

Some Fundamentals of Engaging Stories

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SUMMARY *This paper discusses a form of information transfer referred to as story. It is suggested that stories serve as a singularly effective replacement for direct experience, a useful but sometimes difficult environmental education technique. The effectiveness of stories is argued to derive from their ability to engage the attention of the reader. The paper concludes with a list of elements that can be used to create cognitively engaging stories.*

Introduction

Environmental education is a process that develops a citizenry that is capable and willing to work towards solutions to environmental problems. Environmental education has a broad challenge outlined in the Tbilisi definition (UNESCO, 1980). This definition and accompanying objectives list specific abilities that environmental education should help citizens obtain or strengthen: awareness, concern, knowledge, attitudes, motivations, commitments and skills. Programs, curricula and resource materials vary by the degree to which they help learners achieve each of these abilities; some specialize in creating awareness, while others focus on increasing the willingness to take action. Nearly all, however, have a strong information component. This paper argues that the means of presenting information may be as important as the content of the information. This notion has found expression in the field of environmental education through the development of direct experience or 'hands-on' learning projects. While direct experience is clearly a powerful teaching tool, this paper suggests that stories may be an effective replacement for direct experience. This is particularly the case if one attends to certain fundamental elements of a good story. These elements, some very familiar to educators, are discussed.

Clarity from Direct Experience

Because the presence or absence of knowledge is closely linked to a willingness to take action, it may seem that changing behavior is simply a matter of transferring knowledge. However, the acquisition of knowledge can be problematical. Learning is very selective and is strongly biased towards certain informational characteristics. Many of these characteristics are found in situations that allow for *direct experience* with the target issue or behavior. It is thought that these experiences (e.g. trial periods, demonstration project, action projects and field trips) contain many elements that are inherently interesting and engaging and result in greater learning than might otherwise occur. Studies conducted and reviewed by Fazio & Zanna (1981) point to the importance of direct experience in learning and suggest that there is a difference between indirect and direct experience in learning and suggest that there is a difference between indirect and direct experience with respect to how the information is processed and retrieved. Their findings indicate that attitudes and knowledge developed through direct experience are better predictors of future behavior than are attitudes and knowledge formed without behavioral experience (e.g. gained through reading a brochure filled with factual information). These attitudes are held with greater confidence and the knowledge gained is more well-defined and more resistant to change than that formed without direct experience. Others (see for instance Ramsey *et al.*, 1981) claim that direct experience is the most effective way to teach environmental problem solving skills.

Direct experience, however may not always be the best strategy (Monroe & Kaplan, 1988) nor may it always be possible. There are a number of problems associated with using direct experience.

- (1) Coordination is often expensive and difficult. Field trips, action projects, demonstration projects and other activities can be prohibitively expensive. Clearly, when dealing with education in non-formal settings (e.g. citizen behavior, an employer-based car pooling program and consumer behavior) coordination problems and potential unwillingness of the participants are major constraints.
- (2) Single intervention efforts don't give sufficient variability. Without a sufficient variety and number of experiences, developing clarity about an idea or concept is very difficult. Without a variety of instances to learn from it is unlikely that the information gained can be readily applied in future situations. Resnick (1983) emphasizes the need for repeated exposure when teaching mathematics and science concepts. Decision scientists (see for instance Tversky & Kahneman, 1982; Nisbett & Ross, 1980) also point to the large influence of familiarity (e.g. prior experience) in the decision making process. Unfortunately, due to coordination and expense issues, direct experience learning must often be based upon single instances of exposure.
- (3) Direct experience may not always be positive. When one learns something, this knowledge is often accompanied by an effective code. If one could somehow insure all experiences would be positive then there would be no issue here. Unfortunately, this is not the case. Negative experiences do occur and get coded with negative affect along with the acquired knowledge. People will tend to avoid situations that recall or require the use of knowledge having such negative affect (Kaplan, 1991). It follows, then, that

if the direct experience is negative it may lead to the avoidance of similar situations; exactly the opposite of the effect intended. This avoidance is especially powerful when experience with that situation is limited. Thus, with the best of intentions, there is a risk of doing harm with direct experience.

