Educology Is Interdisciplinary: What Is It? Why Do We Need It? Why Should We Care?

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Abstract

Education provides guided and intended learning across various human disciplines. The result of disciplined inquiry about education is distinct from the process of education itself. If adequate, educational research should result in knowledge about education—that is, educology. Educology is needed to improve education, in contrast to trial-and-error approaches. Education should not only become more effective; it should also become more worthwhile. Not all effective education is worthwhile. Education can be instrumentally valuable but lack intrinsic value. We should avoid effective yet bad education. Instead, we should seek worthwhile education—that is both instrumentally and intrinsically good. Worthwhile education is designed to improve the quality of life for everyone everywhere.

Keywords: Educology, knowledge, education, learning, knowing, theory, effective education, worthwhile education.

1. Introduction

Learning is a phenomenon that occurs across various domains of knowledge. Learning further spans disciplines that are formally focused on learning—including psychology, brain science, educational psychology, education, learning and instructional sciences, and instructional design.

Learning is a phenomenon that even spans biological species. Not only can human beings learn, but also dolphins, dogs, and donkeys.

Furthermore, what is the difference between learning and education? Between education and schools? Education and professional training on the job? Learning and human performance improvement?

We have different words and phrases—let alone expressions in different languages and cultures—that can mean the same thing. Worse, the *same* word can have *different* meanings, depending on the context in which it is used. Then consider fake news, outright lies, propaganda, and falsehoods—in contrast to truth (e.g., see Kakutani, 2019).

How can we sort this out? We need an interdisciplinary field that spans various specialized domains of knowledge that is well-defined. What we need is *educology* (Frick, in press, 2020; Steiner, 1981).

2. Overview

First, I introduce *educology*, making the distinction between *knowledge* and *education* itself. I then discuss the importance of *universal terms* for providing the foundation for *educology*. Next, I distinguish 8 kinds of *learning*: *accidental*, *guided*, *intended*, *conducive*, *discovery*, *disciplined inquiry*, *compelled*, and *induced*; and 4 kinds of *education*: *ineffective*, *effective*, *effective yet bad education*, and *worthwhile education*. I further explain the difference between *educational theory* and *educology*. Next, I address the questions: Why do we need *educology*? Why should we care? I conclude by addressing the question: How do we move *educology* forward?

3. What is *Educology*?

Educology is "*knowledge* of *education"* (Steiner, 1981). This is a highly important distinction. *Knowledge* is not the same as the *object* of that knowledge. *Education* is the object, what is represented by *knowledge*, which is "recorded *signs* of *knowing* about *education*" (https://educology.iu.edu/knowledge.html). That is why we need the new term, *educology*, to distinguish the recorded *signs* from their object, *education* (Frick, in press, 2020; Steiner, 1988). In *educology*, *education* is defined as *conducive learning*. That is, *education* is *intended* and *guided learning* (https://educology.iu.edu/education.html). A *teacher* is one who guides the *learning* of another; and a *student* is one who *intends* to *learn* from that guidance. *Learning*, in turn, is defined as "the increasing of *complexity* of *mental structures*" (https://educology.iu.edu/learning.html). *Complexity* and *mental structures* are further defined, respectively, at https://educology.iu.edu/complexity.html and https://educology.iu.edu/mentalStructure.html.

I am using italics to identify terms in this chapter that are defined more precisely than common usage would typically indicate. I have created a growing and evolving website which provides a glossary of proper terms, definitions, and examples of *educology* at: http://educology.iu.edu/index.html (Educology Website, 2019). The intent of this *Educology* Website is similar to *Stedman's Medical Dictionary* (Stedman, 2006) and *Terminologia Anatomica* (FCAT, 1998) which define terms used in medical science, anatomy, and physiology.

Without *educology*, educators and others will continue to talk past each other. The language we typically use in talking about *education* is imprecise, and so we literally often do not understand what each of us is talking about—because the same words refer to different things. For example, you are talking about a *student*, meaning she or he is a young person who attends a school or university, and I am thinking about a *student* as being a person who intends to *learn* under the guidance of another—she or he does not have to be in school or college, nor young, nor inside a building, nor guided by a state-licensed *teacher* or a college professor. We may both use the same words, *student*, *teacher*, and *learning*, but we mean different things.

