Education and Nuclear Energy Perception:

Studying the Effects of Education on the Perception of Nuclear Energy

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Abstract

The implementation of nuclear energy is important to reduce carbon emissions, but it has garnered minimal public support as a result of the negative stigma associated with nuclear disasters. Education about the benefits and costs of nuclear energy has a significant effect on people's opinions of it. However, nuclear energy's bad rep causes people to perceive it as more dangerous than it actually is. I would like to conduct a research project to answer the following question: How does education about nuclear energy affect people's support for it? Data will be collected using an online survey and distributed to people across the United States.

Keywords: Nuclear Energy, Education, Public Perception, United States

Section 1: Narrative

Introduction

Nuclear energy is a vital aspect of any government's plan to reduce carbon emission, but as a result of the negative stigma associated with nuclear disasters it has garnered minimal public support. I would like to conduct a study regarding the public opinion of nuclear energy technology. As I have learned through research, education about the benefits and costs of nuclear energy has a significant effect on people's opinions of it. However, nuclear energy's bad rep causes people to perceive it as more dangerous than it actually is. My research would use a series of survey questions to answer the following question: How does education about nuclear energy affect people's support for it?

Background/Related Work and Motivation

Similar works have studied the public perception of nuclear energy from a variety of different angles.

An article published in a Canadian environmental scientific journal describes the pros and cons of nuclear power from a human health perspective with insight from two experts on opposing sides of the nuclear energy debate. It discusses health risks associated with nuclear power plants, namely radioactive contamination and nuclear power plant meltdowns, the latter of which is most commonly the face of nuclear energy opposition. The latter half of the article compares nuclear energy to fossil fuels with regard to the effect fossil fuel related pollution has on public health as well as its significant role in climate change. It then explains how little carbon is

produced through nuclear energy processes despite the fossil fuels expended to build nuclear power plants(Harvey & Oliphant, 2015). While it is from a Canadian journal, the concerns centered around public health voiced by the authors are universal to the nuclear energy debates in countries all over the world. This article can guide education about nuclear energy to target the specific fears and benefits associated with it to more effectively promote a better understanding of its role in society.

After the Fukushima Daiichi nuclear disaster, most nations that used nuclear energy to power a significant portion of their energy needs reexamined their national energy and electricity plans and policies. Moreover, the accident resulted in huge losses of lives and capital, affecting public perceptions and acceptance of nuclear power plants. To study the public opinion of nuclear energy in South Korea after the accident, information was collected using a survey to explore the effects of four factors: perceived costs, system reliability, awareness, and environmental knowledge on their opinion of nuclear energy. The findings showed that perceived benefits of nuclear energy played a key role in the participants' willingness to use it, and that the four factors listed above had a significant effect on the perceived benefits(Jang & Park, 2020). While it is a case study focused on a single country, the research was conducted in relatively close proximity to the Fukushima accident and thus provides insight on how people’s knowledge of nuclear energy affects their support for it.

Another angle taken to study public perception of nuclear energy explores how people prefer to use different energy sources depending on whether or not they know the name of the energy type. Participants in a study from 2019 were asked to construct a decarbonized energy portfolio for the U.S. in 2050 using varying percentages of different energy technologies. Information about the risk and benefits for each technology were provided during the experiment, but the

labels for the type of energy technology were omitted for half of the participants. Those who could see the labels chose 40% less nuclear generation in 2050 leading the examiners to conclude that public perception constrains the deployment of energy technologies(Abdulla et. al., 2019). This highlights a serious issue for nuclear energy-people are motivated to not support it because of the dread associated with it even when the information about its risks and benefits are exactly the same.

An interesting research study compared the views on nuclear energy from different groups with varying levels of knowledge about the subject. A series of survey questions about their opinions on the risks, benefits, and values of nuclear energy were given to three groups: nuclear experts, STEM professionals, and non-STEM professionals. The results showed that nuclear experts had more favorable attitudes towards the use of nuclear energy and perceived there to be fewer risks in its use compared to STEM and non-STEM professionals. However, perceived benefits of nuclear energy did not significantly differ across the three groups even though perceived benefits were found to have a more influential role on attitudes towards nuclear energy than perceived risks across all groups(Harris et. al., 2018). This is interesting because other studies have corroborated the influence that perceived benefits have on attitudes towards nuclear energy. This source points out how education about nuclear energy has an effect on how people view it, but this source only looks at professionals rather than the population as a whole so it is limited in that scope. I can use this source to shape the definition of nuclear energy education within this proposal, and my research can further expand upon how the knowledge about how education affects public opinion of nuclear energy.

