

The Role of Imagination in Integrative Knowledge: A Polanyian View

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How do we know the degree of imagination involved in knowing a reality? This is essentially an epistemological question. This essay discusses first the role of imagination in Polanyi's epistemology since it is used here as the basis of integrative reality. The essay then discusses the degree of imagination involved in three types of integrative reality that are found respectively in technology, science, and humanities. It concludes with a discussion on the role of imagination in education.

In the preface to his book *The Body in the Mind*, Mark Johnson writes about the role of imagination as follows:

Without imagination, nothing in the world could be meaningful. Without imagination, we could never make sense of our experience. Without imagination, we could never reason toward knowledge of reality.¹

It is clear, according to him, that imagination plays the central role in human experience, understanding, and reasoning. And yet, he says, "It is a shocking fact that none of the theories of meaning and rationality dominant today offer any serious treatment of imagination." He further states that there is "the total absence of an adequate study of imagination in our most influential theories of meaning and rationality."² Why is this so? The reasons are obvious.

During the past two centuries in the Western world, dominant theories of meaning and rationality have been largely derived from reductionistic objectivism in which the role of imagination in human experience, understanding, and reasoning has been denied. In reductionistic objectivism, the world is made up of objects and properties independent of human understanding. According to this view, the human mind, in facing the world, functions passively like a mirror or a camera eye that has no regard for personal belief or the cultural context in which personal belief is shaped. In explaining the world from this perspective, words that we use are merely literal signs that correspond to or represent objects and properties. To reason means to map the rational structures of objective reality, and to reduce them to concepts according to logical rules.

Based on this view of reasoning, human psychological experiences are identified with those rational structures found in the objective and natural world. Accounts of human experiences which are distinctively different from the rational structures of the objective and natural world cannot be considered as legitimate parts of human experience; human understanding of the world entirely depends on the rational structure whose meanings are independent of the human context. In this approach to human experience, understanding, and meaning, it is no surprise that the role of

imagination is negated.

In contrast to this reductionistic view, a non-reductionistic, Polanyian view of contemporary science recognizes the active role of the human mind in shaping human experience. This perspective recognizes the imagination as integral to the functions of the human mind in science as well as other endeavors. In epistemological terms, this perspective regards real things as integrative in nature. The role of the knower is recognized in the known. The knower's imagination is respected for the part it plays in the knower's experience of the known. Imagination actively molds integrative knowledge.

Imagination alone, however, does not make integrative knowledge possible. Knowledge arises as the anticipatory grasp (or anticipatory potential) of an integrative reality first sensed by the intuition of a person who makes an inquiry. For the inquirer, a problem and the anticipation that the problem has a solution represent hope, possibility, and new meaning. From this perspective, the problem and the solution are an integrative reality that is not yet fully actualized. Such a reality is pursued in an intuitive mode of apprehension by the searching person. The way the searching mind works is explained by Polanyi as follows:

It seems plausible to assume, then, that two functions of the mind are jointly at work from the beginning to the end of an inquiry. One is the deliberately active powers of the imagination; the other is a spontaneous process of integration which we may call intuition. It is intuition that senses the presence of hidden resources for solving a problem and that launches the imagination in its pursuit. It is also intuition that forms our surmises in the course of this pursuit and eventually selects from the material mobilized by the imagination the relevant pieces of evidence and integrates them into the solution of the problem.³

Polanyi clearly holds that the discovery of an integrative reality is impossible without recognition of the role of imagination but imagination works in tandem with intuition.

Because integrative reality is discovered by the active power of imagination, it emerges first in the human mind as an imaginary reality. At this initial stage, it is only imaginarily perceptual, but not sensible. Later, such a reality may be verified scientifically, or it may be validated as is done in the case of real things such as poems. When an integrative reality is verified in the sciences, its imaginary elements are transposed into realistic elements which the knower regards as more fully independent from the human mind like so-called objective items. Such verified integrative realities are no longer predominantly imaginary realities; they have followed the path toward the status of ordinary things. Strictly speaking, what determines the status of an integrative reality is the degree of imagination involved in knowing the reality.

