Postmodern View of Humanistic Mathematics

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This article is an investigation of humanism in philosophy of mathematics from the point of view of postmodernism. We claim that humanistic mathematics is compatible with postmodernism which is taking over everything we have, do, or wish.

Omar Khayyam, an Iranian mathematician and poet:

> *A Book of Verses underneath the Bough,*
> *A Jug of Wine, a Loaf of Bread-and Thou*
> *Beside me singing in the Wilderness-*
> *Ah, Wilderness were Paradise now!*
>
> *Ah, make the most of what we yet may spend,*
> *Before we too into the Dust descend;*
> *Dust into Dust, and under Dust to lie,*
> *Sans Wine, sans Song, sans Singer, and-sans End!*

What is Humanism?

Humanism is a naturalistic philosophy inspired by art and founded on human experience. It asserts the dignity and worth of man. It is a way of living, thinking, and acting. It says that dogmas, ideologies, and traditions should be weighed and severely tested by each individual. Foundations of humanism can be found in the ideas of classical Greek philosophers such as Epicurus and also in Chinese Confucianism. It was the philosophy of the Renaissance and the Enlightenment.

Let us now declare some main principles of humanism which are consistent with postmodern ideas (see [1] for more details):

(i) Humanism is a philosophy of those in love with life. Humanism is a philosophy for here and now.

(ii) Humanism affirms that human beings have the right to give meaning and value to their own lives by their independent thought, free inquiry, and creative activity.

Humanism derives the goals of life from human need and interest rather than from transcendent realm. Humanists believe that the meaning of life is to live a life of meaning.

(iii) Humanism believes that human beings possess the power or potentiality of solving their own problems by means of critical thinking applied with courage and vision.

(iv) Humanism believes in endless questioning of basic assumptions and convictions. Humanism is not a new dogma. For humanists there is no area of thought that is unexplored, unquestioned, or doubtless.

(v) Humanism recognizes that moral values are properly founded on human nature and experience alone.

(vi) Humanists don't believe the final absolute truth has been revealed to them. On the contrary, they believe that all beliefs are fallible and provisional, and that diversity and dialogue are essential to the process of learning and developing. Thus they value tolerance, pluralism, and open-mindedness as positive and beneficial qualities in society.

(vii) Humanists recognize that intuitive feelings, speculation, flashes of inspiration, emotion, and altered states of consciousness remain useful sources of ideas that can lead us to new ways of looking at the world.

Thus humanism will affirm life rather than deny it, seek to elicit the possibilities of life, not flee from them, and endeavor to establish the conditions of a satisfactory life for all.

Humanistic Mathematics

Since the time of Pythagoras era up to the modern time, mathematics has been regarded as a single inseparable whole (the unity of mathematics), always the same (universality of mathematics), independent of context or epistemology (objectivity of mathematics), and is the paradigm of absolute, perfect, indubitable, and precise knowledge. For instance, Euclid's Elements was taken as an absolute truth for over 2000 years. The traditional philosophies of mathematics, i.e. logicism (regarding mathematics as a branch of logic), formalism (viewing mathematics as a game without content) and intuitionism (considering mathematics as a mental activity based on our intuitions of natural numbers), have tried to establish the certainty of mathematical truth [2].

However, Philip J Davis, Reuben Hersh, Imre Lakatos, Philip Kitcher, Paul Ernest and Tom Tymoczko and some other philosophers challenged the paradigm of absolute truth.

Humanism as a school in philosophy of mathematics was introduced by Reuben Hersh in about 1979 [3]. According to Hersh, a world of ideas called social-cultural-historical exists which is created by human beings as part of their shared consciousness, and that mathematical reality is neither mental nor physical [4]. Once created, these objects have properties which are determined and we may however have difficulty in discovering their properties. The mathematical entities have no sense or existence beyond their cultural meanings. These objects are derived from the needs of science, experience, social problems and specially technology, and in brief, everyday life. Mathematical theories are accepted for social reasons rather than they are in any objective sense "true".