- (4) Direct experience is not always possible. There are many environmental issues where direct experience is not possible. This is true of large-scale environmental issues, such as acid deposition, ozone depletion and climatic change. For instance, in the case of global warming the signal-to-noise ratio (i.e. of long-term global climatic change to short-term daily and seasonal change) is so low that it escapes human perception. Another factor is the time lag between behavior and noticeable environmental change; when the effect of one's behavior does not directly follow that behavior, associations between the two are difficult to make (Pawlik, 1991; Brewer, G.D., 1992). Because the physical parameters of large scale environmental change often cannot be processed or responded to directly, knowledge about the problem and appropriate behavioral remedies must be learned indirectly. And certainly, this problem is true of the many environmental issues that occur too far away to make a field experience possible (e.g. desertification, rain-forests).

Stories: substitutes for direct experience

Direct experience may not be a feasible nor even a preferred behavior change strategy in many environmental situations. Unfortunately, finding substitutes for direct experience has not been a priority in the fields of environmental education or conservation behavior. In fact, when knowledge-based interventions are utilized most programs have relied on text-based documents that, while informative, are nonetheless dull and uninteresting (Stern & Aronson, 1984). Information presented in an uninteresting format is unlikely to be internalized. Lack of such internalization is a significant problem and a contributing factor to the failure of individuals to adopt many technically and economically feasible programs.

The use of case studies or narratives (or 'stories' as they will be referred to in this paper) which provide interesting and mentally engaging information has been suggested as an effective substitute for direct experience (Monroe & Kaplan, 1988; Monroe & De Young, 1994). A good story readily encourages a depth of cognitive processing that makes it more likely the information presented will be used when making future decisions about the issue or behavior in question.

A Cultural Bias against Story

Before introducing the ways we use stories and the elements that make stories work, it is necessary to examine a cultural bias against the use of stories in education and behavior change. This bias is discussed by Sarbin (1986), who explains it using a theory of 'root metaphors'. The 'root metaphor' theory proposes that every culture has a unique mental framework that helps its members to organize and make sense of occurrences in the environment. Sarbin

describes the Western metaphor as one of 'mechanism'. Our educational model, based on the metaphor of 'mechanism', is biased to explain natural occurrences through the movement of external forces, one against another. This mechanistic or scientific explanation of environmental occurrences tends to emphasize raw facts and declarative knowledge over narrative or historical explanations. Its main educational tools are objective, expository information-intensive educational curricula, text and news articles, to the exclusion of the story.

There is another possible bias against stories. Stories and storytelling are most often associated with fantasy or pretending. They are viewed as primitive, non-scientific or only for children (Rosen, 1985) or recreation. Serious scientists and educators may be skeptical of their use and favor instead the use of factsheets and text books (Kearney, 1994). Nevertheless, several prominent uses of stories can be found.

The Use of Stories

Stories as a Traditional Means of Communication

Stories are an inherent part of culture. All people, young and old, of all cultures are familiar with stories. They have been used traditionally to explain natural phenomena, convey morals and values, mold culturally appropriate behavior, preserve cultures and resolve personal problems (Stein, 1982). Oral stories were often the only records of a culture as it was passed down from generation to generation. Because of their importance, stories were told with great care and storytellers were shown respect (Baker & Greene, 1977).

Stories as Modern Means of Communication

Stories enrich life by stimulating imagination, clarifying emotions and suggesting solutions to problems (Bettleheim, 1975). They are successful in doing so because they simplify complex situations, a prerequisite to coping with enormous amounts of information. This simplification has been most often accomplished by including typical characters with which people can readily identify (Bettleheim, 1975). It has been suggested that stories are a particularly appropriate medium for formal educational settings because they present history in a subjective form that is closer to the way people explain themselves and the world (Freeman & Levstick, 1988).