How do we know the degree of imagination involved in knowing a reality? This is essentially an epistemological question. In this essay, I want first to discuss further the role of imagination in Polanyi's epistemology, since it is used here as the foundation of my claim that it is important to recognize knowledge and reality as integrative. I will then discuss the degree of imagination involved in three types of integrative reality that we find respectively in technology, science, and humanities. Finally, in conclusion, I will discuss the role of imagination in education.

II. Integrative Reality

As suggested above, what is sought for by a person as a solution for a problem is originally hidden. It is however present as a hope and a possibility. This double status, hidden as well as present as a hope and a possibility, means that a solution is not somewhere out there in the world like a natural thing just waiting to be discovered. Discovery in the sense of solving a problem demands the creative act of the human mind. The way the human mind works for discovery is not really different from the way it works for the creation of a new reality. The discovery of a hidden reality, like the creation of a new reality, requires the use of multiple resources conjoined in an effort aiming at actualization. The actualization is a process of integrating multiple resources. Who integrates them? How is such an integration accomplished? According to Polanyi, such an integration does not take place naturally. It is done by the intuitive imagination of a person who is in search of a solution to a problem.

In terms drawn from Polanyi's epistemology, a problem's solution is the object of focal awareness and the multiple resources contributing to the solution are the components of subsidiary awareness. Polanyi explains the relationship between these two kinds of awareness in terms of the relationship between means and end and between parts and whole. When he says the object of focal awareness depends on the components of subsidiary awareness, he means that the end depends on the means and the whole depends on the parts. He states the relationship as follows:

We cannot comprehend a whole without seeing its parts, but we can see the parts without comprehending the whole. Thus we may advance from a knowledge of the parts to the understanding of the whole.⁴

According to Polanyi, for an understanding of a whole, there is a direction of movement that begins with the parts. The parts are directed toward the whole, as they are being integrated by the power of intuitive imagination which is the act of the creative human mind. This directive process, in psychological terms, can be effortless and short, but it is the process of integrating the parts into the whole. The parts have no meaning unless they are related to the whole, which is to say that the parts find their joint meaning in the whole. The meaning that results from the joining of parts is different from the original state of the "parts" before they were joined together. Such a meaning is a joint meaning and a new reality. The act of joining parts is an integrating act carried out in intuitive imagination. The new reality is, therefore, an integrative reality.

Why term a new reality an "integrative" instead of "integrated" reality? Meaning is an "integrated" reality when imagination is only minimally present in the process of integration. When imagination functions as a principle component of an act of the human mind, apprehended reality is alive and dynamic. Such a new reality is incomplete. Although such a new reality may be a problem's solution, it is to be regarded more as a fruitful possibility than as a final solution. Such a solution can be refined, improved and understood more deeply. In sum, the term "integrative" reality, retains the sense of process appropriate to true mental achievements as they emerge in human history.

By recognizing the active role that imagination plays in knowing reality, we recognize that real entities are not close-ended. Imagination works tacitly and unexpectedly with great surprises when it leads us to the discovery or creation of a new reality.

Reductionistic objectivists reject this vision of an integrative knowledge grounded in imagination as a scheme

overly subjective and irrational. For them, the world is made up purely of objects that have properties independent of persons who experience them. These properties are inherent in the objects, and, through analytic and reductive approaches, certain conceptual categories and concepts corresponding to the properties are established. Even relations between the objects are understood in terms of categories and concepts. Our knowledge of objective reality cannot rely on imagination that is subject to errors of individual judgement and that is culturally biased.