Mathematics is like law, like money, like religion and like all those other things which are very real, but only as part of collective human consciousness, so there's no mathematics without human beings [5].

Abstract ideas do not drop from Heaven and are considered as a human endeavor. Mathematical knowledge cannot be given a final, fully rigorous form. In fact what separates formal from informal mathematics is only their degree of rigor and formality. Mathematics is not infallibility, since mathematicians make mistakes; is not unique, because there are different approaches to investigate the same thing; is not certain because of a lack of rigor practiced by many mathematicians. Mathematics is constructed, not discovered; and is contextual not foundational. Humanist philosophy is educationally beneficial, since it is about and a part of our life; it is alive, growing and accessible; and everyone could learn and like it. ([6,7]). Moreover, applications of mathematical knowledge to empirical sciences can be fruitful in humanism. Also, as noted by Lakatos, mathematics is developed through the application of methodologies within rational research programs [8].

Humanistic mathematics attempts to explore the human side of mathematical thought and to guide students through mathematical ideas by the use of imagery, history, internet and computer tools to discover the beauty of mathematics [9]. This school is clearly consistent with general humanism described above. In my view, Hersh's views are compatible with postmodernism.

What is Postmodernism?

Postmodernism is a recent movement and a reaction to modernism. Postmodernism appears in a wide variety of areas of study including art, architecture, music, television, literature, sociology, communications, fashion, science, technology, and philosophy. Some of the main components of modernism are rationalism (the belief in knowledge through reason), empiricism (the belief in knowledge through the scientific method) and materialism (the belief in a purely physical universe).

Postmodernism has such features as the tolerance of ambiguity and disorder, stressing on skepticism and nihilism, the mixing of styles and manners, rejection of ultimate reality and absolute truth, lack of determinism and dogmatism. It emphasizes negative critical capacity and looks for such oppositions as good-bad, truth-fiction and science-myth. It is a refusal of any base for moral and of any already given meaning in the universe. It is a reaction against any naive confidence in progress.

Because postmodernism is rejection of ideas and values, it seems that there is not any definition for it. We could however give some of its main components as follows (see [10, 19, 7, 11, 15]):

1. *There is no Ultimate Reality*

An important idea of modernism is that signifiers always point to signifieds, and that reality is hidden in signifiers. In postmodernism, however, there are only signifiers and signifieds are ignored. Postmodernism rejects the idea that the external world objectively exists or could be studied. It enforces the belief that we can create reality for ourselves according to our needs, interests, prejudices, and cultural traditions. Photoshop is, for instance, a postmodern computer software in which photos can completely be altered that 'reality' disappears.

2. *There is no Absolute Truth*

There is nothing as an intrinsic nature behind everything which can be represented as an absolute truth, there is only interpretation. According to Foucault, knowledge and power cannot be separated, since knowledge embodies the values of those who are powerful enough to create and disseminate it; cf. pp 11-13 of [6]. There is no a-priori dogma.

3. *The World is Meaningless*

Postmodernism doesn't lament the idea of fragmentation and incoherence. It says that the world is meaningless and let's not pretend that art, religion and science can make any meaning and let's just play with nonsense. According to Richard Rorty, an American philosopher, there is nothing as an intrinsic nature behind everything which can be represented.

4. *Deconstruction*

Methodology of postmodernism is deconstruction. It emphasizes negative critical capacity and looks for such oppositions as good-bad, truth-fiction, science-myth, love-hate and so on. Its aim, in particular, is to show there are multiple meanings in a text (concepts, ideas and objects), there probably are texts which are absent, and there is no "right" interpretation of any text.