Unfortunately, we may think we are talking about the same thing, when in fact we are not. This kind of miscommunication and inconsistent use of terminology hinders advancement of *knowledge* in the field of *education*. You do a research study on *student learning* and find one result. I do a study on *student learning* and find a different result. Whose results should we believe? But we may not even be talking about comparable *students* or comparable *learning*. *Learning* is yet another term that needs clarification.

It is as if you are studying cooked oatmeal with added sugar (*sucrose*) and I am studying cornflakes with added high *fructose* syrup. But we both call them sweetened cereals. This clarification is important because *fructose* is *metabolized* differently than *glucose* in the human body. *Fructose* is effectively a chronic toxin that when *metabolized* rapidly in significant amounts repeatedly over time can lead to diseases that include Type 2 diabetes, atherosclerosis, and cancers. See for example: Lustig (2009; 2017), McKinley, O'Loughlin and Bidle (2016), and Taubes (2016).

It is as if in physics *mass* and *energy* meant different things to different people—a wide range of misconceptions. For example, some people think of mass being associated with how big something is and how much it weighs. Not so, as it turns out, in the field of physics. *Mass* is different from *weight*. An astronaut living in the space station that orbits the earth has zero *weight* and appears to just float in the air. Yet the same astronaut standing on a scale in the doctor's office on earth weighs 130 *pounds*, or about 59 *kilograms*. Her *mass* has not appreciably changed. Just orbit the earth at about 17,600 *miles per hour*, and we will *weigh* nothing. And there are some new terms: *pounds*, *kilograms*, *miles*, *hours* and the implied concepts of *velocity*, *force*, *acceleration*, and *gravity*.

As a further example in *educology*, the difference between schooling and *education* clarifies what we are talking about when we lament problems we see in our schools, and what to do about these problems. Unfortunately, some schools are not *educating* because those who are taught are not *students*—i.e. they do not *intend* to *learn*—as is discussed below.

4. Universal Terms

In *educology*, terms are defined as universals. A *universal* is not limited to time or place. For example, the definition of *education system* is not restricted to existing education systems in the U.S. in the 21st century, but applies to *all* education systems—including those in the future, as well as those in the past—that could be located anywhere.

In development of *educology*, it is important that our terminology consists of *universal* classes (Steiner, 1988). A *universal sign* is defined as a "*symbol* whose object is a *universal* class not limited to time or place" (see http://educology.iu.edu/universalSign.html). As an example, in another discipline, when we refer to *adipose tissue cells* in physiology and anatomy, we are signifying a class of cells in *homo sapiens* in general, not just in Socrates' body about 2,500 years ago, now, or in humans in 5,000 A.D., whether here on earth or elsewhere.

5. What is *Education*?

Education is *conducive learning*, which stands in contrast to *compelled learning*, *discovery learning*, and *accidental learning*. Conducive learning is "guided learning and intended learning," which meets Steiner's (1988) criteria for what constitutes the universal class, *education*. These essential relationships are further illustrated next, and by Venn diagrams on the Educology Website: http://educology.iu.edu/index.html. Figure 1 illustrates relationships among important concepts, in order to separate *education* from other kinds of learning:

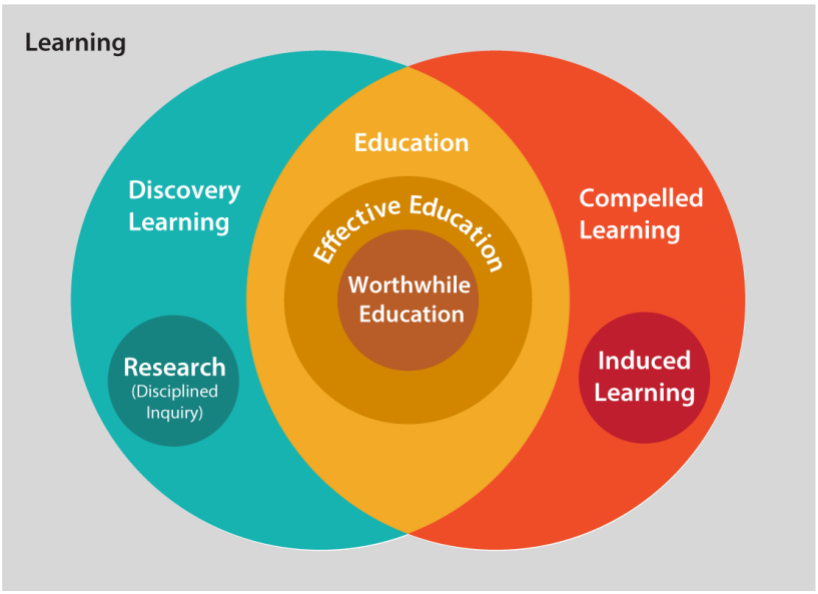

Figure 1. Venn diagram of kinds of learning and education

Key concepts from which definitions of types of *learning* are derived from this Venn diagram are further illustrated by specific shadings in Venn diagrams in Figures 1.1 – 1.13:

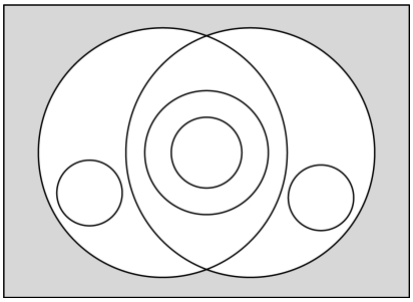

Figure 1.1. Accidental learning: neither intended learning nor guided learning (Type 1)

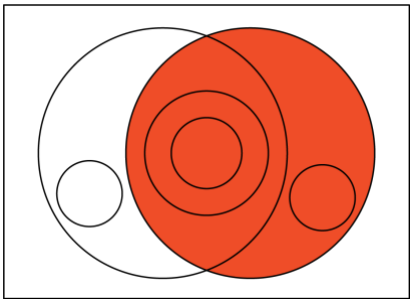

Figure 1.2. Guided learning (Type 2)

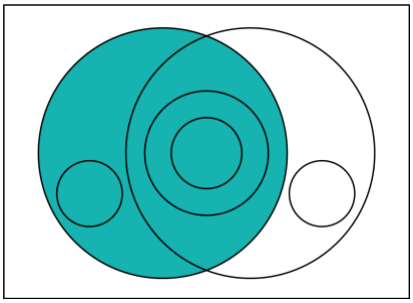

Figure 1.3. Intended learning (Type 3)

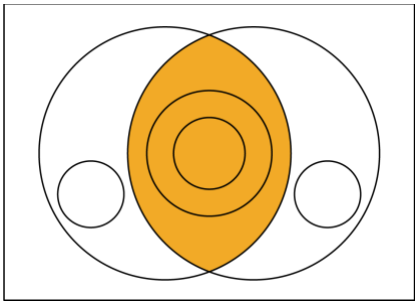

Figure 1.4. Conducive learning (education): Intended learning and guided learning (Type 4)

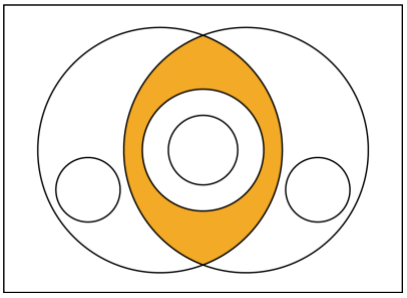

Figure 1.5. Ineffective education: neither instrumentally good nor intrinsically good (Type 5)

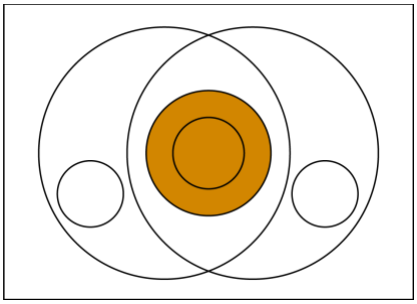

Figure 1.6. Effective education: instrumentally good (Type 6)

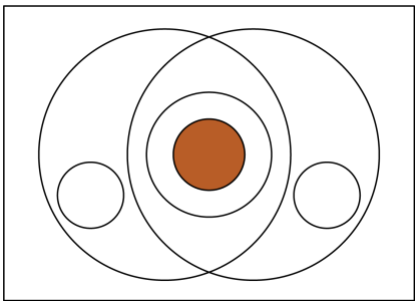

Figure 1.7. Worthwhile education: instrumentally good and intrinsically good (Type 7)