Although Polanyi obviously opposes the objectivist position, this does not mean he accepts a subjectivist alternative. His theory of “personal knowledge,” transcends both the objectivist and the subjectivist options. Polanyi accepts the personal participation of the knower in the known; he calls for the recognition of personal commitment in the knowing process. He affirms passion as integral to personal action and recognizes that human actions are the expression of personal beliefs. Polanyi’s personal knowledge is clearly distinguished from subjectivist views. Polanyi explains the difference between his notion of the “personal” and the “subjective” as follows:

I think we may distinguish between the personal in us, which actively enters into our commitments, and our subjective states, in which we merely endure our feelings. This distinction establishes the conception of the personal, which is neither subjective nor objective. In so far as the personal submits to requirements acknowledged by itself as independent of itself, it is not subjective; but in so far as it is an action guided by individual passions, it is not objective either. It transcends the junction between subjective and objective.⁵

For Polanyi, all knowledge is personal knowledge. In fact, there is no separation between the “personal” and the “knowledge” in personal knowledge. Essentially what constitutes the “personal” in personal knowledge is the activity of a particular human. That is, personal knowledge is achieved through the integration of the components of subsidiary awareness by intuitive imagination. Personal knowledge is therefore integrative knowledge, and we can also say that, when we achieve integrative knowledge, we achieve an integrative personality.

An integrative personality, like integrative knowledge, is not static and fixed. Integrative reality is open-ended; it holds the possibility of additional meaning. Integrative personality never curtails the activity of self-cultivation that occurs when newer understandings of integrative reality emerge. Being an integrative personality means having an imaginative understanding of an integrative reality.

Imaginative understanding is the act of a person’s mind which moves the person toward discovery or the creation of an integrative reality as new meaning. In the process of understanding, the person is confronted with a problem, and the solution of the problem is sought. Intuitive imagination leads to the solution. Since imagination is unpredictable, risk is involved in problem solving. But belief in the possible discovery of the solution comes along with intuitive comprehension. This comprehension first occurs as a glimpse of a whole. It is a tacit comprehension with which all creative acts of the human mind begin in the initial stage of discovery. The person’s commitment to the discovery of a solution for a problem is intensely passionate until he or she is brought to the realization of the goal. Imaginative thinkers have no other choice but to pursue a goal humbly and hopefully. They must be prepared for failure to achieve their goal. Their task is risky, and errors are always part of imaginative understanding. But failure only means that the goal needs to be seen from different perspectives. As long as imaginative persons are humble and prepared for failure, their minds are always open to new sources, new approaches and new understanding. New ideas and new methods remain open.

As the source of our ever new meaning, integrative reality always points toward the future. Acts of imagination are related to things that are not here and now. Polanyi explains acts of imagination as follows:

I call all thoughts of things that are not present, or not yet present—or perhaps never to be present—acts of the imagination. When I intend to lift my arm, this intention is an act of my imagination. In this case imagining is not visual but muscular. An athlete keyed up for a high jump is engaged in an intense act of muscular imagination. But even in the effortless lifting of an arm, we can recognize a conscious intention, an act of the imagination, distinct from its muscular execution. For we never decree this muscular performance in itself, since we have no direct control over it. This delicately coordinated feat of muscular contractions can be made to take place only spontaneously, as a sequel to our imaginative act.⁶

What is clear in Polanyi's discussion of imagination is his recognition of intention as an act of imagination. Where there is an intention, there is an act of imagination. As recognized by phenomenologists, there is intentionality in consciousness, which is an act of imagination. There is no consciousness without an object. That object is, in Polanyi's epistemology, the object of focal awareness. Lifting one's arm, for example, is implemented by the integration of subsidiary muscular particulars. In this situation, the imagination is fixed on lifting the arm and that is the end result; by fixing the imagination, we can induce the requisite muscular integration. Originally, the conscious intention of lifting one's arm is distinctively different from the muscular execution. Lifting one's arm is the end and the muscular execution is the means. Intention and execution represent two different movements or levels in Polanyi's epistemology. Thus, when our means are insufficient to meet the end, there is a gap between them. How do we close the gap? Polanyi explains this as follows:

A new life, a new intensity, enters into this two-leveled structure the moment our resolve meets with difficulties. The two levels then fall apart, and the imagination sallies forward, seeking to close the gap between them. Take the example of learning to ride a bicycle. The imagination is fixed on this aim, but, our present capabilities being insufficient, its execution falls behind. By straining every nerve to close this gap, we gradually learn to keep our balance on a bicycle.⁷

