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Education for a Sustainable Development

Complementary Material and Pedagogical Hints for UN SDG no 01



SDG no 1: No Poverty

End poverty in all its forms everywhere

1. Introduction to the topic

In the global poverty report of 2020 (UN), is listing out of others the following eight statistics (1):

1. Globally, 10 percent of the world is living on less than \$2 a day.
2. For every 1,000 children born, 39 will die before they turn five years old.
3. Globally in 2016, over 63 million children ages 6-11 years old were not attending school.
4. Of all the children living in extreme poverty, 75 percent live in Sub-Saharan Africa and Asia.
5. Today, approximately 8.9 percent of the world's total population is still practicing open defecation.
6. Rural populations around the world are seven times as likely as urban populations to be drinking contaminated water.
7. Less than half of rural populations (45 percent) have the knowledge and resources to manage their own health by washing their hands with soap and water.
8. People in the United States are expected to live 18 years longer, on average, than those born in Sub-Saharan Africa.

Reading and hearing of poverty, some basic questions may arise:

- What is the definition of poverty?
- Is this definition valid for everybody in whatever region or country they live in the world?
- Why does poverty exist?
- Is it just bad luck or insufficient efforts of individuals to fit into a society?
- Has it something to do with our beliefs and experiences, that in a society, appreciation and acceptance are only given to wealthy people- the richer they are, the more admired they will be and therefore many people are aiming for wealth at any cost?
- Is it family related and therefore inherited?
- Is it just a question of politics?
- Are governmental systems other than democracies more vulnerable to poverty?
- Or maybe Poverty just be a number? in some kind similar to the artificial school-marks, which do have to meet ideally the „Gauss distribution“ means: „normal distribution“. In order to be within the „norm“, rating a class with school-marks - one has to have „bad“ students - and very good ones. Otherwise you'd never get such an idealistic curve and therefore never meet the „norm“. Transferring this model to poverty: in order to get the „normal distribution of a society concerning its welfare, there has to be Poverty!
- Could poverty in the final analysis be something artificial?
- How would the world look like, if richness and wealth (economically) would not anymore be considered as the top value for a society? If other values start to weigh more, such like: kindness, being of service for the community, handcrafting skills and so on.
- Could you draw / describe such a social-equal world?
- How the world would look like, if we would have no poverty.

These are only some questions arising if I think about poverty. The gap between the poor and the rich people becomes always bigger. And even though thanks to efforts of non-profit organizations some regions are able to exit poverty, new regions are just on the brink of slipping into it.

Understanding poverty with its background and reasons is very complex. Therefore, this SDG should, likewise all other SDGs, not be addressed in isolation, but should always be taught and explored in a multidisciplinary way. Therefore STEM-teachers are asked to reach out to their colleagues of different fields to work together:

For this SDG no 01, one can connect with colleagues in subjects like:

History	Politics	Sociology	Economics
Ethics	Religion	Geography	
Philosophy	Psychology	Biology	

(The order of the topics is random and has no implication of a ranking!)

If you click on one of the [hyperlinked words](#), it will lead you to ideas for a multidisciplinary teaching in the text. With such a precious potpourri of fields and competences, you can introduce your students to the very much multifactorial aspects of poverty. They should be able to understand, that poverty is not just happening, but has its reasons. They should be aware of, that different styles/forms of poverty are existing; and sometimes just around the corner of their own home place...

An important source for more information about the topic of poverty is the Socioeconomic Data and Application Center (SEDAC) ([2](#)), which is part of NASA's Earth Observing System Data and Information System (EOSDIS), hosted by CIESIN at Columbia University. CIESIN is a Global Poverty Mapping Project, which begun in 2004. It contains a number of 1-page maps each highlighting a different poverty facet.

SOURCES:

1. LiveWater, Poverty statistics, <https://lifewater.org/blog/9-world-poverty-statistics-to-know-today/>, last accessed 2021/05/12
2. SEDAC, <https://sedac.ciesin.columbia.edu/maps/gallery/search?facets=theme:pov-erty>, last accessed 2021/04/08

2. How to implement SDG 1 with STEM education?

a. Science

Poverty and Health

With **Biology** for example, you've got the topic of nutrition (esp. malnutrition) you can link it to the anatomy of the digestive tract and what effect the lack of essential elements/minerals do have on cells, on our immune- or nervous-system. Together with **Psychology**, the **Biology** Teacher could address the syndromes of bulimia and anorexia.