One does not have to go far to observe the pervasiveness of stories in our culture. Much of the information we get in our lives is in narrative form and, through this form, our understanding of the world is formed (Schank, 1990a). Gudmundsdottir (1991a, b) reports that traditional midwives share stories with each other to help aid in the technical diagnosis of problems and to identify appropriate remedies. The same is true for repairers of complicated electromechanical machines (e.g. photocopiers), where stories are used to describe problems and propose solutions. Stories have also been shown to be significant in decision making situations (Schank, 1990a; Halford & Sheehan, 1991). A study by Neustadt & May (1986) showed that government officials tend to make decisions based on stories. These officials commonly used stories of what had happened to them in similar situations. In fact, it was reported that they relied

on stories more than they relied on a rational, objective decision making process.

Another example of the successful use of stories in a technical area is discussed by Armstrong (1992). Recognizing the ageless appeal of stories, Armstrong decided to use stories to explain the core values and visions of a corporation's future as well as to celebrate its successes. It turned out to be an amazingly effective form of communication and motivation. Eventually, Armstrong reports, stories replaced the company's policy manual.

A Human Bias for Stories

Regardless of the current cultural bias in favor of expository, factual and information-intensive text, people have a natural bias toward thinking, perceiving and imagining within a narrative structure. If shown two or three unrelated pictures and asked to remember what was seen, participants will make up a story to explain the pictures and how they relate. And when participants were shown two or more triangles on a computer screen in random motion, they almost always use a narrative to describe the movements (Sarbin, 1986). Even the most rational and objective scientists sometimes use narratives to explain their findings. For instance, Marshack (1991) uses a story to explain the meaning of a Mesolithic bone fragment with markings on it and critical discoveries, such as Watson and Crick's double helix model, are typically retold in a time-sequenced story of trials, complications and results.

Stories as a Means of Environmental Education

Many researchers are arguing for an increased role of stories as vehicles of knowledge transfer (Rosen, 1985; Sarbin 1986). DiPardo (1990) suggests that the best teaching occurs when meeting learners on their own turf using the narrative as a starting point. Within the field of environmental education there is a strong and growing awareness of the value of stories. Monroe & Kaplan (1988) argue that the use of stories (i.e. case studies) and talking about what others are doing to solve environmental problems may be as or even more effective than the traditional approach of 'learning while doing'. Monroe (1991) has shown a significant association between interesting stories and attitudes toward taking conservation actions. Schank (1990b) has effectively employed computer simulations containing databases of stories as teaching tools. Yates & Aronson (1983) found that using stories of 'super-conservers' was a particularly effective means of promoting energy conservation.

Interest

The cultural bias against stories is consistent with, if not the basis for, the faith in the 'issue comprehension' behavior change model. This model predicts that as soon as people are fully aware of the facts and understand the logical causes and consequences of their environmentally destructive behaviors, they will take immediate and appropriate actions to improve matters and, perhaps, convince others to do the same. Thus, to achieve environmental protection and restoration

one need only provide more and better facts, distribute these to more of our citizens who will then comprehend the crisis and act appropriately.

The difficulty with this approach lies not in its faith in the power of information, for that is something shared by most education and behavior change strategies. Its error is to focus on only one way of presenting information. There is much evidence that informational programs fail not because individuals are incapable of awareness or have difficulty understanding the causes and consequences of their actions, but because the information presented simply does not hold the audience's attention, engage their intellect or present the material in a behaviorally meaningful way (Ester & Winett, 1981–1982; Dennis *et al.*, 1990). A key, then, is to provide information that is interesting and engages the reader.