The act of imagination works exactly in the same way in the act of speaking. James Alan Astman explains the role of imagination in the act of speaking as follows:

Simply put, what enables us to speak is the intention of speaking. And when we are in the act of speaking, we are focused on an achievement that has not yet been fully realized. That is, we know what we want to communicate before we are able to bring into use all of the abilities, all of the words and sentences, that will enable us to express our meaning. In other words, our intention is aimed at the future. And it is only through our imagination that we can attend to that future.⁸

In the act of our speaking, its achievement in the future is the expression of our meaning. "All of the words and sentences" are the means for the meaning on which our imagination is focused, and they are integrated through our imagination. When the meaning is expressed, it is very much like the achievement of a solution to a problem which occurs by

integrating multiple resources through an act of our imagination. Speaking is the creation of a new and integrative reality.

Since integrative reality is achieved in the act of imagination, it is not yet in an actualized form. It is a vision of coherence which is detected by intuition. Intuition launches and guides imagination. But it is our imagination that ransacks the brain and available resources and sallies forward onto a vision of coherence. It is a deliberate act, in Polanyi's terms, a focal act of the creative imagination. In the meantime, the vision of coherence is recognized by our intuition. This recognition of coherence is the spontaneous act of discovery. Before the discovery is made, the coherence still remains hidden, although it was guessed. The guessing requires "a skill guided by innate sensibility to coherence."⁹ Hidden coherence is only sensed by intuition. This function of relating clues to the hidden coherence lies in the power of imagination. Hidden coherence is a potentiality that is not yet brought into a vision. When the potentiality is sensed, however, it evokes an anticipation through which we maintain our quest for the discovery of the coherence. According to Polanyi, this process is how our mind works not just in search for natural reality in science, but also in search for truth and beauty in humanities.

The roles of intuition and imagination, in acts of the human mind complement each other. Polanyi explains their functional relationship by stating that "intuition informs the imagination which in its turn releases the power of intuition."¹⁰ The greater is the power of intuition, the greater is the power of imagination. With a greater power of imagination, our intuition can sense a deeper coherence. Our imagination carries all the available resources forward, pointing to the future manifestations of a deeply hidden coherence, while our intuition integrates those resources and recognizes the final result of our imagination to be valid. Even when our quest for a coherence has ended, our intuition and imagination are not exhausted. The inquiring mind returns again for a deeper, more profound new vision of coherence. According to Polanyi's epistemology, our intuition works tacitly, on a subsidiary level, and, therefore, we do not know exactly how it works. There are principles by which our intuition integrates subsidiary clues into a coherence. But Polanyi states clearly that "history suggests that there are no universal standards for assessing such coherence."¹¹ This means that we do not control intuition's operations. Coherences are not of our making. Instead, we give our allegiance to them. We recognize their value and their authority over us.

Although there are no rational accounts that explain functions of our intuition, Polanyi does discuss imagination in almost quantitative terms in relation to the types of coherence recognized in science and humanities. According to Polanyi, the mind appreciates coherence and recognize an integrated reality. When the mind first grasps novel coherences, it is an integrative reality in the imagination rather than a perceptual reality that is apprehended. Generally, in science such a novel coherence eventually becomes a verified reality, while in the humanities it becomes a validated reality. Originally, however, novel coherence begins as an integrative reality in imagination. Verified and validated realities are different types of coherence. Now the question is how our imagination works differently in these different types of coherence or realities. This will be explored in the following section.

III Imagination in Verified and Validated Realities

According to Polanyi's epistemology, the belief that knowledge of reality can be completely objective and detached is false. Because of the tacit element in the knowing process, knowledge of reality has an indeterminate content, which is explained by Polanyi as follows:

The content of any empirical statement is three times indeterminable. It relies on clues which are largely unspecifiable, integrates them by principles which are undefinable, and speaks of reality which is inexhaustible.¹²

