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Compartmentalization

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Humans tend to compartmentalize. We hold ideas in isolation from each other and do not make connections among them. The failure to connect ideas to each other is a major impediment to the construction of knowledge. This can lead to the simultaneous holding of beliefs inconsistent with each other, difficulty in using prior knowledge when faced with a new problem solving task, and a lack of creativity. Compartmentalization of knowledge leads to isolation of ideas. When ideas are stored in distinct areas of the mind without links that are the basis of integration the result is an array of closed systems leading to a lack of cognitive progress. Although evolutionary psychologists have argued that compartmentalization may be advantageous in some contexts, (Kurzban, 2010) and a psychoanalytic interpretation identifies compartmentalization as a helpful defense mechanism (McWilliams, 1994), the cognitive disadvantages of compartmentalization are substantial. It is essential that we as educators equip students to recognize compartmentalization in their own thinking and overcome its effects where appropriate.

The consequences of lack of integration and educational practices to address these consequences are outlined below.

Types of Compartmentalization

Belief Systems

There is evidence that sets of beliefs important to an individual may have no logical connection to each other or may be inconsistent with each other. This may occur in the context of political, scientific, or religious areas, as well as in beliefs that affect our private lives. A prime example in the political area is illustrated by the belief systems widely held by individuals who self-identify as Democrats and sets of beliefs held by those who self-identify as Republicans. Within each party affiliation there are beliefs that do not have any obvious relationship to each other except for being part of the general party position. For example, the belief that the government should promote a free market economy with few government regulations, widely held by conservative Republicans, does not logically lead to the view that government should make laws that restrict access to abortion, even though that is also a view associated with conservative Republicans. (Wikipedia, 2020a). The two views may be seen as inconsistent with each other in terms of attitudes about government's role in the lives of individuals. Similarly, there are members of the Democratic Party who believe both that government programs are inefficient and that they should be expanded. (Wikipedia, 2020b)

Another example, argued by Thomas Frank (2007), is that the majority of the citizens of Kansas espouse economic views that in fact do not benefit them. In the area of religious belief, there are individuals who oppose abortion because of a commitment to the sanctity of life, while simultaneously favoring the death penalty for certain crimes. On the level of the individual, there are scientists who insist on raising doubts about the nature of the universe as part of their work while simultaneously accepting on faith the certainty of religious tenets. There are persons who believe in democratic principles in the conduct of their professional lives but exercise authority in making personal decisions.

Compartmentalization can be related to discrepancies between between thought and action. Persons who believe in protecting the environment can be found purchasing gadgets that lead to the depletion of environmental resources; academics give long, one-way lectures on the importance of learning through interactive pedagogy; cancer researchers can be heavy smokers; critics of capitalism can invest heavily in the stock market.

The existence of compartmentalization may help us to live with discrepancies in our lives, but it can surely be a source of dysfunction. The examples of voting against one's economic interests or smoking when it is known to be unhealthy are certainly cases where harm follows from failures to connect sets of beliefs with each other or beliefs with actions. I argue that we should at least be aware of the contradictions that can result from compartmentalization and be ready to remedy the effects of compartmentalization when it is in our interests to do so.