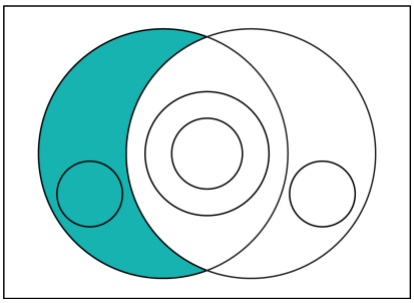

Figure 1.8. Discovery learning: intended learning but not guided learning (Type 8)

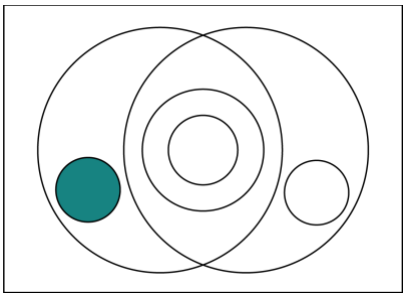

Figure 1.9. Disciplined inquiry (research): discovery learning that is regulated by criteria (Type 9)

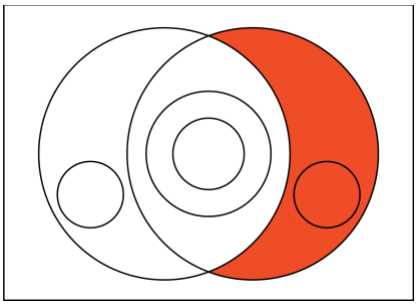

Figure 1.10. Compelled learning: guided learning but not intended learning (Type 10)

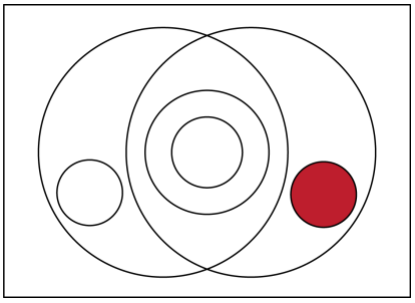

Figure 1.11. Induced learning: guided learning but initially not intended learning (Type 11)

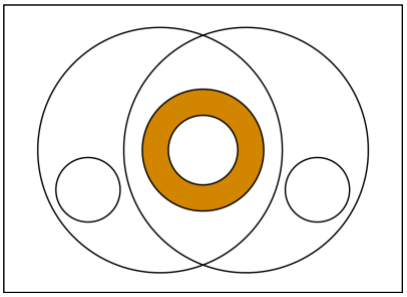

Figure 1.12. Effective yet bad education: instrumentally good but not intrinsically good (Type 12)

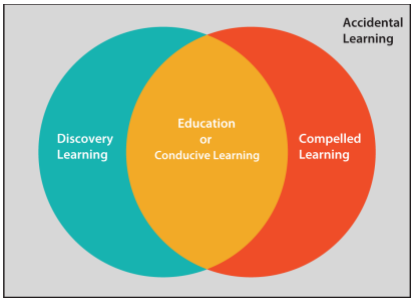

Figure 1.13. All learning: accidental learning or discovery learning or conducive learning or compelled learning.

What is important to note is that these terms are well-defined. For example, *effective yet bad education* is "*instrumentally good* but not *intrinsically good education*" (http://educology.iu.edu/effectiveBadEducation.html). In other words, teaching methods could be highly effective, where students attempt to learn, and they succeed; however, what is being learned is not worthwhile. This would be exemplified by students going to school, who try hard, and who score highly on standardized tests; but unfortunately, what they have learned lacks intrinsic value.

As another example, *compelled learning* is "a person's *learning* which is *guided* but not *intended*" (http://educology.iu.edu/compelledLearning.html). This would be exemplified by individuals who do not try to learn, while nonetheless are guided. That is, they might be going to school where they are being taught, but no *education* is occurring; and they are in fact not actual *students* because they do not intend to learn what is being taught. These situations contrast with

worthwhile education, which is "*effective education* that is *intrinsically good"* (http://educology.iu.edu/worthwhileEducation.html).

Given these distinctions in *educology*, one might ask: How much *worthwhile education* is occurring in American schools versus *compelled learning*, *ineffective education*, or *effective yet bad education*?