We first know reality as a vision which means we know it intuitively in our imagination, but how we come to know it as a vision cannot be explained. Even though the vision is later a more recognizable, familiar reality, how resources worked toward its discovery remain unspecifiable. The power of intuition is spontaneous and effortless. In a scientific inquiry, intuition predominates. It is intuition that senses a hidden reality, launches and guides imagination, integrates clues which are sought by imagination, and then finally accepts the apprehended reality. Without imagination, however, the work of intuition is empty and fruitless. For the discovery of integrative realities, intuition and imagination constantly work together as two mental powers, distinguishable but not separable. In all scientific inquiry, Polanyi says,

First, an ideal appears, given by intuition, to be pondered by the imagination. Second, the imagination is let loose to ferret out a path of possible clues, guided by intuitive feelings. And third, an idea offers itself intuitively as a possible conclusion, to be pondered in its turn in the light of the imagination.¹³

Although a vision of a reality as the object of focal awareness is first sensed by intuition, it is brought into focus by imagination. Without being focused, the vision cannot become an apprehended reality. The duration of the act of focusing is proportionately longer than that of the intuitive sensing. Because this is the case, the specifiability of the focusing act seems greater than that of the sensing act. Thus specifying or measuring the activity of imagination seems to us more plausible than measuring the activity of intuition. In the work of imagination, some objects of integration, however, seem, or become with practice (as in the example of raising the arm), less indeterminate. What this amounts to saying is that when the focusing act requires greater effort and integrative knowledge seems most indeterminate, the degree of imagination involved is greater. Of course, according to objectivist reductionism, all human knowledge is determinate and specifiable and, therefore, no range of imaginative participation in the content of knowledge is recognized.

Polanyi comments on the indeterminate implications of the imagination in the focusing act in three different areas: technology, science, and humanities. There is no question that, in Polanyi's epistemology, the imagination works in search of a solution to a problem in all of these three areas. But imagination has a different character and different degrees of indeterminate implications in different areas. Comparing technology with science, Polanyi says,

The solution of a technical problem has perhaps less widely indeterminate implications, but they are wide enough to substantially engage the imagination.¹⁴

Why are there "less widely indeterminate implications" of the imagination in the solution of a technical problem? In his discussion of differences among technical invention, scientific discovery, and artistic production, Polanyi explains the differences as follows:

The quest for scientific discovery also integrates fragmentary clues to an initially unknown coherent meaning (although the quest is guided vaguely by certain powers of anticipation), whereas technical

invention starts, on the contrary, by aiming at a product that will fulfill a definite function and seeking the means to contrive it. To produce a work of art is to make something never before seen but grasped in a vague way by powers of anticipation, and in this essential feature the artist's quest is nearer to that of the scientist than to that of the inventor.¹⁵

One distinctive difference between a technical and a scientific problem is that the former has a more clearly desirable focus than the latter does. In other words, the aim of a technical problem is to invent or produce a tool for useful performance. Technology always involves applicable knowledge that is derived from an acknowledged purpose, and it has to serve the purpose successfully. On the contrary, scientific discovery is totally unrelated to any such purpose. Scientific knowledge, unlike applicable knowledge, lacks any framework of useful performance. Its aim is originally to discover an initially unknown fact in nature and this unknown fact has nothing to do with its useful performances. Instrumentality is the key in technical knowledge. The focus of a technical problem is necessarily more specifiable than that of a scientific problem. In the solution of a problem, the final achievement of the imagination is guided by intuition; this is known as invention in technology and discovery in science. Differences between invention and discovery are explained by Polanyi as follows:

The beauty of an invention differs accordingly from the beauty of a scientific discovery. Originality is appreciated in both, but in science originality lies in the power of seeing more deeply than others into the nature of things, while in technology it consists in the ingenuity of the artificer in turning known facts to a surprising advantage. The heuristic passion of the technician centres therefore on his own distinctive focus. He follows the intimations, not of a natural order, but of a possibility for making things work in a new way for an acceptable purpose, and cheaply enough to show a profit. In feeling his way towards new problems, in collecting clues and pondering perspectives, the technologist must keep in mind a whole panorama of advantages and disadvantages which the scientist ignores. He must be keenly susceptible to people's wants and able to assess the price at which they would be prepared to satisfy them. A passionate interest in such momentary constellations is foreign to the scientist, whose eye is fixed on the inner law of nature.¹⁶

Since tools are made to serve particular purposes, in many cases inventions quickly become ordinary things which require little imagination to use them. There is no doubt that an automobile is the product of an enormous amount of technical imagination and knowledge, and yet the majority of automobile drivers need little knowledge of cars to operate them. An inventor's passion for the solution of a technical problem is essentially not different from that needed for a scientific inquiry or artist's creative inquiry. What makes them different is the character of the imagination involved in the passion.