Problem Solving

Problem solving is a prime example of the use of previously acquired knowledge to address novel situations. In many cases of problem solving we can be successful by applying the solution of one problem to solving a new problem. Unfortunately, we often fail to make the cognitive connections between previous experiences and new situations that are needed for problem solving success. One illustration of this is through our weakness in analogical reasoning. A classic experiment by Duncker (1945) has been the basis for research on such reasoning. In Duncker's original experiment, participants are told that a patient has a tumor that can only by cured by radiation with a powerful radioactive beam. Unfortunately, the beam is so powerful that it will damage healthy tissue around the tumor. The solution is to have several weaker beams aimed at the tumor from different angles. None of these weaker beams will damage healthy tissue but their collective merging at the tumor will destroy the tumor. Glick and Holyoak (1980) presented an analogous problem in which a general must attack a fortress that is surrounded by a moat. It is not possible to send a force strong enough to capture the fort by crossing any of the bridges spanning the moat because the bridges are not strong enough to sustain the weight of the full force. The solution is to divide the attacking forces into smaller units and have each cross one of the bridges. Each bridge could sustain the weight of the reduced forces. The forces could then be assembled at the fort and succeed in the attack. The military problem is analogous to the tumor problem, and if participants could make the connection between the two, solving the military problem should facilitate solving the tumor problem. The evidence is that participants in the experiment were not able to make this connection. Solving the analogous problem leads only to a 30% success rate on the subsequent problem. The failure to make use of prior information (the first problem) in solving the second problem is an important example of our cognitive inability to make connections. This suggests that the lack of connectivity or consistency in our political, economic or personal belief systems may be based on characteristics of the human cognitive system.

Other studies of problem solving suggest that we cannot make connections among the essential elements of two problems. Rather, we are tend to focus on the surface characteristics of problems. A representative series of studies by Chi, Feltovich and Glaser (1981) demonstrated that novices tend to solve physics problems by focusing on surface characteristics and are not able to make connections among underlying principles. Experts do gain the ability to represent problems in terms of their principles after considerable practice. A hopeful aspect of research on problem solving is that in many domains expertise can be achieved through practice. This suggests that compartmentalization can be overcome through experience, if that experience is properly structured.

Creativity

In the groundbreaking Silliman Lectures, later published as The Origins of Creativity and Imagination (1978), Jacob Bronowski argued that the heart of creativity is making connections between two ideas not previously thought to be related. He cited the example of Sir Isaac Newton making the connection between the movement of objects in the sky and the movement of objects falling on the surface of the earth. The result of this connection was the theory of gravity. The important point is that the relevant observations already existed. The breakthrough came from the cognitive act of connecting these observations. It is this connection that allowed a deeper understanding to emerge. The idea that creativity is facilitated by making connections is also discussed by Gaut (2010) and Dillon (2006). As with problem solving, a focus on ideas in isolation defines a closed system in which progress is impeded. In short, compartmentalization is an impediment to creativity.

The Implications of Compartmentalization

In all three areas, the development of beliefs that are functional, success in solving problems, and creating what did not exist before, compartmentalization is a hindrance to cognitive success. The isolation of ideas leads to a closed system in which progress is stifled and we do not develop the knowledge that can better our lives. In considering how to address the issue of compartmentalization, it is important to consider the possibility that compartmentalization is a natural result of our cognitive nature. As mentioned above, some have argued for the evolutionary advantages of compartmentalization. (Kurzban, 2010). This means that overcoming compartmentalization is unlikely to happen spontaneously. We need to create situations that favor making connections. At the very least, it is important to recognize when we are engaging in compartmentalization. Going beyond this recognition to make decisions about the wisdom of integrating across compartmentalized beliefs may be more complex, but at least these decisions need to be made consciously

Overcoming compartmentalization

As mentioned above, the possibility that compartmentalization has an evolutionary basis suggests the need to overcome its effects through conscious educational processes. If we think of evolutionarily controlled processes as "natural" then we need interventions to help individuals address the difficulties involved. Whether compartmentalization has an evolutionary basis or not, it requires conscious attention to alleviating its negative consequences. Liberal education is well suited for this task. It focuses on large scale concerns that encourage connection making; it attends to the process of thinking as well as the content of knowledge; and it uses pedagogies such as discussion and writing that facilitate consideration integration across ideas.

Higher-Order Conceptions

If the basis of compartmentalization is a failure to make connections, one approach is to choose tasks involving significant, high level conceptions. An example might be trying to understand the nature and origins of evil in the human experience. This task can be the basis for considering different ideas from various sources and connecting these ideas to the question of evil. Students could read Hannah Arendt's (1963) account of evil as a case study of evil along with experimental psychological research on the sources of human aggression. (Milgram, 1974; Buss, 1961). If we think of the higher order concept of evil as concept A, a case study of evil as concept B, and empirical evidence on human aggression as concept C, the task of understanding evil leads to connections between A and B and A and C. The overarching concept or concern then becomes the vehicle for connection making.