One hypothesis about why stories may be useful focuses on their unique ability to engage the reader (Bardwell, 1991). She reasons that engagement allows the reader to mentally build an understanding of the information, to become involved with the text in a cognitive sense. Research has attributed learning to cognitive involvement, citing the depth of involvement as a determinant in how well information is processed and whether that knowledge can later be remembered or transferred to new problems (Lepper & Malone, 1987). Stories not only involve a reader, but also supply an example of the context or the circumstances under which this information is useful. The context might assist readers in remembering important concepts from the story text. From a specific story, readers can build a mental model of information that is far easier to recall and transfer to a new setting than is generic information, such as that supplied by textbooks. Although the goal of transferring knowledge is to help the learner build a generic structure in their head, reading about the structure does not help the reader reconstruct it. This generic knowledge must be constructed by the owner and built over time, out of specific instances (Kaplan & Kaplan, 1982).

Interest is an important issue in engaging a reader. It is important, however, to distinguish between two types of interest: topic interest and interestingness (Schiefele, 1990). When the reader is asked 'is this passage interesting?' it may not be possible to know if their answer means that they are interested in the topic or if the text itself is interesting. Although this is the distinction between topic interest and text-based interestingness, it is not a distinction most people are asked to make. Yet people are familiar with these two forms of interest, as any reader of a dull passage about a favorite topic might reveal.

Topic interest involves what one already knows and feels about the subject. A great deal of the research on interest is focused on topic interest (Asher, 1980). Interestingness focuses on the actual construction of the story and is independent of the topic being covered. Both forms of interest engage readers in the material (Hidi & Baird, 1986).

Topic Interest and Prior Knowledge

The topic of a story may, by itself, engage one's attention (Bank, 1986). A reader's prior interest in a topic makes written material about that topic interesting. Such *topic-based interest* works for those with a predisposition to spaceships or horses, for example, which usually implies a prior exposure to these subjects, as well as for universally appealing content such as danger and sex (Schank, 1979).

If we accept that understanding a story is an explanation-driven process, it follows that people will not be able to understand a story's plot or a character's action unless they can find a plausible explanation for why such an action occurred in the first place (Wilensky, 1978). Thus, a certain degree of prior knowledge about the content must exist before a reader can understand the story and identify its topic. Studies have shown that a high prior knowledge of a topic leads to better comprehension of a passage (Entin & Klare, 1985) and higher recall (Kintsch, 1980). If this background information is lacking, readers will reorganize the material to fit into whatever are their current expectations and interpretations (Bartlett, 1932).

The relationship between topic interest and prior knowledge is complex. It is thought that topic interest is independent of and additive to one's prior knowledge (Baldwin *et al.*, 1985; Entin & Klare, 1985). Yet one's prior knowledge about a topic may not always result in a story about that topic being perceived as interesting. One's prior knowledge may be recalled with negative affect; familiarity may breed contempt. Of course, there are many topics for which one has no prior knowledge. In both of these instances one can expect either negative or neutral topic interest.

The usual advice, when concerned with topic interest, is to know one's audience. The importance of personalizing the content of a story so that it relates to the prior knowledge of the audience cannot be overstated. Fortunately, catching people's attention and engaging their intellect is as often a function of whether the *story is interesting* as whether they perceive the *topic as interesting*. The issue here relates to the 'interestingness' of the story.

Interestingness

Interestingness is a construct. It is composed of those qualities of a story that make it engaging and enjoyable to read. This form of interest arises from the way in which the text is written, regardless of the topic. This *text-based interest* is created by authors who use qualities such as action, mystery, imagery and meaningful characters.

If we reason that learning is an active process, then it is logical to assume that material must be mentally engaging; it must hold the reader's attention long enough to be assimilated into existing mental structures. Stories tend to engage a reader better than other media in that one of their main purposes is to entertain (Kintsch, 1980). It is for this reason that stories are proposed as an effective teaching method (Monroe & Kaplan, 1988; Schank, 1991). In numerous studies stories have been rated to be more interesting than expository text on the same topic (Kintsch, 1980; Entin & Klare, 1985; Hidi & Baird, 1986; Hidi, 1990). Interestingness has also been positively associated with comprehension and understanding (Kintsch, 1980) and the affective enjoyment of the material (Schiefele, 1991). Support for this notion is found in a study where young people were asked to read passages of similar content written in three different styles; narrative, expository and a mixture of the two. Recall for important ideas was best for the pure narrative. Expository was second. Mixed texts scored the lowest, the authors reasoning that mixing styles confuses the reader, thereby lessening recall of the material (Hidi *et al.*, 1982). Sadoski *et al.* (1990) report that readers of an interesting story not only developed powerful mental images from

the text, but were able to integrate the information presented in the text to the degree that even their own elaborations were recalled as being part of the original text.