Methods

To answer the question: How does education about nuclear energy affect people's support for it? I propose to create a survey which will study how providing information about nuclear energy affects the participants' responses to questions about their support for it. To do this, I first have to break down what nuclear energy education would entail, and how people's support for it would be measured.

Education about nuclear energy should explain the risks and benefits of using it in comparison with other energy sources in use today. Primarily, this would include how safe it is, how clean of an energy source it is, how reliable of an energy source it is, the amount and kind of waste it produces, and where it can be implemented. A concise explanation of these aspects would be approved by faculty members to ensure a lack of bias and inaccuracy.

People's support for nuclear energy will be measured using a similar set of questionnaire items as were used in the study by Jang & Park, wherein participants express their agreement with different statements by choosing options from a likert scale(strongly disagree, disagree, neither agree nor disagree, agree, strongly agree). Participants will be recruited from a commonly used survey-taking website Amazon Mechanical Turk (MTurk). Only respondents living in the United States will be able to take the survey. Education level will also be recorded in order to see if the education about nuclear energy is more effective for people who have taken more or less years of school, as well as other relevant demographic data.

With the specifics of the education and the measurement of support now explained, it's time to illustrate how the effects of the education will be compared. The participants will be randomly assigned to one of two groups: one group will receive the nuclear energy education treatment before taking the survey, while the other group will serve as the control and will just take the

survey on its own. Answers from the survey will be recorded and the data will be analyzed using IBM SPSS statistical analysis software. By comparing the results of the two groups, we can see how the presence of the education affected the participants' support of nuclear energy.

Expected Results

The results of this study will be presented in a research paper detailing my findings. Based on statistical analyses of the data collected from the survey, I will either confirm or deny the hypothesis that nuclear energy education will cause participants to be more in support of it. Based on prior research, I expect there to be a significant difference in nuclear energy support between the treatment group with the nuclear education and control group without it. I will also note any significant findings based on the results from the demographic data collected from survey participants to see how things like education level, location, gender, and age correlate with nuclear energy support.

Conclusion

This study will explore how nuclear energy education affects the public opinion of nuclear energy technology. Based upon prior research, education about the benefits and costs of nuclear energy has a significant effect on people's opinions of it, as does formal and practical knowledge relating to nuclear energy and science. However, nuclear energy's bad rep causes people to perceive it as more dangerous than it actually is. My research will use a series of survey

questions based on what has been used in earlier published studies to answer the following question: How does education about nuclear energy affect people's support for it?

Section 2: Works Cited

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Section 3: Budget

The funding required to conduct this study can be categorized into two areas. Research time, and survey participant payment. Memberships for Qualtrics and IBM SPSS are provided through LMU, so there will be no cost associated with these softwares.

I plan on spending 10 hours a week for 6 weeks researching and analyzing data for this research project. The LMU pay rate for undergraduate research students is $15.00 an hour, so the total amount for the hourly rate will be **$900**.

Participants will be paid a flat rate to take the survey, and MTurk charges a small fee for each payment. A link to MTurk's pricing policy is here: https://www.mturk.com/pricing. I plan to pay participants $8 an hour to work on the survey taking into account average MTurk pay rates and ensuring it is above the federal minimum wage of $7.25 an hour. I estimate that the survey will take 30 minutes to complete for the treatment group that reads the nuclear energy information, and 20 minutes for the control group that will only take the survey. This means the participants will be paid $4.00 and $2.67 respectively to complete the survey. I plan to collect information from 1000 participants, 500 from each group, which adds up to $3335 for the participants. MTurk charges a 20% fee on the amount paid to each participant, which comes out to $667. The total amount it will cost to pay for the participants will be **$4002**.

In total, to fund this research project I am requesting **$4902**.