Polanyi's arguments make it clear that scientific imagination has wider indeterminate implications than technical imagination. Discovery of the unknown facts that already exist in nature is the aim of scientific imagination. Unknown facts are initially sensed by intuition; such facts are loosely imagined in terms largely guided by powers of anticipation. Loosely imagined facts have few specifiable qualities; they have widely indeterminate implications, and thus to apprehend these realities definitively demands extraordinary imagination on the part of scientists. Because the focal object is relatively amorphous, the imagination relies heavily on whatever clues seem promising. There are also greater chances for the imagination to make mistakes in filling in the missing parts in the case of a less specifiable focal

object. Searching for the right clues bearing on the focal object is not easy.

The results of scientific inquiries are eventually verified, and the verification process in science transforms the strange vision into the familiar. Integrative realities come to be understood as facts of nature. Knowledge of nature is not directly useful like technological knowledge. However most natural phenomena come to be regarded as ordinary things in our world, although some remain ambiguous and seemingly pregnant with deeper meaning. In sum, Polanyi's outline of the role of imagination in science suggests that originally hidden facts in nature are the objects of our imagination, but as ordinary things most natural facts evoke little imagination.

The creative integrative realities known in humanities are in Polanyi's scheme the most indeterminant of coherences. Such realities do not have practical or instrumental value such as inventions do; they do not serve us. Instead, they sometimes demand that we serve them. We study the works of Shakespeare to find higher and more noble ideas and then we respect, honor, and follow those ideas. The coherences recognized in the humanities, including literary, artistic, and musical creations, are not integrative realities to be verified like the results of scientific inquiry. Such realities are accepted by the public in imagination. This means that we as members of the public do not accept them as things of nature or as practical devices.

Polanyi's epistemology is fundamentally based on the conviction that the discovery of heretofore unknown facts involves the activity of a person's intuition and imagination. In terms of personal participation through intuition and imagination in the process of discovery, there is no difference between scientific discovery and artistic creation. No one can deny the greatness of Einstein's intuition and imagination. Where do we then find the difference between scientific and artistic creativity? Polanyi explains it as follows:

As we have seen, the inception of a scientific inquiry and the undertaking of a technical problem are both based on imaginative anticipations of unknown facts, but to start on a work of art is to anticipate a result which will be brought into existence first in the imagination of the artist and then in that of his public. An artistic problem is the imaginative anticipation, not of unknown facts that already do exist, in some sense, in nature, but of a fact of the imagination—of a poem or a painting that could exist.¹⁷

According to Polanyi, problems, whether they are scientific, technical, or artistic, are resolved only as imaginative anticipation begins searching for solutions to problems. But powers of imaginative anticipation are not persistently called into play as solutions to problems in science and technology come to be known in the public world. Discoveries and inventions are eventually accepted by the public as natural or practical things; such things are taken for granted. They evoke little imagination in us. This process of becoming second nature does not prevail, however, with the integrative realities found in humanities. As Polanyi states, "an artistic problem is the imaginative anticipation, not of unknown facts that already do exist, in some sense, in nature, but of a fact of the imagination—of a poem, or a painting that could exist." "A fact of the imagination... that could exist" is different than those facts "that already do exist." Strictly speaking, this difference marks a distinction between the realities known in the sciences and humanities. Humanities deal with facts of "the imagination... that could exist." This means, the facts are recognizable only through overt imaginative anticipation; artistic coherences always reveal meaning only by directly evoking the imagination of the public. This type of integrative reality does not come to be accepted in the same way that natural or practical things do by the public. Artistic realities are known by the public by relying on imagination. In Polanyi's words, "we do have

to achieve an imaginative vision in order to 'use' a work of art, that is, to understand and enjoy it aesthetically."¹⁸

