluation studies was confidence in personal decision-making capabilities. For example, GOFER students responded to statements like "the decisions I make turn out well." Botvin's students responded to "I have the ability to solve most problems even though at first it looks as if there is no solution." Improvements in this sort of confidence might even be

undesirable if it represented an increase in confidence (and in overconfidence) without a corresponding increase in competence. In this respect, the GOFER question would be especially troubling. Botvin's question asks more about perceived ability to do something constructive (instead of panic, delay a decision, etc.), whereas the GOFER statement represents faith that things will work out.

Despite this inconclusive evidence regarding changes in decision-making behavior, some programs do seem to have demonstrably reduced risky behaviors, like smoking and drug abuse. There is, however, simply no way of knowing why they work and what is the specific contribution of their decision-making component. Conceivably, they do not teach decision-making at all. Rather, the decision-making component just serves to give students a feeling that they are being trusted to make their own choices. That, in turn, makes it easier for them to accept the strong persuasive messages in the rest of the program materials, telling them what to decide about sex, drugs, smoking, etc., under the guise of telling them how to go about deciding.

Decision Making about Decision-Making Curricula

Reviewing the experience with existing curricula raises several general questions regarding future programs and their evaluations:

What are the aims of the program?

"Improving decision-making skills" is too general a goal for designing or evaluating a curriculum. We have already mentioned the difference between knowledge about decision-making principles, attitudes toward decision-making procedures, and actual decision-making behavior. To the extent that appropriate knowledge and attitudes are necessary conditions for behavior change, they should also be goals of training. However, learning the right answers to knowledge questions provides no guarantee of wanting or being able to implement them in practice. Thus, behavior change should also be measured - recognizing the difficulties of doing so.

What theoretical approach guides a curriculum?

As Sternberg (1983) notes, any training program should be based on a theory of intellectual performance. We have argued that the theoretical bases for decision-making curricula should be a normative theory of how decisions should be made and a descriptive theory of how they are made. That descriptive account should include not only intellectual aspects of decision making, but also its emotional,

motivational, and social aspects. There is an extensive literature regarding these aspects, at least for adult behavior, but it is as yet neglected. It should be supplemented by the more general literature of instructional psychology which emphasizes lessons like the importance of explicating the appropriate problem-solving structure, procedures, and strategies, and of allowing problems to arise naturally, in order to address them and replace them with new behaviors.

The normative content of decision-making curricula also requires further thought. The model implicit to most existing programs is that the expert decision maker is an industrious person, going over all decision-making stages, quantifying every step, and integrating it effectively, unaffected by any bias. There is little discussion of the possibility that good decision making may also involve knowing how to make efficient short cuts, or having "canned" decisions available for some situations. If "an important aspect of intelligence is deciding just how one's resources and especially attentional resources should be allocated" (Sternberg, 1986), then that also ought to be an important aspect of good decision making. An expert decision maker might know, for example, when the transaction costs and expected yield of a full-blown decision-making process are not worth the effort. Decision-making expertise might mean having a set of general decision schemata and being able to match them to specific decision situations.

How should we evaluate a decision-making program?

A comprehensive answer to this question (like the others) requires an article of its own. Clearly, a set of evaluative criteria ought to be in place before a program is undertaken. These should include criteria of internal validity such as the fidelity of the program to the normative and descriptive literatures on decision making. They should include criteria of external validity such as changes in behavior, emphasizing generalizability and durability.

Should decision making be taught in a specific domain or in its own right?

Our review covered two kinds of programs: life and social skills programs, which taught decision making for the purpose of influencing specific behaviors (e.g., smoking, drinking), and decision-making programs, aimed at improving decision making per se. This contrast in approaches is a special case of the general issue regarding the generality and specificity of intellectual processes. This conflict has long been a controversial topic in the educational and psychological literature.

Those who advocate the specific approach (e.g., Glaser, 1984) claim that one cannot separate

knowledge from processes: "High aptitude individuals appear to be skillful reasoners because of the level of their content knowledge as well as because of their knowledge of the procedural constraints of a particular problem form... Thus, improvement in the skills of learning... takes place through the exercise of conceptual and procedural knowledge in the context of specific knowledge domains. Learning and reasoning skills develop not as abstract mechanisms of heuristic search and memory processing. Rather, they develop as the content and concepts of a knowledge domain are attained in learning situations that constrain this knowledge to serve certain purposes and goals." (p. 99) From this perspective, it seems best to teach such skills as problem solving and decision making in terms of familiar knowledge domains. Summarizing the literature Glaser and Bassok (in press) conclude, "Useful knowledge is not acquired as a set of general propositic but by active application during problem solving in the context of specific goals." (p. 42)

According to the general approach (Sternberg, 1985), "processes of various degrees of domain generality are critical to the acquisition and utilization of domain-specific knowledge, just as domain-specific knowledge is critical to the acquisition and utilization of further domain specific knowledge." (p. 572) Those who hold this belief recognize the value of using familiar materials in teaching, but view it as a vehicle for conveying general skills. They argue, however, that it is more efficient overall to seek such general understanding, rather than having to address decision making in every domain separately.

