Why IF I APPLY isn't CRAAP: The evolution of source evaluation with PSU STEM Libraries in the Engineering Classroom

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Introduction

Source evaluation is the process of critically assessing the features, such as reliability, credibility, and relevance, of information sources. This source evaluation ensures that authors make informed decisions and judgments based on the available data. While these concepts are fairly apparent to librarians, they are at the heart of information literacy lessons in the engineering classroom. Students, and undergraduate students in particular, are bombarded with information from sources on a daily basis and need to find methods to navigate through to reach the credible and the reliable.

At Pennsylvania State University Libraries (PSUL), one tool deployed to help students navigate the information landscape is IF I APPLY. This method uses two parts, the personal and the resource, to help users negotiate source evaluation. Reviewing a researcher's own emotions and intellectual courage helps to limit the confirmation bias and reach students in a novel way. Through this paper, the authors plan to review selected evaluation methods before diving into a deeper explanation of the IF I APPLY tool. Finally, some examples from use in the classroom are shared. By exploring the changing face of source evaluation in the Penn State University engineering classroom, readers will better understand why it is important to put the student at the center of their own evaluation.

Literature Review

CRAAP

Over the past two decades, there have been many attempts to create a method or tool that helps students comprehensively evaluate the sources they find. The most well-known method is known as the CRAAP test. Designed mostly to help students remember steps to take while examining resources, the acronym stands for **C**urrency, **R**elevance, **A**uthority, **A**ccuracy, and **P**urpose. To use the tool, an evaluator moves through the steps, answering questions about the source that relates to each criterion [1]. Although the CRAAP test can seem like nothing more than just checking off boxes when evaluating suitable resources, it really comes into its own when the examples shown in class are below the standards required for academic and professional papers [2].

The CRAAP test has been used by multiple STEM librarians, sometimes in quite imaginative ways. Librarians at the University of Iowa created an online video module that allows students to take on the role of "detective" using the method to investigate a fictional lab explosion. Through gamification, students were able to take an active role in the learning process and have fun discovering how to use CRAAP [3]. While not all STEM librarians created a game, the various

research guides and instructional styles shared by librarians across the country speak to the role that CRAAP took on as a leader among resource evaluation tools.

Some issues have arisen with the use of CRAAP, especially when used to review information found through online sources. Librarians at a small community college in New England decided to modify the method using a "lateral reading" assessment that reviewed papers and websites created by a variety of authors on the same topic [4]. This tool was designed to be based on the ACRL Framework for Information Literacy for Higher Education, primarily "Searching as Strategic Exploration," "Information Has Value," and "Authority is Constructed and Contextual" [5]. Using lateral reading allows students to place the information source into context with other resources on a given topic, something that the CRAAP method does not do [4].

RADAR

In the years since the introduction of CRAAP, other methods have been created to either complement it or fill in evaluation gaps that the method exposed. In 2013, the RADAR method was published in the Journal of Information Science. Designed as a way for students to evaluate internet sources, RADAR is an acronym for **R**elevance, **A**uthority, **D**ate, **A**ppearance, and **R**eason for writing. Since the term is a palindrome, the evaluation can be done in either order without losing effectiveness. The big difference between CRAAP and this tool is this flexibility [6]. Depending on student and research needs, starting with Relevance or Reason can be the most appropriate to help with the evaluation of resources.

In 2017, librarians at the University of Waterloo adopted RADAR in their information literacy sessions. The librarians asked students to evaluate both an academic article and an online source on an engineering topic of choice, then report back with their results [7]. RADAR was chosen because the instructors identified it as having a better alignment with the critical evaluation of scientific literature, no matter the source of information. A later study conducted by the same librarian team found that RADAR suffers from the same context issue as CRAAP [8]. Though not as widely adopted, this tool is still employed by librarians at institutions today.