6. How is Educational *Theory* Different from *Educology*?

Education provides *guided* and *intended learning* across various human disciplines. The result of *disciplined inquiry* about *education* is distinct from the process of *education* itself. If adequate, educational research should result in *knowledge* about *education*—that is, *educology*.

In *educology*, *theory* is defined as "intersubjective signs of universals about essential properties and their relations, yet to be warranted by disciplined inquiry" (http://educology.iu.edu/theory.html). Therefore, *educational theory* is intersubjective signs of universals about essential properties and their relations about *education*, yet to be warranted by *disciplined inquiry*. And *education* is defined as *conducive learning—learning* that is both *intended* and *guided*. See Fig.'s 1.4 and 1.9.

In *educology*, *knowledge* is taken to be "recorded *signs* of *knowing*." Such records are intersubjective, i.e., between persons, and they are preserved in some medium over a period of time. Steiner (1988) argues that:

> First, *knowing* should be distinguished from *knowledge*. *Knowing* is a psychical state in which one has certitude about something and has a right to that certitude…. *Knowledge*, however, is recorded *knowing*; it is the body of expressed certitudes. (p. 5, italics added)

Recorded *signs* of *knowing* can be preserved in a variety of media. At one time, cave paintings, stone and clay tablets, and papyrus were used. Nowadays, in addition to printed paper and books we have video and audio recordings, photographs, animations, and computerized games and simulations. We also have electronic storage devices to store records such as hard drives, flash memory, and the "Cloud"—remote storage on devices which can be accessed over computer networks such as the Internet.

The record of *knowing* consists of *signs*. The *signs* are not the object of what is known, but rather the *signs* represent what is known. Charles Sanders Peirce spent much of his life attempting to develop a *theory* of *signs* (see Short, 2007). Peirce's *theory* evolved over his lifetime, which he never finished to his satisfaction. Peirce (1932) defined *sign* as follows:

> A *sign*, or *representamen*, is something which stands to somebody for something in some respect or capacity…. every representamen being thus connected with three things, the ground, the object, and the interpretant (2:228)…. The *Sign* can only represent the Object and tell about it. It cannot furnish acquaintance with or recognition of that Object; for that is what is meant in this volume by the Object of a *Sign*; namely, that with which it presupposes an acquaintance in order to convey some further information concerning it (2:231).

Disciplined inquiry is *discovery learnin*g that is guided by criteria for conducting research to create *knowledge*. Thus, educational *theory* becomes *knowledge* of *education* (i.e., *educology*) when it is verified through *disciplined inquiry* (Frick, in press, 2020; Steiner, 1988). *Educology* is also different from the process of *education*, which is the object of educational research (*disciplined inquiry* about *education*).

As an example, I have developed the theory of *totally integrated education* (TIE). TIE theory builds on definitions of *learning* and *knowing* in *educology*, and further distinguishes among *learner cognition*, *conation*, and *emotion* (Frick, 2018). Nine kinds of *knowing* are defined in *educology* (https://educology.iu.edu/knowing.html). These definitions of basic terms then permit definitions of new terms: *integrated learning* and *integrated knowing* (see https://educology.iu.edu/integratedLearning.html and https://educology.iu.edu/integratedKnowing.html).

I have recommended that empirical research studies be carried out based on designing different kinds of *learning environments* according to TIE theory. Learning achievement—particularly long-term achievement gains compared with short-term gains—can be investigated by manipulating components of TIE theory. For example, in typical classroom learning in elementary, secondary, and postsecondary schools, *knowing that* is disconnected from *knowing that one* and *knowing how*. TIE theory predicts that, under these conditions, *student mental structures* will be weaker, more disconnected, and more vulnerable to *forgetting*, especially if *intention* to *learn* and *learner emotions* are disconnected during learning activities.

On the other hand, what happens when *cognition*, *intention* and *emotion* are *wholly connected* with *knowing that*, *knowing how* and *knowing that one* (illustrated at https://educology.iu.edu/integratedKnowing.html)? These two kinds of contrasting systems could be empirically compared on a number of dimensions—student motivation and satisfaction, attitude towards learning, mastery of expected learning outcomes, teacher satisfaction, and so on.

