[Collapse](https://myasucourses.asu.edu/webapps/discussionboard/do/message?action=list_messages&forum_id=_942635_1&group_id=_268979_1&nav=group_forum&conf_id=_529374_1&course_id=_296601_1&message_id=_15409481_1)

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A notable success in critical thinking can be attributed to Michael Faraday, a physicist who discovered electromagnetic induction. Faraday experimented with electrical conductors placed in magnetic fields, and with conductors coiled around magnets. By changing the electrical state of systems, he was able to induce currents in nearby conductors. Faraday was the first to realize that the force that resulted when an electrical system was changed was manifested in a field. Faraday demonstrated intellectual perserverance in his designs, which required many iterations to demonstrate electromagnetic induction.

A notable failure in critical thinking can be attributed to Dr. Louis Slotin, a physicist who worked on the Manhattan project. Dr. Slotin was directly involved in an infamous criticality accident in which he manually controlled a fission reaction by manipulating a beryllium reflector placed on top of a plutonium core. Dr. Slotin and several colleagues were observing how the rate of the fission reaction changed when he lowered the reflector onto the core. Normally, shims would be used to prevent the reflector from completely covering the core, but Dr. Slotin chose to remove the shims and brace the reflector with a screwdriver instead. This circumvention of safety protocol cost Dr. Slotin his life. The screwdriver slipped, and the reflector fell onto the core, causing a critical reaction. Dr. Slotin instantly knocked the reflector to the core, saving the lives of his colleagues who were further away from the core, but he had already received a lethal dose of radiation. In a futile attempt to restore safety to the situation, Dr. Slotin ordered dosimeter badges, which none of the scientists had been wearing during the experiment, to be placed on the core. This act was futile, as it was now impossible to measure how much radiation the scientists had previously been exposed to. Dr. Slotin failed to show intellectual humility when he chose to ignore safety protocols, and this error in judgement cost him his life.

Bottom of Form

Michael,

                During your analysis of Mr. Faraday’s discoveries on induction, you may need to elaborate more on the electrical theory behind inductance. You write that, “by changing the electrical state of systems, he was able to induce currents in nearby conductors”. More clarity of this key concept may be needed in order to familiarize the reader on what electrical properties Mr. Faraday changed, and what results these changes may have yielded.  Also, you wrote, “Faraday was the first to realize that the force that resulted when an electrical system was changed was manifested in a field”. It is my opinion that this statement should have included a citation in order to make the information seem more credible. How do you know he was the first? A source may add credibility to that particular claim. Towards the end of your analysis, you claim that Faraday had experimented many times to demonstrate electromagnetic induction. For added depth, you may have included some failed experiments, or listed a progression that could have led him towards his success.

During your assessment of the critical thinking failure of Dr. Slotin, I have noticed that little attention had been given to Dr. Slotin’s point of view. I understand that this was a mishap that had cost him his life and endangered the lives of his peers, but there must have been a reason for his actions. For example, why did Dr. Slotin remove the shims and brace the reflector with a screwdriver? You state that he and his colleagues were observing differences in the rate of fission when the reflector was lowered. Was he manually lifting and lowering the reflector at the time of the incident? Also, some clarity on the process of fission should be included. What is the role of the reflector in the process? Is it a shield?

PICO Framing of the CAIB Report

Through our reading of the Columbia Accident Investigation Board and the NOVA documentary on the same, It seems as though there were many underlying factors that created the environment that had overlooked the damage caused by the external tank foam. What had really shocked me was that the video reported this issue occurring on the very first shuttle flight in 1982. It was determined that after repeated success, the issue was overlooked or deemed a, "maintenance issue". In turn, an attitude of complacency had fallen over NASA, because the repeated success of the shuttle in spite of foam damage had replaced a sound engineering solution that could have prevented the foam strikes all together. Below is a PICO framing of the analysis based on information provided in the CAIB report. Below the PICO statement is an outline based off of information in the report.

If NASA managers and engineers (P) resisted an attitude of complacency created by an atmosphere of recurring successes(I) and model best safety practices of the organization after the Naval Nuclear Propulsion (Naval Reactors) program (C), how would it positively impact safety reporting?(O)

**P = Population (participants, problem, process, point of view, primary event)**

Population(management, engineers), problem(catastrophic failure, complacency), process(shuttle re-entry, take-off, safety reporting), primary event(shuttle accident)

**I = Intervention (therapy, treatment, causes or etiology, improvement, investigation, interpretation)**

Cause(Cultural issues, confusing success with sound engineering, giving in to the pressures of strict deadlines), Improvements(Using outside agencies to enforce safety, improving safety culture, ability to operate in a centralized and decentralized manner, improving communication, avoiding simplification)

**C = Comparison (Opposing arguments)**

U.S. Navy Submarine Flooding Prevention and Recovery (SUBSAFE), Naval Nuclear Propulsion (Naval Reactors) programs, and the Aerospace Corporation’s Launch Verification Process

**O = Outcome (measurement)**

Improvements in reporting and culture, the issues have been reported multiple times, but had not been seen as serious.

**Respond:**

Nicholas, I think your PICO question is excellent!  The question clearly incorporates all four components of PICO.  The P clearly defines the Who and what.  Who(Nasa Engineers and Managers) and the what(the shuttle accident, failure and safety reporting).  The I clearly defines the why(improve safety, culture and communication) and how(using outside agencies and avoid simplification).  Your comparison with SUBSAFE is very good in that SUBSAFE seems to set a standard for safety protocol, and communication.  Your outcome does show improvements in the actual reporting of issues and I would also add in prevention of shuttle accidents as well as adding in a factor that could be measured such as something related to reporting issues. They could create a way to show the effects that reporting issues in a timely manner had on prevention of problems.

Great PICO framing, you could add some reasons why you chose some of the factors.  Having read the same article, I can see why you chose everything, but to an outsider it might be less clear.  Explicitly state why you included SUBSAFE as a Comparison for example or why you included avoiding simplification in your Intervention.

Great job!