IV. Integration and Education

To recognize that the powers of intuition and imagination are engaged in technological invention, scientific discovery, and artistic creation is to recognize that all reality created and understood by persons is fundamentally integrative reality. However, as both invented and discovered realities in technology and science become more familiar, they, at the same time lose the power of evoking the imagination in the mind of the public. As the public enjoy, in daily life, benefits that are provided by these scientific and technological products, the products are quietly accepted as ordinary things and facts.

Ordinary things and facts are normally in our control, which means we know how to use them with minimal imaginative effort; in many cases, we know very little about how they were originally made. A telephone is a wonderful product of science and technology. Without it, our life today would be enormously inconvenient. As users, we pay very little attention to how it is made. We just use it and it is at our mercy. Its inventor, Alexander Graham Bell, however, was a man of great imagination. The telephone was originally a product of his great imagination. When it was first conceived as an idea in his imagination, there was belief and passion in his mind, as is the case with all great inventors, driven by the idea for realizing something. The telephone may be viewed as the product of his belief and passion. He invented it and presented it to the public for use. But Bell could not transmit his belief and passion to the public. The public takes the product, but it fails to be infected with the imaginative component. This is the nature of the relationship between the public and ordinary products and facts.

The limited ability to transmit the belief, passion, and imaginative powers of a creative technological or scientific mind is reflected in the difficulties in our educational institutions. Our educational facilities are often provided with the best equipment in the world today. Socially, in daily life, we have and enjoy the greatest advantages of technological and scientific creativity. And yet there is no certainty that our society and educational systems will produce imaginative and creative students. The reasons for this are much clearer when they are examined in light of the role of the imagination in the knowing process. A central issue is how to educate students to have greater powers of imagination.

Before exploring this issue, some summary of the role of imaginative thinking in integrative knowledge is in order. To anticipate anything imaginatively involves a sense of the future. The object of imaginative anticipation is something to be achieved. Thus all works of the imagination are achievements. From the view of Polanyi's epistemology, a solution to a problem is an achievement which is realized by intuitively integrating clues; the solution is an integrative reality. Integrative realities are of several different types: Polanyi seems to distinguish scientific, technological and humanistic achievements. Scientific and technological achievements are at least eventually subject to processes of verification while humanistic achievements must be recognized as valid. All three types of achievements can be considered as an arrival at a significant or meaningful whole. That whole is visible in imagination and the parts (the clues that function subsidiarily) may be either tangible or intangible. When functioning as subsidiaries, such clues remain somewhat of a mystery; we can say only that such clues are integrated into a whole. When such clues are seen in themselves as objects of focal awareness, they appear as specifiable things; they have lost the original meaning they had as subsidiaries bearing on the original meaningful whole. It is the integration of clues through imagination that

Polanyi focuses our attention upon as the central act of the dynamic, living mind.

How can teachers get their students involved in such dynamic and living acts of the mind? First, according to Polanyi's epistemology, students need to recognize that they acquire a sense of a whole, of coherence or global meaning by taking what they know already and by using it as clues or parts to some broader coherence. In other words, what they already have and know needs to be placed in the context of something larger that is not fully known, and not fully specifiable. That something larger is an integrative reality.

