The Social Impact of STEM

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The Impact of Humankind

Shakespeare applauded humankind in his longest play, *Hamlet*, saying,
"What piece of work is a man, how noble in reason, how infinite in faculties, in form and moving, how express and admirable in action, how like an angel in apprehension, how like a god!". (Hamlet, Act 2, scene 2, circa 1600)

Daniel Quinn, in his groundbreaking book, *ISHMAEL*, stated unequivocally that nature would do better without humankind. “We're not destroying the world because we're clumsy. We're destroying the world because we are, in a very literal and deliberate way, at war with it.” (Quinn, 1992)

David Attenborough narrated a wonderful documentary called, "The Year Earth Changed", highlighting positive effects to nature from the pandemic of 2020. He spoke in measured, balanced tones, noting that:
- global shipping traffic dropped by 17% in the first 3 months of lockdown,

- people in some cities of India could see the Himalayas for first time in their lives,
- dolphins of New Zealand had increased range of communication,
- whales could hear their young and thereby leave them alone while the adults went on prosperous hunting expeditions,
- 3 months into lockdown, global major city footfall was reduced by more than 90%,
- wildlife appeared in cities: a hippopotamus came to a gas station, jackals visited a park, a puma strolled down a sidewalk,
- 6 months into lockdown, the Ganges River in India showed an 80% increase in oxygen levels,
- the African coastal waters leapt from poor to excellent,
- African cheetahs could call cubs because human noise was not interfering,
- in Uganda, twice as many mountain gorilla babies were born,
- 12 months into lockdown, global carbon dioxide emissions were down by over 6% (the largest drop ever measured),
- underground planetary sound was the quietest in history.

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Humankind has a social responsibility to our incredibly wonderful earth and thereby to ourselves. So, one question is, "What are some intelligent, informed ways science education can help?"

The Social Impact of STEM Education

Have you ever watched an infant look into her mother's face to see if a new food is going to be good or bad?

Have you talked to a pet with your eyes? What about giving a look to a friend across the dinner table, when you must communicate but you can't talk? The other day, my wife and I were having dinner with a friend who was giving advice on things he clearly did not know. If I tried to question his sources, he would pour far too many facts all over the table, until he buried the point - and dinner for that matter.

These subtle, human, social cues can be very effective. Imagine how much more we affect STEM students when we portray nature as an aggressive arena and we use phrases like: 'conquer space', 'battle the elements', and 'compete for survival'. What we teach in a STEM course has a strong influence on society. For instance, to assume the classical physics view that all matter is made of totally separate objects causes people to feel unconnected and isolated. To assume the pre-quantum stance that human observations and intentions are not related to material events causes people to feel that it doesn't matter what we think.

If STEM Teachers are still teaching from a classical perspective, then we need to update our work. The quantum findings of the last century put some issues of the nature of science in question. So, we have two changes to make: 1) include quantum findings, and 2) become aware of the psychological implications of the world of relativity and quantum mechanics.

Psychological Implications

Are you telling students that science has moved from classical to quantum, but ***teaching*** science in the classical way? Do you ***admit that adults act as if we are***

all separate and what's more they ***act as if we cannot change the world***?

One way that teachers, parents and counselors could communicate about this is to show your students how you understand that youth can see that the adults have sometimes made a mess of the world. The next generation is painfully aware that we have not kept our world clean: the environment is getting hurt and there is an excess of trash. They watch us argue too much: witnessing external struggles among countries, and significant internal disagreements. You may protest, that these are societal, psychological problems - outside the jurisdiction of STEM education. But - truly - are they?

Be Honest

A STEM course can start by portraying the state of the world honestly to students. It can give a clear and transparent depiction of the current conditions of the world. Then, with this shared awareness you can go to the next step after awareness, namely, what to do about it. Here we can draw on science for the impact it has as on social issues. The course can outline the example of Classical Mechanics giving way to Relativity and Quantum Mechanics. In the last 200 years, we have seen physical, experimental evidence that reinforces what we knew when we were children and what the ancients knew: that there is physical connection throughout the world (entanglement) and that we affect the physical world through our very presence (the observer effect). Although very young children cannot articulate the wisdom they see, they know these psychological implications in their hearts. So, instead of throwing out every manner of ancient wisdom as being superstitious or primitive, STEM

can show historical correlatives among childhood, ancients, and quantum findings.

Let's Break it Down

The question is, “Where can Quantum Mechanics have an impact on the students”? Here are some psychological implications students may take away from science class.

8 Psychological Implications of Science		
	Relativistic & Quantum	Classical
1	*Connection [Schrodinger said Entanglement is not just A property of quantum mechanics, it’s THE property. Therefore, if we were entangled at the big bang, we could all still be connected.]*	*Separateness*
2	*Meaning & Intention*	*Randomness*
3	*Observer/Matter Interrelationship*	*Observer Does Not Matter*
4	*We Affect Everything*	*We Are Machines*
5	*The Universe (even matter) is mostly empty POTENTIALITIES*	*The World is made of solid matter that is predictable and unchanging*

	waiting to become something	
6	*Incredible energy is everywhere ($e=mc^2$)*	*Matter has small amounts of energy - stars have more*
7	*Empty space has huge energy & perhaps consciousness controls some of it*	*Empty Space is just that*
8	*Quantum Time Reversal defies the notion of the arrow of TIME … Entanglement obliterates SPACE*	*The arrow of TIME moves forward at a regular pace and SPACE is fixed, keeping us separate*

So, in summation relativistic and quantum science implies a few possibilities:

- connection, not separateness may be everywhere (entanglement),
- observing the physical world may change it (the observer effect),
- and the energy that we may be connected to and may be able to change is extremely large.

This is important and hopeful news to pass on in a science lesson.

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Here is a fable story (Bickart, 2020) - a dramatic way to make this point.

#57 The First Artist

When the world was being created, three artists were chosen to propose conceptions of creation. The first was a worker in clay. She scooped up a handful of mud and said, "The world should be created from the clay beneath our feet. It is a very responsive medium. One can mold it with the slightest touch, allowing the hand to cause the shape." The second artist was a woodcarver. He picked up a branch and unsheathed his knife. Chipping off a bit of wood he said, "The world should be created from the forest around us. It is a medium that responds very slowly, encouraging us to achieve our goals one step at a time." The third artist was a meditator. He sat in contemplation, then said, "The world should be created from consciousness. If we all focus our intentions, we will see that the entire physical world is a medium that responds to our wishes."

THE PHYSICAL WORLD IS A RESPONSIVE MEDIUM

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References

Bickart, J. (2020). *Bickart's Just-in-Time Fables* (Vol. 2). Asheville, NC: Red Shirt Interactive Group.

Quinn, D. (1992). *Ishmael: A novel*. New York: Bantam/Turner Book.