Attention

Writers motivate readers by breathing life or voice into words (Elbow, 1981). All the reader knows, however, is that interesting text takes less effort on their part to get through. This ease is, in part, due to the clever use of attention.

Attention is the means by which we are able to focus on selected stimuli (e.g. the elements of a story) while ignoring others, thus allowing for perception and information processing. James (1892) distinguishes two types of attention: involuntary and voluntary (or directed) attention. [1] 'Involuntary attention' is based on interest; it is spontaneous and effortless and easily inhibits competing thoughts. Involuntary attention can either involve things of innate interest (James's provocative list includes 'strange things, moving things, wild animals, bright things, pretty things, metallic things, words, blows, blood, etc...') or be based on interests that have been gained through extended experience. Examples of the latter, called learned involuntary attention, include the interest an avid bird watcher takes in a rare bird call or the interest of an expert chess player in a novel board configuration. The spontaneous nature of involuntary attention is quite adaptive, as it ensures that events and objects, important in an evolutionary context, will be noticed. Classic as well as popular literature has often relied on techniques for manipulating the interestingness of text for the purpose of maintaining the attention and fascination of readers. Interesting stories are thought to engage and hold a reader's fascination by drawing on involuntary attention (Hidi & Baird, 1986). A study by Schank (1979) confirms that certain components, such as life or death situations, danger, unexpected events or personal relevance of stories, always catch the reader's attention and associate highly with interestingness.

'Directed (voluntary) attention' is employed to deal with numerous activities throughout the day that are important, but intrinsically uninteresting (Cimprich, 1990). Invoking directed attention allows one to engage in purposeful, directed behavior and thought. However, there is a cost associated with directed attention: it requires mental effort to sustain; it is neither spontaneous nor effortless and is thus subject to fatigue (Kaplan & Kaplan, 1982). Due to the energy required and fatigue associated with directed attention, text that utilizes this form of attention may be perceived as burdensome to read. At a minimum such text will be unable to engage most individuals. Encyclopedias containing declarative information, and little else, are an extreme example.

Irrelevant Details

Not all issues naturally contain aspects that evoke involuntary attention. In fact, many important environmental issues are so filled with technical facts as to be dreadfully boring. Without being intrinsically interesting, such topics require readers to employ their directed attention to complete the text. *If* they complete the text, that is! To improve the willingness of readers to complete the text, writers have long combined elements that invoke involuntary attention as a

means to make the important but boring information more palatable. This is sometimes called the 'seductive detail' approach. While having the best of intentions, this strategy turns out to be a misuse of involuntary attention.

Stories that include seductive details are indeed rated as more interesting than stories without such details (Garner *et al.*, 1989, 1991; Graves *et al.*, 1991). Unfortunately, this increased interest did not translate into higher recall or comprehension scores. This same effect was shown in a study by Garner *et al.* (1989), where adults who read stories with seductive details were less adept at remembering the main ideas as compared with the control group. Another study attempted to improve a classroom text on the war in Vietnam by giving journalists free rein. Versions of the text that used seductive details, such as 'leech infested jungles' and 'razor bamboo sticks', were, in fact, judged to be interesting, but recall of the main ideas decreased significantly.