- Is there any difference for a body being confronted with the different forms of malnutrition?
- What is the impact of malnutrition of a child's' body in relation to his growth, of his/her development of the hormone system?

Regional distribution of Poverty

Together with **Geography**:

- What kind of regions are affected most by famine?
- What do these landscapes look like?
- How did they change over the last 10'000 to 100'000 years?
- Or did they change only recently? What was/is the impact of men on this landscape?
- Does poverty also exist in your neighborhood?

Methodological hint

Hang up a large Map of the world. Let your students place pins at each place they already visited - or, they immigrated from. Let them tell if they could see poverty in these places. If not, why? This is esp. interesting in places, where the poverty of the local population is hidden from the tourists...

Poverty and the lack of water

- Where do poor people take the water from? Is it safe to drink?
- How can dirty water be sanitized? —> Together with the **Engineer**: create / build your own water-sanitizer, not with fancy tools, just with materials which affected people would have! (Little hint: Fill a PET bottle with water out of a river / lake and leave it in the sun for a couple of hours. (3, 4) What is the effect of the sun on the water? Here, the **Physicist** can join, filter the water through stones and gravels and sands! To explore the difference before and after this treatment- take examples and measure their properties: pH, Nitrogen levels and have a look on a drop of water under the microscope (**Biology!**) to explore the microbes and to be able to see what happened with them...

- What are „sunrays“? What are their characteristics?
- What happens to the water if it is exposed for hours to the sun?
- Test the water (pH, nitrate, salinity, etc.) with TI-Nspire CX CAS and Vernier Sensors.

b. Technology

- Do you know / can you find technical inventions already invented to lower poverty?
- Many projects of the development aid are based to improve the poor countries technology. Look for examples (with **Geography**) and try to find out, what effect these new inventions had/have.
- What is the footprint to build such tools? (—> see material SDG 12) Discuss, if such a support / aid is sustainable or not. What other SDGs are affected from?
- How one can build or dig a well with as little material as possible?
- How can water be found? How do indigenous people find water? —> Together with a **Biology** teacher you can explore the ways animals other than humans have to search for water: Elephants, for example.
- Does it reduce poverty in a place, if we are donating old computers, text books or mobile phones?
- EPFL- essential TechCentre: Get to learn the projects presented here and have a close look on them, together with **Engineers**. Always ask the question: will this project be sustainable? What are the costs by means of natural resources which have to be provided / exploited in order to provide such an aid? (see SDG 12) ([5](#))

c. Engineering

- Engineers topics are often to implement new, modern and handsome tools to change people’s life away from their tradition towards a more modern “western” lifestyle. Together with a colleague who teaches **Ethics**, you can explore the tension and impacts on such development goals.

Methodological hint

Form small groups. Each group is working on a different perspective to this subject. They have to formulate arguments, statements, points of view. In a second round, you can let them go into a dispute/discussion (maybe with audience).

- Look up 3D-Printing with your students for artificial Limbs, Organs, which could be donated to persons with such needs. —> Can you build a very simple 3D printer yourself?
- What are the most popular tasks engineers are doing for a society hit by poverty? Try to find it out.
- EPFL- essential TechCentre: Get to learn the projects presented here and have a close look on them, together with **Technicians**. Always ask the question: will this project be sustainable? What are the costs by means of natural resources which have to be provided / exploited in order to provide such an aid? (see SDG 12) (5)