TIE theory has further implications for schools without walls, that is, *education systems* which include local community and culture as integral parts of the *education system* as *content* for *learning*. This contrasts with exclusion of *content* about what happens outside classrooms in the local community. In other words, if *students* are *learning* in real-world *contexts* (i.e., literally through hands-on learning activities), would they be better able to connect *knowing that* and *knowing how* with authentic parts of their culture (with *knowing that one*)? After all, for tens of thousands of years humankind did *learn* in real-world *contexts* prior to more recent attempts via formal schooling in the 20th and 21st centuries where *students* have largely been sequestered inside buildings.

If predictions from TIE theory are warranted through *disciplined inquiry*, then those claims become part of *educology—knowledge* of *education*. The value of new *theory* is to predict unexpected, nonobvious, unseen and counterintuitive outcomes (Frick, 2018; Thompson, 2006).

7. Why Do We Need Educology? Why Should We Care?

Trial-and-Error Approaches to Improving Education Are Risky and Inefficient

Educators who have been around several decades have seen widely touted changes come and go. In the past four decades, for example, some of the innovations have been referred to as: site-based management, constructivist classrooms, technology integration, school restructuring, systemic change, and re-inventing schools.

Despite such rhetoric, changes that have occurred in U.S. K-12 schools appear to be "tinkering around the edges." In 2019, for example, there may be more use of computer tablets, Chromebooks, and wi-fi networks in schools, more standardized achievement testing, more accountability for *student learning* achievement, less state funding for public schools, more tax

dollars going to private charter schools, and increased regulation of schools by state and federal governments.

But, have any of these changes significantly improved K-12 *education*? While apparently well-intentioned state legislators and state departments of *education* are mandating changes in K-12 *education*, there are no guarantees of improving matters.

Worse, these changes may cause more harm than good. The stakes are very high. The consequences of mistakes can be devastating for our children and our future.

The following questions have not been adequately addressed:

"Change what?"

"Change how?" and

"How do you *know* the change is likely to work?"

We must *know* what to change in order to *know* how. Without *knowing* what to change, the "how" is irrelevant (Frick, Thompson & Koh, 2006). We must *know* whether the change is likely to accomplish the goal and that the change will not have negative, unintended effects.

For example, attempts to hold *teachers* accountable for *student* achievement not under their control may drive the best *teachers* to leave the profession, due to frustration with such working conditions. It may also discourage potentially good *teachers* from entering the profession. Moreover, the best *students* might leave the public schools to attend private charter schools, if their parents can afford it. This would leave public schools in possibly worse straits, with the least capable *teachers* and lowest achieving *students* remaining, and less money from public tax dollars to support them. Then what?

Paradigm Change for Improving Education Requires Sound Knowledge

Some scholars argue that an entire paradigm change is needed in *education*. For example, Reigeluth & Karnopp (2013) have promoted a vision and strategies to get there. These include significant curriculum expansion, individualized *learner*-centered instruction, and attainment-based evaluation of *learning*—that contrasts with existing time- and age-based structures for moving *student* groups through lock-step grade levels. As another example, Duffy (2009) is promoting systemic change efforts.

But do we know how well such new paradigms will work? This does not mean that a new *education system* that is learner-centered and attainment-based is not worthwhile. Nor does it mean that changes to expand and revamp curriculum in school are not needed. It just means that we lack sound *knowledge* to predict outcomes of new designs of *education systems.*

Why Sound Knowledge of Education is Needed

As an analogy, consider an old bridge that is failing—it is structurally weak and is impeding the flow of traffic. If the bridge is not fixed, it will collapse, and vehicles will plunge into the river. When engineers design a new bridge, they utilize adequate scientific *knowledge*. No one in modern times would consider designing a new bridge by trial and error. Nor would they let politicians try to do it.

Yet, in *education* we are essentially proceeding by trial and error in attempts to improve *education*—whether tinkering around the edges or by creating new paradigms. We lack sound *knowledge* to make reasonable predictions whether or not the proposed remedies will fix the problems in *education* we face.