These relationships can be explicitly asked for in college or university courses. For example, in the first year course at Lawrence University, students read and discuss primary texts. Two of these texts are Plato's Republic (2001) and Native Guard (2006) by Natasha Trethewey. On the surface, these are seemingly unrelated. One was written over 2,000 years ago by a Greek philosopher and the other in the 21st century by an African American woman. But what they have in common is that both address issues of justice. Plato uses a dialectic technique to have a group of young men sharpen their ideas through considerations of hypothetical situations and carefully considered analogies. Trethewey describes her own experiences in a racially biased environment that includes extreme oppression and murder. When students are asked to discuss and write about how both works strive towards an understanding of justice, they are able to see past the surface details and approaches of each work and strive toward the essence of justice. There are two significant results. First is that they consider the basic elements of justice through commonalities. Second, they are able to form abstract concepts. Instead of a set of discussions among a group of (presumably) wealthy young men or a description of a racially charged scene in a Southern city, they are thinking about the elements of justice in a way that cannot easily be represented concretely. This ability to abstract is a significant part of making connections and leads to knowledge that can be extended. When Newton constructed the idea of gravity, he had a concept more abstract than the sight of falling objects on the surface of the earth or the sight of objects moving across the sky and one that could be generalized to a large number of situations.

The approach of integrated knowledge through making connections to high level conceptions can be extended to topics such as poverty, force (both physical and political), human nature, identity, development, or wellness. It is not difficult to see how any of these ideas, or others, could become a means of learning how to make significant connections.

Interdisciplinary Courses

Making connections can be done in the context of interdisciplinary courses. In such courses there is typically an issue that is addressed through different disciplines or there is an explicit comparison of the methods and goals of different disciplines. For example, the nature of human memory can be studied within a single course that includes the results of investigations in experimental psychology and the reading of imaginative literature. These two disciplines, psychology and literature can highlight the contrasts between methodologies and fill in gaps in the knowledge from one discipline with information from the other discipline. For example, experiments on memory sometimes lack consideration of the importance of real life emotions in remembering. This is a lack of information that can be addressed through autobiographical accounts of memory. On the other hand, experiments can provide some surprising results, such as knowing that distributed practice is better than intense practice in the remembering process. Such information would not normally be available through studies of literature.

The use of interdisciplinary courses is likely to be more explicitly focused on connections than is a course like the first year course described above. Either type of course can focus on connection making as an important cognitive skill. Almost by definition, this will be part of an interdisciplinary course. What I argue here is that the need to make connections be a stated course goal if we want students to enhance their connection making skills.

Paired Courses

It is possible to focus on connection making through the pairing of two courses or the clustering of several courses. For example a psychology course on visual perception can be paired with an art course on painting.

If a course on literature that involves visual metaphors is added to the grouping, then there are three different approaches to understanding the visual world. The possibilities for connection making are very powerful in this combination.

One of the advantages of pairing courses is that they can still exist as separate entities that serve a variety of purposes. This means the effort of creating an interdisciplinary course or the use of human resources to teach such courses can be avoided. Of course, some explicit connecting making among the courses will need to be made. There are a variety of ways to do this. For example, a final project in one of the courses can have a requirement of referring to material in the other course or courses.

The basic argument here is that a conscious effort must be made to teach students to make connections. Too often in higher education we assume that students will discover qualities on their own. As important as this can be for individual development, we cannot assume this will happen without some intentionality.

Making connections can lead to deeper insight, fill in gaps in knowledge and address dysfunctional behavior. Perhaps most of all, in can lead to ideas that did not exist before. Being able to make connections is a cognitive gift than can last a lifetime.

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