d. Math

- Using big data! Introduction in statistics or some parameters of data about poverty. Introduction to the topic of extrapolation. —> In this context: extrapolate the future trends for a society, affected by poverty.
- Can poverty be eliminated? Are extreme poverty and obsessed richness not linked somehow? Or, the other way around: If we would not have rich people at all, would there be no poverty on earth?
- Together with the **History** / **Politics** teacher: What form of government is vulnerable to “produce/provoke” poverty? Which form of government is the least vulnerable to such a process? Do such countries have no poverty at all?
- Calculate / display in nice graphs: How much money belongs to the richest person on earth? How many poor people would have to add up their money until they would reach the same amount?
- Some financial math - together with a colleague of the **Economy**: What happens, if the value of the money steadily shrinks —> For example Argentina. What is the impact of inflation?
- What is the relation between poverty and the speculation of staple or other primary foods on the stock market?
- Can you forecast the time a group of people or even a whole society will become poor as next? Do you know the significant indicators to predict the development of poverty? —> Students in this case would get to know the indicators for example the WHO or SEDAC are using for compiling its rankings...

SOURCES:

3. The invention of „SODIS“, <https://www.land-der-erfinder.ch/die-erfindung-sauberes-wasser-mit-pet-flasche-und-sonnenlicht/> (last accessed 2021/04/09) (in germ.)

4. CDC - Centers for Disease Control and Prevention. About „SODIS“ <https://www.cdc.gov/safewater/solardisinfection.html> (last accessed 2021/04/09) (in engl)
5. EPFL, <https://essentialtech.center/engineering-humanitarian-aid-awards-six-epfl-ethz-icrc-projects/> , last accessed 2021/04/09

3. Connecting this SDG with other SDGs

Methodological hint

Encourage your students, to present the different links and dependencies in a *Concept Map*. This is a powerful tool, not only to show how things are linked together, but it shows you, if the student can make the links and name the dependencies. (6)

Some ideas:

- SDG 02: Hunger often comes from poverty
- SDG 03: Poverty threatens health
- SDG 04: Poor people do have less access to adequate education
- SDG 06: Poor people often have only access to contaminated drinking water or even none
- SDG 08: Poor people are often ejected from a working system
- SDG 10: Inequalities provoke poverty (one-sided accumulation of wealth)
- SDG 15: Land grabbing and land violation provoke poverty of locals
- SDG 16: Poverty can cause civil wars and migration, which by itself is causing multi-layered conflicts

Trying to reduce the negative impact of humans on our planet with the help of the 17 SDG's, can be a really good idea to make positive impacts. There is a stumbling block to overcome: If enterprises, governments and individuals in their pursuit of following the SDG's are just focusing on one single or may be two SDG's, there will be a huge rebound effect with other goals. So, the crucial point really is, to have always all SDG's in mind, if a new project or idea is launched.

How the SDG 1 is affected, if one is **only focusing** on one of the following goals:

- **SDG 8:** Economic growth requires access to raw materials like rare minerals or agricultural products and cheap production. Due to power disparities indigenous people are getting exploited and treated unfairly. (low salaries, land grabbing).
- **SDG 9:** Industrial infrastructures have to be built somehow. The resources for all this originate mostly from our soils. Therefore, every object has a material footprint. A applicable measure to quantify this impact is the MIPS (Material Input per service Unit) (—> see SDG 12) Most resources are taken from places, where people are most vulnerable (mining, land loss).
- **SDG 11:** Building and maintaining Western-style “sustainable” cities requires access to huge amounts of resources from other parts of the world.
- **SDG 12:** Modern societies are defining their wealth through consumption and economical wealth. Again, here is the measure of MIPS the central focus one should put on! Discuss with your colleagues from the **Sociology / Psychology**, why possession can't make men sustainable happy—> Enroll projects with your students on minimalism, on sharing economy, and discuss about renunciation and modesty.
- **SDG 16:** The mindset of the modern economy and the pursuit of permanent growth makes this goal unreachable. Look up the complementary material for SDG 08. There, the exponential function will be discussed.

Methodological hint

Let the students do *scribbles* about this subject. Where do they see the negative influence of only focusing on for example SDG 12 (Z)

SOURCES:

6. Creately.com, The Ultimate Guide to Concept Maps: From Its Origin to Concept Map Best Practices, <https://creately.com/blog/diagrams/ultimate-concept-map-tutorial/>, last accessed 2021/04/08

7. Art by Ro, Scribbling Drawing Tutorial for Beginners, <https://artbyro.com/scribble-drawing-basics-for-beginners/>, last accessed 2021/04/08