Disciplines Require Precise Language

In disciplines where *knowledge* has significantly advanced, there has been careful development of terminology so that researchers *know* what each other is actually talking about. For example, in physics the concepts of *atoms* and *molecules* are clearly defined. Each *atom* has a particular combination of subatomic elements called *electrons*, *protons*, and zero or more *neutrons*. For example, in chemistry a *molecule* of *water* is comprised of two *hydrogen atoms* and one *oxygen atom*. A *hydrogen atom* consists of one *electron* and one *proton*. A stable *oxygen atom* contains eight each of *electrons*, *protons* and *neutrons* (see "Properties of water," n.d.).

As another example, it was not that long ago that the field of medicine was not a discipline. There was no medical science, as there now is. At one time, physicians would prescribe bloodletting to treat all kinds of disease, which turned out to be an ineffective practice and has been largely abandoned ("Bloodletting," n.d.). Many people were harmed by such ignorance.

Medicine advanced, in part, because researchers in the field became more disciplined in their inquiry. Terms are now precisely defined in medicine. *Osteoarthritis* does not mean whatever people want it to mean. *Osteoarthritis* is the precisely described medical term for a particular disease. Researchers and practitioners in the field of medicine have agreed on what this term means. Thus, when treatments of this particular disease are investigated, competent medical professionals *know* what they are talking about.

The Need for Precise Language in Educology

In the field of *education*, such precise terminology has not been developed until now. Steiner (1977, 1986, 1988) has long argued that such terminology is sorely needed for the field to advance, and has proposed the term, *educology* to mean "*knowledge* of *education*." Basic terms of *educology* have now been defined: *learning*, *knowing*, *signs*, *education system*, *teaching-studenting processes*, *teaching-studenting structures* and many others. The definitions are available to all at the *Educology* Website at: http://educology.iu.edu/glossary.html.

A standard vocabulary will lead to advances in *educology* that, in turn, will help improve *education*—that is, develop *worthwhile education for everyone*.

Worthwhile education for everyone is needed to:

- Enhance the quality of life.
- Reduce inequality.
- Minimize suffering.
- Maximize overall good. (http://educology.iu.edu/we2.html)

8. How Do We Move Educology Forward? Next Steps?

During the Summer 2019 AECT Research Symposium, a number of participants indicated that, while they see the benefits of establishing educology as a discipline, similar questions emerged from several different groups: How can we make this happen? What are practical next steps?

These are clearly important questions. Suggestions from symposium participants included: create a professional organization, possibly located in an Institute for Educology or a research center on a university campus; consider joining forces with other established groups

such as the Glossary of Education Reform (https://www.edglossary.org/), the United Nations Educational, Scientific and Cultural Organization (UNESCO: https://en.unesco.org/), or the International Organization for Standards (https://www.iso.org/home.html).

It may be further worthwhile to study established professional organizations and their history of development. For example, the American Medical Association (see https://en.wikipedia.org/wiki/American_Medical_Association) could potentially serve as a model. The AMA was formed in 1847 to improve public health, to advance competent research in medical science, and to establish medical education standards. Note that at that time, over 170 years ago, that many "quack remedies" were being promoted to the American public which had no scientific evidence to support their effectiveness and safety; and in fact, could be harmful or fatal—e.g., the proverbial snake oil salesman.

In general, the problem is one of adoption of an innovation. In this case, the innovation is the *discipline of educology*. Everett Rogers (2003) was a prominent researcher who identified critical stages through which diffusion and adoption of innovations typically progress. "Diffusion is the process in which an innovation is communicated through certain channels over time among members of the social system" (p. 5). According to Rogers, factors which influence the rate of adoption of an innovation include perceptions of its: relative advantage, compatibility, complexity, trialability, and observability/visibility. These factors, in turn, affect the amount of time for the diffusion process to occur, and indeed influence whether or not it is ultimately successful.

While the educology website is clearly a communication channel, more channels will be needed in the future. I created the current website as a starting point (http://educology.iu.edu), to serve largely as a centralized reference for terms and their definitions. The website is but a first step to increase awareness of educology. What will stimulate interest and willingness to give educology a try remains to be seen. The relative advantage of educology should be demonstrable improvement in education itself that, in turn, clearly improves the quality of life in the social system. This is the daunting challenge. The length of time required to observe such impacts is likely to be decades, if not centuries. Others beyond myself will need to carry the torch.

9. References

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