These studies show that the core material is not made more memorable merely by adding seductive but irrelevant details. Efforts to hold the reader's interest *at any cost* can, in fact, divert attention from the important information (Garner, 1992). The challenge, as outlined by Wade & Adams (1990) is

...to develop alternative strategies for creating (written) material so that important information will be made more memorable. Rather than focusing on topics that arouse emotional interest, strategies are needed to increase cognitive interest. Cognitive interest may occur when learners are able to relate new information to their background knowledge and when they believe they are learning something new and worthwhile.

The Elements of an Engaging Story

Creating an engaging story, even if the reader lacks previous knowledge about or interest in the topic, involves manipulating specific text-based elements. Anderson *et al.* (1987), in a study of interesting sentences, have suggested four elements that contribute to interestingness: life themes, character identification, novelty and activity level (see also Sawyer, 1991). Life themes and novelty are related to the specific content of the story and likely function by evoking involuntary attention (see, for instance, Schank, 1979). Character identification is a component of a larger element, characterization, discussed below. Activity level is related to the use of more powerful language, also describe below.

Building on the list developed by Anderson *et al.* (1987), we propose seven elements as important in creating engaging stories. Each is reasoned to enhance the interestingness of text independent of previous knowledge about or interest in the subject matter. These elements are not meant to comprise a definitive list. They are meant to act as a starting point for future research, research that will surely discover other important elements for increasing the perceived interestingness of text.

Coherence

In order for a story to be engaging, it must first be understood; it must be coherent. Clearly, a reader's prior knowledge plays an important role here, but

there are also a number of text-based strategies for enhancing coherence. It has been suggested that cohesion among a story's events is based to a large degree on the causal cohesion among its events (Stein & Glenn, 1979). If there is no causal relation or coherence between the events of a story, a reader will have a difficult time making associations among events, get discouraged and lose interest. Information in a story must hang together well enough so that the reader can see how the various parts of the story relate (Kintsch, 1980).

One way in which coherence in stories is achieved is through a sense of movement through time. Understanding is significantly aided by arranging actions toward a particular goal, thus allowing the reader to put the actions together in a meaningful way (Gergen & Gergen, 1986). It is also reported that stories with either a positive or negative goal (e.g. restoring a wetlands, preventing developers from building in a wetlands) as compared with a neutral goal (e.g. understanding the special role wetlands play in flood control or ground water recharge), are better remembered (Omanson *et al.*, 1978). A related issue here is the concept of a 'story line'. Text that structures a beginning, a middle and an end is easier to process mentally and more memorable.

Coherence is also created by the reader as they work through a passage. It has been found that readers use titles, paragraph headings and first sentence to get the main idea of a text and attempt to fit each succeeding sentence into what they initially perceive to be the structure of the main idea, i.e. people process the text, building a mental map in an attempt to develop and maintain coherence. If this attempt fails, main ideas are reconsidered and adjusted, often leading to confusion and loss of interest (Kieras, 1980).

Problem Resolution

This concept moves beyond the idea of a story line by including a dilemma, problem or paradox (either stated or assumed) that becomes resolved within the story. Beyond having a beginning, middle and end, a story's interestingness is enhanced by having it progress from a problem statement, through certain complications, to a satisfactory resolution (Mandler & Johnson, 1977; Bower, 1982; Jose & Brewer, 1984; Iran-Nejad, 1987). In typical expository text books interesting pieces are usually added as an aside, often as a boxed case study or example. These asides can overshadow the important points to such a degree that readers miss them (Hidi *et al.*, 1982). For expository materials to model the story format the entire passage should become a story with beginning, middle and end, rather than interspersing stories between the important paragraphs.

Mystery

One of the better documented elements for enhancing a story's interestingness is mystery. When there is uncertainty as to how the story will end enjoyment is derived from the process of getting there (Rabkin, 1973). It has been found that cognitive engagement will increase if the reader must predict or anticipate what will happen next (Schank, 1979; Kintsch, 1980). Creating suspense (Rabkin, 1973) or introducing surprise (Brewer, W.F., 1983; Jose & Brewer, 1990) can also heighten interest. To create mystery one must turn the reading process into a problem solving task, where the reader can match the unfolding events against

his or her expectations (Black & Bowler, 1980). One of the ways this is accomplished is by presenting the important information slowly, allowing it to emerge as the text is read, rather than all at once in a table or list or summary introduction. As Dewey (1916) states it, in a story 'self and the world are engaged with each other in a developing situation'. The reader becomes engaged in the text, experiencing the information and events as if they were just happening, all the while cognitive structure is being built.

