The concept of problem solving education essay

Introduction

Problem solving is generally regarded as the most important cognitive activity in everyday and professional contexts. Most people are required to and rewarded for solving problems. Many of our daily activities involve problem solving of some sort. For example, we decide what to wear in the morning, which route to take to get to our school, which academic-related duties to perform in which sequence, what to have for lunch, and so on. Of course, not all problem solving is alike. There are problems that require extensive thinking. There are problems that we have never encountered before and there are problems we are familiar with. There are problems that have very clear goals, and there are problems where the goals are far from clear. Problems then, can be distinguished on any number of meaningful dimensions, and the solution processes, the mental steps w engage in when solving a problem, may differ widely for different types of problems.

Researchers in the area of problem solving have long been troubled by the absence of agreement on the exact definition of problem solving. To mention, some of the better known definitions of problem solving that have been offered in the past.

Problem solving

Is a goal-directed sequence of cognitive and affective operations as well as behavioral responses for the purpose of adapting to internal and external demands or challenges. (Heppner and Krauskopf, 1987, P. 375).

Is defined as any goal-directed sequence of cognitive operations. (Anderson, 1980, p. 257)

What you do, when you don't know what to do. (Wheatley, 1984, p. 1)

Is self-directed cognitive-behavioral process by which a person attempts to identify or discover effective or adaptive solutions for specific problems encountered in everyday living" (D'Zurilla & Nezu, 2001, p. 212).

Problems are a central part of human life, so that there are many different kinds of problems to be identified and solved. They exist in a variety of forms within our major social life or our chosen future profession. Therefore, solving problems is clearly an important survival skill in today's information society where we must deal with a complex, technologically advanced world. Business leaders emphasize the need for higher order thinking skills and problem solving skills for the future workforce.

There are a number of variable attributes of problems. Problems vary in knowledge needed to solve them, the form they appear in, and the processes needed to solve them. The problems themselves also vary considerably, from simple addition problems in elementary school to complex social-cultural political problems like those encountered in the Middle East. Intellectually, problems vary in at least four ways: structuredness, complexity, dynamicity, and domain specificity or abstractness.

1. Structuredness

Problems within domains and between domains vary in terms of how well structured they are. Jonassen (1997) described problems on a continuum from well structured to ill-structured. The most common problems that students solve in schools, universities, and training venues are well-

structured problems. Like the story problems found at the end of textbook chapters or on examinations, well-structured problems require the application of a limited and known number of concepts, rules, and principles being studied within a restricted domain. Ill-structured problems, at the other end of the continuum, are the kinds of problems that are more often encountered in everyday and professional practice. Also known as wicked problems, these problems do not necessarily conform to the content domains being studied, so their solutions are neither predictable nor convergent. Ill-structured problems are also interdisciplinary, that is, they cannot be solved by applying concepts and principles from a single domain.

For a long time, psychologists believed that " in general, the processes used to solve ill-structured problems are the same as those used to solve well structured problems". However, more recent research in everyday problem solving in different contexts makes clear distinctions between thinking required to solve well-structured problems and everyday problems. Dunkle, Schraw, and Bendixen (1995) concluded that performance in solving well-defined problems is independent of performance on ill-defined tasks, with ill-defined problems engaging a different set of epistemic beliefs.

2. Complexity

Problems vary in terms of their complexity. Problem complexity is determined by the number of issues, functions, or variables involved in the problem; the degree of connectivity among those variables; the type of functional relationships among those properties; and the stability among the properties of the problem over time (Funke, 1991). Simple problems, like textbook problems, are composed of few variables, while ill-structured

problems may include many factors or variables that may interact in unpredictable ways. For example, international political problems are complex and unpredictable.

Complexity is also concerned with how many, how clearly, and how reliably components are represented in the problem. Complexity and structuredness overlap. Ill-structured problems tend to be more complex, especially those emerging from everyday practice.

3. Dynamicity

Problems vary in their stability or dynamicity. More complex problems tend to be dynamic; that is, the task environment and its factors change over time. When the conditions of a problem change, the solver must continuously adapt his or her understanding of the problem while searching for new solutions, because the old solutions may no longer be viable.

4. Domain (Context) Specificity/Abstractness

Most contemporary research and theory in problem solving claims that problem solving skills are domain and context specific. That is, problem-solving activities are situated, embedded, and therefore dependent on the nature of the context or domain knowledge. Problems in one organizational context are solved differently than they are in another context. Problems at IBM are solved differently from those at Hewlett-Packard. They have different organizational structures, different cultures, and different sociological mixes, all of which affect the kinds of problems that arise and how they are solved. Problems within a domain rely on cognitive operations that are specific to that domain (Mayer, 1992; Sternberg and Frensch, 1991).

If problems differ in terms of structure, complexity, and context, then so too must the kinds of problem-solving processes. Jonassen (2000) described a typology of problems, including puzzles, algorithms, story problems, rule-using problems, decision making, troubleshooting, diagnosis-solution problems, strategic performance, systems analysis, design problems, and dilemmas.

Problem solving self-evidently links two elements: the problem with which the individual begins and which leads to engaging in the exercise; and the solution which presumably is an objective or desired outcome of that effort. D'Zurilla and Nezu have described a problem as " any life situation or task (present or anticipated) that demands a response for adaptive functioning, but for which no effective response is immediately apparent or available to the person, due to the presence of some obstacle(s)" (2001, pp. 212-213). A solution is " a situation-specific coping response or response pattern (cognitive and/or behavioral) which is the product or outcome of the problem-solving process when it is applied to a specific problematic situation". Put at its simplest, problem-solving training or therapy is designed to help individuals find their way from problems to solutions, using a systematized sequence of methods and steps. Perhaps more importantly, it is also designed to enable them to acquire the capacity to repeat this when necessary on subsequent occasions.

D'Zurilla and Goldfried (1971) in their initial conceptualization, envisage problem solving as a progression through five stages. They were delineated as:

1. Problem orientation or " set";

2. Problem definition and formulation;

3. Generation of alternative solutions;

4. Decision-making;

5. Solution implementation and verification.

In advocating the view that the ability to secure ideas for solving problems is a skill that can be acquired, D'Zurilla and Goldfried (1971) cited research on the procedure of brainstorming.

According to Spivack et al. (1976) the absence of effective problem-solving is associated with interpersonal difficulties and other mental health or behavioral problems. There are two possible causal pathways leading to this outcome.

In the first, poor problem solving is a result of inhibition of skill. Individuals have the ability to solve problems but they do not apply it. This is primarily a motivational issue and unlikely to be remedied by training. In the second, the problem derives from a deficit of skill. Individuals have not acquired adequate levels of skill for effective problem solving, most probably as a consequence of limited learning opportunities, constrained by parenting or other socialization influences.

The manner in which interpersonal learning occurs is a function of its wider socio-cultural context. It is therefore often emphasized within problem-solving training procedures that the focus of intervention is upon the how

rather than the what of problem-solving. Individuals are given assistance in acquiring or improving skills (changes in cognitive-behavioral capacities) without any presumptions regarding the ways in which those skills will be applied (the content of their thinking). This is based on the supposition that while culture has a profound influence on the dominant themes is individuals' thoughts (expressed through language, beliefs, values, personal goals).

Finally, Regardless of how many kinds of problems there are, there are similarities in the cognitive processing engaged within these classes of problems. Within classes, there are differences in problem solving depending on the domain or context in which the problem occurs and its structuredness and complexity. Because it is practically impossible to design and develop models, methods, and tools for solving problems in every domain.