How can we get good transfer?

The relative efficiency of general and specific approaches is one aspect of the transferability of training. "Transfer" is change in the performance of one task as a result of the prior performance of a different task (Gick & Holyoak, 1987). Typically, the amount of transfer depends on the degree of similarity between the two tasks. Thus, more transfer would be expected to decision problems in life that are similar to those considered in the training period. Although the principle of similarity is well established, the definition of similarity must be determined for particular tasks. The role-playing exercises in many curricula seem to represent attempts to capture as much as possible of the setting in which actual decisions will be made, including their emotional and social pressures. Although this appears to be a reasonable strategy, a more comprehensive account is needed. For example, if we successfully teach 6 basic steps of decision making for every decision, then that is probably what will happen in real-life situations that cue lessons from the course. However, real-life situations often involve time pressure, making such thoroughness a luxury. Thus, even if there are strong commonalities to decision making in

different contexts, a program might still have to provide the special decision-making skills needed for specific situations.

Several other principles of training are worth remembering: (a) More training improves transfer; two to eight hours of decision-making training is obviously not enough for such a complex skill. (b) Transfer is best with varied training problems. (c) Transfer is best if an abstract rule or explanation accompanies the specific solutions (Gick & Holyoak, 1983; Glaser & Bassok, in press).

When shall we teach what?

No doubt, adolescence raises serious decisions. Although that raises an urgent need to teach decision making, that effort may be useless unless adolescents have already acquired the necessary basic cognitive skills. Beyth-Marom et al. (1987) provide such task analysis for decision-making under certainty. Matched with an analysis of cognitive development (Keating, 1980; 1988; Kuhn, Amsel, & O'Loughlin, 1988), it could provide the basis for timing and sequencing the learning of these skills.

How much teaching is needed?

If decision making requires many higher-order thinking skills, much time is clearly needed. The only sustained improvement in general thinking skills reported in the literature involved two years of graduate training (Lehman, Lempert & Nisbett, 1988).

What are the opportunity costs?

Students participating in a curriculum are doing that rather than something else. One must, therefore, ask what they are giving up. We suspect that decision making can be taught and that it is worth the investment of significant class time. However, a much stronger evidentiary base is needed if that claim is to be made on the basis of scientific results rather than scientists' impressions.

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T^BLE 1: Curricula's Content

Decision-making Skills	CURRICULUM GOFER	Personal Decision Making	Odyssey	Life Skills-Schinke et al.	Life Skills-Botvin	Decision Skills Curricula
Distinguishing between different decision situations			X			
Defining & Identifying decision-making situations	X		X	X	X	X
Listing action alternatives	X	X	X	X	X	X
Identifying criteria for comparing alternatives	X	X	X	X	X	X
Assessing probabilities (when necessary)			X			
Assessing utilities (when necessary)		X	X			
Assessing alternatives	X	X	X	X	X	X
Assessing the value of information						
Evaluating decision process	X	X	X			X

TABLE 2: Evaluation Studies

Feature	CURRICULUM					
	GOFER	Personal Decision Making	Odyssey	Life Skills Schinke et al.	Life Skills Botvin	Decision Skills Curriculum
Manipulation						
Structure	high	high	high	low	high	intermediate
Duration (hours)[a]	(16-20)	(10)	56(5)	8(2)	10-20(2)	8(2)
Groups[b]	M,NM	M,NM	M,NM	M,NM M,OM	M,NM	M,NM
Decision Making Measures						
	Flinders ADM questionnaire	Decision Making test	Ability tests	Perspective taking	Decision-making autonomy	Decision-making questionnaire
				Means-end thinking		
	Virgil questionnaire		TAT	Anticipating consequences	Confidence in problem solving	
	Decision knowledge questionnaire					
Time of Testing	Immed.	Immed.	Immed.	Immed.	Immed.	Immed. & 10 months later

[a]The number in brackets specifies the number of hours devoted to decision making.

[b]M=group receiving focal curriculum; NM= control group receiving no treatment, OM=group receiving another curriculum.

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