Characterization

One of the ways that a good story involves the reader is through the use of a character (Anderson *et al.*, 1987). A character is an element that the reader can care about and track through the story and with whom the reader can identify (Hidi & Baird, 1986). Anderson *et al.* (1987) report that young readers found adult characters more interesting than similar aged characters. It is also argued that identification with a character improves interest in a story and that this interest is related to the gender and goodness of the character and independent of character age (Jose & Brewer, 1984; Jose, 1989). Taken together, these studies suggest that similarity between the reader and the character is important but, may be communicated in a variety of ways: gender, age, interests, outlook, etc.

Imagine trying to promote the use of bicycles as alternatives to automobiles in California. A characterless text might read as

The heavy use of automobiles has become a concern, particularly in heavily populated areas of the state of California. Air pollution, fuel shortages, limited parking spaces and road congestion are increasing problems. Using bicycles for short errands and combinations of public transportation should be considered by everyone.

In a story about just this issue Gross (1989) used characterization to enhance interest:

In this car-crazy state, Ellen Fletcher's boast is at least eccentric and perhaps bizarre. She only fills the gas tank of her battered 1963 Plymouth Valiant twice a year and has to remind herself to take the car out of the garage once in a while for some exercise. Instead, at 60 years of age, Fletcher bicycles.

For excursions to San Francisco, 35 miles to the north, she takes the train and brings her folding bike. For meetings in San Jose, 15 miles to the south, she rides her 18-speed touring bicycle along the roadside bike path, making the trip in 80 minutes. The grocery store is easy. She tethers her three-speed to one of the racks that are plentiful here, then fills up her wire baskets. Getting home with a load of groceries isn't hard, because the green lights are timed to allow bicycles to get across busy intersections.

Concreteness

The concrete-abstract dimension is a key determinant of the ease with which one forms a clear mental image. People tend to recall material expressed using concrete examples far better than generalized or abstract material (Hidi & Baird,

1986). The change from 'Thomas Edison became the most famous inventor of all time even though he left school when he was very young' to 'Thomas Edison became the most famous inventor of all time even though he left school when he was only six years old' increased immediate recall from 57 to 87%. More abstract text about the general characteristics of inventors and inventions were poorly recalled (Hidi & Baird, 1988). Furthermore, images for concrete words are created spontaneously and effortlessly, while mental images for abstract words take longer, if they can be imagined at all (Clark & Paivio, 1987). In a study involving word pairs Paivio & Yuille (1969) found that imagery was reported for 62% of the concrete word pairs and only 26% for the abstract word pairs. A striking example of how concrete examples can aid in understanding is found in a study by Hudson (1983) exploring how students solve word problems in mathematics. The problem was presented in two different forms: the first read 'There are 5 birds and 3 worms. How many more birds are there than worms?' and the second read 'There are 5 birds and 3 worms. How many birds will not get a worm?' The second instance involving a concrete, real life example was answered correctly 40% more often than the more abstract first answer.

Human decision making is also affected by the concreteness of the information provided (Nisbett *et al.*, 1976; Nisbett & Ross, 1980). It has been reported that while people are not willing or able to apply population base rates to predictions about the behavior of a particular individual, they are willing to generalize from the observed behavior of two individuals to the behavior of an entire population. Information derived from concrete, specific cases has much greater effect during human decision making than information derived from a larger population. Studies have also suggested that using metaphors can aid in the process of linking concrete examples with abstract concepts and help generalize already learned material into novel problem solving situations (Evans & Evans, 1989). This ability to link the concrete and the abstract is an invaluable tool in the realm of environmental issues, where the problems are often of a complex and abstract nature.

