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Problems, Solutions, and Opportunities for Engineers and Scientists

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Title: Problems, Solutions, and Opportunities for Engineers and Scientists

Overview:

[Provide a brief summary of the module's central theme(s) and purpose(s), emphasizing what humanities questions the module is intended to address]

In this module, students spend time reflecting on major problems facing society today (ex: poverty, hunger, health, education, clean water/sanitation, etc.). They then compare their findings to the major societal challenges identified by the United Nations through the UN Sustainable Development Goals, the National Academy of Engineering - if the class is an engineering class - or the National Academy of Sciences - if the class is a science class. Finally, the students reflect on the major career paths for students graduating with engineering/science degrees and then, more specifically, for students graduates from their college and/or university (Rowan University College of Engineering, in our case). Students then reflect on the degree to which companies that are likely to employ them, are engaged in solving the problems they previously identified. Finally, students identify other non-conventional careers where they can address some of the problems they identified.

This material was used as part of a course called "The Sky's the Limit: Drones for Social Good", which presents students with material that increases their awareness of the needs, challenges, and resources of diverse communities that these drones can serve.

Goals:

[Provide a list of specific goals for the module; try to be concrete and specific about what the outcomes of the module are intended to be]

1. Students will be able to identify major challenges facing people in diverse communities throughout the world.
2. Students will become familiar with frameworks established to address major world challenges developed by the United Nations as well as national Engineering/Science organizations,
3. Students will understand the role that their career path plays in enabling them to collaborate on initiatives aimed at alleviating/solving major world challenges.
4. Students will become aware of alternative career paths for graduates from their disciplines.

User Guide:

[Provide some instructions on how the module could be implemented. You might include specific assignments, instructions on how it should be sequenced, thoughts on how the module could be scaled for different amounts of time, etc.]

The powerpoint in the materials section provides the framework for the order of the discussion that takes place during this module.

Introduction (5 minutes, Slide 2): Ask students to reflect on their career plans.

Problems (10 minutes, Slides 3-10): Have students begin by working in groups to identify what they consider to be some of the major problems / challenges that exist in the world total. Encourage students to start by reflecting on their personal knowledge. After a brief time, encourage students to use information from the websites below:

- https://www.un.org/sustainabledevelopment/sustainable-development-goals/
- https://80000hours.org/problem-profiles/
- https://www.businessinsider.com/world-economic-forum-world-biggest-problems-concerning-millennials-2016-8
- http://datatopics.worldbank.org/world-development-indicators/themes/environment.html#featured-indicators_1

Grouping Problems (5 minutes): Have each group put up the problems that they've identified. When all the groups have their lists of problems on the board, students should go around and identify the similarities and, as a class, determine the top 5 to 10 most important problems.

Present the problems identified by leading national researchers (5 minutes, Slides 11-13): After the students decide on what they consider to be the top problems, present them the engineering grand challenges - for an engineering class - or the national academy of sciences global challenges - for a science class:

- http://sites.nationalacademies.org/international/international_052200
- http://www.engineeringchallenges.org/

Compare findings (5 minutes): Students should compare the problems they've identified with those identified by the national organizations.

Solutions (5 minutes, Slides 11-13): Have students identify which of the problems their discipline (science/engineering) can actually solve and how they might solve those problems?

Career Paths (10 minutes, Slide 15-17): Present data that shows the major employers for graduates from their major. Engage in a discussion regarding the degree to which students in these professions work on addressing these problems. Finally, discuss other potential career paths, and options for those in the careers of the majority of graduates, that can provide options for students to address the major problems.

Present non-conventional career paths (5 minutes, Slide 18-19): Many students are aware of nonprofit organizations, but may not be aware of B corporations, benefit corporations, micro-enterprises, and non-government organizations.

Materials:

[Provide readings, case studies, PowerPoints, etc. that could be used in the module]

The presentation provided has an engineering focus but could be modified to incorporate the needs of scientists.
https://docs.google.com/presentation/d/1rXHt0fZAljBvxjpPxlRFR9S7GBBzMSL8jHrtfDpIiTI/edit#slide=id.g512e6ed0b9_0_0

Sample Implementation:

[Provide a description of how the module has been or might be used in a specific course. Give an indication of how much class time the module is intended for and (where applicable) how the module might be scaled for different lengths (15 minutes, a whole class period, multiple days, etc.)]

This was performed in a sophomore level engineering clinic course and took approximately~45 minutes. This could also be used in many introductory science courses where career paths are discussed. This could also be extended to having students work on a technology that could be used to provide a solution to one of the NAE Grand Challenges or NAS Global Challenges. The students in our course developed entrepreneurial pitches that used drones as the technology that could provide social good and potentially address some of the problems discussed in the first part of the discussion we had in this course module.