5. *Plurality*

In postmodernism, knowledge has an essentially pluralistic character. Diversity, divergence, contradictory, and incommensurable interpretations contest each other without canceling each other out. It is appropriate to speak of 'knowledges' or 'multiple truths'. It also stresses on plurality of cultures, perspectives, meanings, methods, values, reasons and that no particular type 'should' be privileged over others. This leads to the birth of a global culture, as a belief system which is unable to accept any of the other belief systems as absolutely true.

Postmodern Mathematics

Art, architecture, music, film, literature, sociology, communications, fashion, science, technology, philosophy, and also mathematics are influenced by postmodernism.

In postmodernism, mathematics has turned from abstraction to representation and from control to indeterminacy. Also mathematical absolutism is being deconstructed and certainty becomes an unattainable idea. It emphasizes upon experimental mathematics, nonlinear dynamical systems (which are governed by a set of simple rules that, through feedback and related effects, give rise to complicated phenomena), chaos theory (in which there are no natural or god-given centers, and describes unpredictable systems and irregular and highly complex structures in time and in space) and discontinuity.

The other important characteristics of the postmodern mathematics are the following:

(a) Postmodern mathematics is free from any dependence on the concept of absolute truth and ultimate reality [10]. We want to move beyond the 'modernist' knowledge such as Newtonian and Cartesian sciences which seek to represent nature as a reflection in a 'mirror'. Postmodernism says that knowledge is neither eternal nor universal. It is a representation which is not necessarily truer than the other representations. The concepts, theories and methods through which we describe the world are socially constructed, and they are accepted for social reasons rather than they are in any objective sense true.

(b) For postmodernists, as noted by Feyerabend [11], there is hardly any difference between science and magic. Postmodernism considers all types of knowledge with equal skepticism and believes that science is predicated on faith and may be regarded as a religion. Mathematics shares some features with religion while mathematics is done in an axiomatic method.

(c) Postmodern mathematics respects contradictions and paradoxes. It sees a mix of order and disorder, cause and effect, certainty and probability, control and creativity in every system. In particular order is no longer a base for knowledge and disorder is no longer an enemy to truth; cf. [12].

(d) Computers are transforming the way mathematicians discover and prove ideas. Investigators have proposed a computational proof that offers only the probability, not the certainty, of truth. Computational experiments can yield more results than the old-fashioned conjecture-proof method.

(e) In the modern science one must use the rules of logic put forth by Aristotle. He taught that a thing was either true or false, and not both. Postmodernism emphasizes fuzzy logic as an approach to decision based on "degrees of truth" rather than the usual "true-false". Fuzzy theory resembles human reasoning in its use of approximate information and partial truth. Hence it is ideal for controlling nonlinear systems and for modeling complex systems where ambiguity and uncertainty is common.

Conclusion

Postmodernism rejects the role of reason as a unique tool for discovering truth and says there are no universal truths valid for all people. Any individual conclusion may not be true for others.

Traditions such as Hinduism, Buddhism, and Taoism reject reason as a tool for discovering truth. The central proposition of monism, that "everything is one," is no more rational than saying 1 =1,000,000. They even utilize contradiction to drive learners to a deeper or higher plane of understanding. Zen Buddhism, for instance, offers koans such as "What is the sound of one hand clapping?" The Hindu Brahman is "always and never." With its rejection of rationality, such paradoxical thinking is naturally compatible with postmodernism. ([13], p.205)

Although, from the point of view of modern mathematics, demand for a rigorous proof is a core value for contemporary mathematical publication, the essential role of plausible reasoning and reality of fallibility, incomplete arguments and reliance on authority cannot be eliminated.

In a postmodern society, knowledge is characterized by its utility and becomes functional, i.e. you learn things, not to know them, but to use that knowledge. In a postmodern perspective, we say that chaos, graphics, intuitive explanations, metaphors, computer investigations, iterative and recursive procedures are all important and should be included in a postmodern reconceptualization of the mathematics curriculum [14].

Acknowledgment

Suggested Reading

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The process of scientific discovery is, in effect, a continual flight from wonder.

Albert Einstein