Imageability

Bardwell (1991) reports that imagery is an important element in helping readers to understand how a problem can be solved. Imaging techniques have long been used to improve memory (Paivio, 1979; Thorndyke & Stasz, 1980; Reed, 1982). Sadoski *et al.* (1988) document a strong relationship between the mental imagery induced by a story and the story's perceived interestingness.

A related issue is providing instances of success. People often understand the problem and have the necessary knowledge to change their behavior and yet still feel hopeless (Bardwell, 1991). By including success stories, such as the bicycling example above, one helps people to imagine what their role in solving a problem might look like. This is particularly needed in the environmental field, where people often feel that their individual efforts cannot make a difference. In a study including text about 'super-conservers' it was reported that such success stories were an effective method of promoting conservation behavior. It was reasoned that such success stories gave people the imagery necessary to see that their actions could make a very real difference (Yates & Aronson, 1983). As Bardwell (1991) points out, success stories 'hold promise in terms of helping

people build more adequate models about environmental problems and their roles in addressing them'.

Challenging Previous Knowledge

Kintsch (1980) argues that incongruity leads to learning. This is an element that employs a reader's previous knowledge about a subject in a way that enhances interestingness. Materials that contain small deviations from expectation and misfits between prior and currently presented knowledge can hold a reader's interest longer than material about something expected. Examples include stories about the life cycle environmental impacts of plastic versus paper bags and discussions about ozone layer depletion and a 'healthy' suntan. The notion that plastic bags are always environmentally unfriendly is shown to be out-of-date during a story about the pros and cons of various types of grocery bags. And the commonly held idea that suntans are excellent indicators of health and vitality is overturned during a discussion of the increased risks of ultraviolet radiation brought on by the destruction of atmospheric ozone. Frick (1992) reasons that it is more interesting to read about something being disproved than to read about further support for the known. This notion also emerges in the work of Omanson *et al.* (1978), where characters that had positive or negative goals were more easily remembered than characters that had run-of-the-mill or neutral goals.

Other Factors

There are other factors that may increase the interestingness of a story but have yet to be fully examined. Hidi & Baird (1986) suggest that well-formed text, affective response, abnormality, and omission of important background information may all help to increase the interestingness of stories. Recall of stories is also improved when stories have vivid details (Tulving *et al.*, 1965; Bower, 1979). It is believed that vividness is effective in promoting recall because people tend to respond to vivid text in a way identical to actual emotional situations (Vrana *et al.*, 1986). Although the reader knows that the details in the story are not occurring at that moment in the 'real world', the vivid material aids in accessing their mental knowledge. In addition to increasing recall, vivid detail in a story can also increase the perceived power or importance of the message. Sherer & Rogers (1984) reported that while concrete information increased recall, the addition of vivid details also had a positive effect on attitudes and increased one's willingness to change behavior.

Conclusion

Informing people about environmental issues has proven much harder than first imagined. Changing their behaviors has proven even more difficult. Environmental problems are often complex, abstract and overwhelming. Information about problems is sometimes incomplete, contradictory or at best inconclusive. The behaviors needed to improve matters are often unfamiliar and inconvenient. This lack of clarity about the problem and solutions can lead to outright avoidance, sometimes coupled with reactions of denial, frustration or feelings of

helplessness. Our well-intended attempts to inform the public about the problems being faced through factual, scientific explanations may actually discourage the average citizen by not providing the information they need in a form that is easily understood and remembered.

Fortunately, stories seem to be a means of educating and changing behavior that is welcomed by the public. The new behaviors may still be burdensome and demanding, but the means of informing people about the reasons for these behaviors may be more easily accepted and assimilated.

Notes on Contributors

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NOTE

[1] These are not the only types of attention (Kaplan & Kaplan, 1982), but are the two most relevant types to consider in the understanding of engaging stories.

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