The study of technological machines, social systems, or scientific theories as only things in themselves produces only acquaintance with information. Any study that does not show an interest in a larger framework or whole will not increase integrative knowledge. Information can be accumulated, of course, but such knowledge is largely impersonal and detached. Integrative knowledge is personal knowledge that demands personal commitment to an unspecifiable larger meaning than what we already have and know. Personal commitment to a meaning naturally places teachers and students in the process of achieving the meaning. In this process, both find themselves as achievers or makers of meaning. As achievers of meaning, we all join in the creative process that is carried out with the dynamic act of our imagination. Creative people function best as makers or achievers of meaning. As already explained, a meaning is a solution to a problem. In our actual lives, not all solutions are deeply meaningful. But in the case of serious integrative knowledge, meaning is more encompassing than what already is known and the knower can never be in the position of controlling the meaning. After habits are formed, we can easily control specifiable objects with relatively little use of our imagination. But unspecifiable meanings demand a greater use of our imagination. They evoke our imagination. When we try to understand such meanings (i.e., Polanyi's "facts of the imagination") in the creative works in humanities, we must use our imaginations. When imagination comes more fully into play, we find ourselves already personally committed to the meaning we arrive at through our mental acts. The pursuit of meaning in such challenging mental acts stands in contrast with the meaning we already hold or take for granted in our present life. Within the context of pursuit of more comprehensive realms of meaning, we come to sense what we lack and thus we become humbler. Nevertheless, any discovery of integrative meaning as the result of our commitment, also bring joy, a great intellectual joy.

In integrative knowledge, the joy and the meaning of life are not separated. They do not come from controlling or possessing tangible objects or information. They come from achieving comprehensive meanings which are larger and greater than the meanings we already have in our present life. What would then be the better sources in which teachers and students can find those meanings? They are the works of the imagination with greater indeterminate implications. Specifically what are they? Polanyi answers this question as follows:

The arts are works of the imagination, and so are the sciences. But all our hopes and fears, all our memories and our very feeling of ourselves, our suppressed desires and hidden feelings of remorse, all that we see in sleep and indeed in daytime perceptions, and all our deliberate bodily motions—all these are also works of the imagination. Why then does the word "imagination" instantly evoke in our minds the notion of works of art rather than any of these other matters? The reason that comes to mind with little effort is that the arts alone aim at transmitting their imagination to a public—to successive generations of publics—and depend on the imaginative powers of these people to accept the works of their imagination as meaningful. But we can explain also what it is that qualifies the arts—and the arts alone—for this enterprise. Our lives are formless, submerged in a hundred crosscurrents. The arts are imaginative representations, hewn into artificial patterns; and these patterns, when

jointly integrated with an important content, produce a meaning of distinctive quality.¹⁹

This passage clearly indicates that the works of the imagination in humanities provide a greater foundation for “a meaning of distinctive quality” in our lives. As potential makers of future technology, science, humanities as well as of their lives, our students need to prepare themselves to be imaginative. Let us not forget to teach them, along with science and technology, the poetic, artistic, musical, and other works of the humanities. In other words, let us not forget their need to have integrative knowledge that will prepare them with greater imaginative power for “a greater meaning of distinctive quality” in their lives.²⁰

Endnotes

¹Mark Johnson, *The Body in the Mind: The Bodily Basis of Meaning, Imagination, and Reason* (Chicago: The University of Chicago Press, 1987), p. ix.

²Ibid.

³Michael Polanyi and Harry Prosch, *Meaning* (Chicago: The University of Chicago Press, 1975), p. 60.

⁴Michael Polanyi, *The Study of Man* (Chicago: The University of Chicago Press, 1959), p. 29.

⁵Michael Polanyi, *Personal Knowledge* (Chicago: The University of Chicago Press, 1962), p. 300.

⁶Michael Polanyi, “Creative Imagination” in *The Concept of Creativity in Science and Art*, eds. Denis Dutton and Michael Krausz (Hague, Netherlands: Martinus Nijhoff, 1981), p. 100.

⁷Ibid.

⁸James Alan Astman, “Reading and the Role of Imagination” in *Claremont Reading Conference 1986* (Claremont: California: Claremont Graduate School Curriculum Laboratory, 1986), p. 35.

⁹Michael Polanyi, “Creative Imagination,” p. 99.

¹⁰Ibid, p 104

¹¹Ibid., p. 102

¹²Ibid, p. 106.

¹³*Meaning*, pp. 96-97.

¹⁴Ibid., p 97.

¹⁵Ibid., p. 98.

¹⁶*Personal Knowledge*, p. 178.

¹⁷*Meaning*, p. 99.

¹⁸Ibid., p. 85.

¹⁹Ibid., p.101.

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