CCOW

A very recent alternative, also designed for online resources, is CCOW. The acronym stands for **C**redentials, **C**laims, **O**bjectives, and **W**orldview, with the evaluators actively engaged in investigating each criterion instead of just going through a list of questions to answer, as with CRAAP. The biggest difference is the removal of "relevance" from the evaluation. The creator of the method felt that this was not important to the task of evaluation. Using CCOW allows students to become active participants in the evaluation process rather than passively answering the questions from CRAAP [9].

Through the use of this tool, students have the opportunity to explore who created a web resource and also the author's qualifications. Most research guides on this method feature the use of quizzes and real-world pictures, screengrabs, and memes to get the point of each step across to the viewer. CCOW is a unique and creative voice in the source evaluation picture.

CEI

Another recent addition to the resource evaluation game is the University of Waterloo's "Critical Evaluation of Information" (CEI). Its purpose is to combine information literacy skills with the scientific method. It approaches the process of assessing sources by using the following steps:

- *Define context.*
- *Find a source.*
- *Use any Evaluative Framework (like CRAAP, RADAR, or CCOW).*
- *Critique/Apply the Scientific Method.*

CEI can be used as an overall framework for finding and assessing literature intended to be used in research projects [10]. In addition to the actual evaluation process, students are able to determine the context of the information using their own knowledge of their profession. As they learn more about their chosen discipline, they can use CEI to improve their information literacy skills [11]. CEI makes an effort to consider the needs of students and researchers while also emphasizing the idea that this is a learning process.

Overall, the various methods in this literature review are not taking on the form of an exhaustive list of all possible resource evaluation tools. Rather, this literature review seeks to move the reader through the evolutionary process that brings us to IF I APPLY and its use in Penn State University engineering classes. Many of these tools have similarities and there are threads that run throughout the lot. Additionally, a focus on mnemonic methods helped to link these tools together. It is important to understand what was, and even what is current, to understand why IF I APPLY is the best-chosen method for this institution. Finding a way to connect to students while also utilizing sound evaluative strategies can make or break any tool.

IF I APPLY

IF I APPLY approaches source evaluation from both the personal and the resource. Many source evaluation methods mentioned above focus on the resource as a stand-alone object without considering that students need to think about their own biases or demands of the resource. As an example, the CRAAP test considers the relevance of the resource to the writer's topic, but what it lacks is the first step of asking the student to review their own emotions when using a resource.

When using the IF I APPLY method, the student needs to think critically about, "the process of seeking, using, and evaluating sources of information for research" [12]. By asking students to engage with the resource, what is happening is a request for a student to engage with their own emotions. And that is the hard part. Emotions can be squishy and not something easily faced. Additionally, emotional management by students can impact their ability to cognitively engage in schoolwork and research [13]. Figure one provides an overview of the source evaluation mnemonic broken into its two different parts.

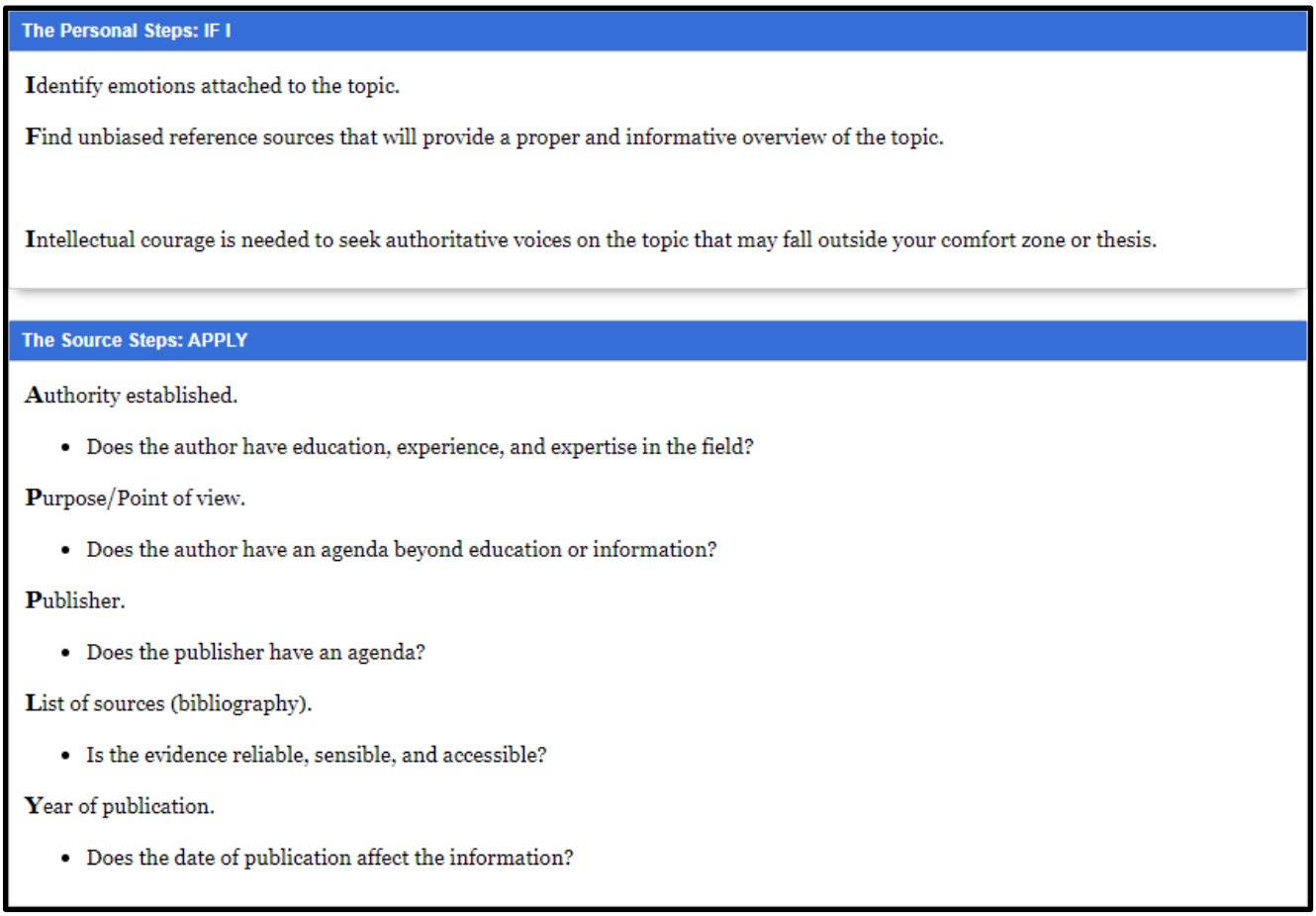

Figure 1: Overview of IF I APPLY [14]

IF and I function as the personal section of the tool.

- **I***dentify emotions attached to a topic.*
- **F***ind unbiased reference sources for proper review of a topic.*

These personal steps in the source evaluation process look at the emotions of the student or writer, while also calling on them to perform a bit of background research on their topic to make sure that confirmation bias is not coming into play. Confirmation bias is exactly as the name

implies in that people tend to look for and gather facts that support one's own beliefs, to the extreme so as to not balance other facts or opinions that directly oppose their own [15].

- **I***ntellectual courage to seek authoritative voices on topics that may be outside of the thesis.*

This is where intellectual courage comes into play for this source evaluation method. In a way, the *I* in this method is a challenge to students because it asks them to find credible material and have the intellectual courage to seek out multiple viewpoints [16]. Then this step goes a bit further by asking students to reject arguments that are unsound. Through use of personal and potentially uncomfortable steps, students can engage further with their resources. Students learn that resources are not existing in a vacuum waiting for them to come and cherry pick those that suit their needs, but rather the students can learn how they are part of the evaluation process. They make their own choices and thereby need to approach all potential resources using a critical eye. Figure two identifies questions and information sought during the IF I section of the tool.

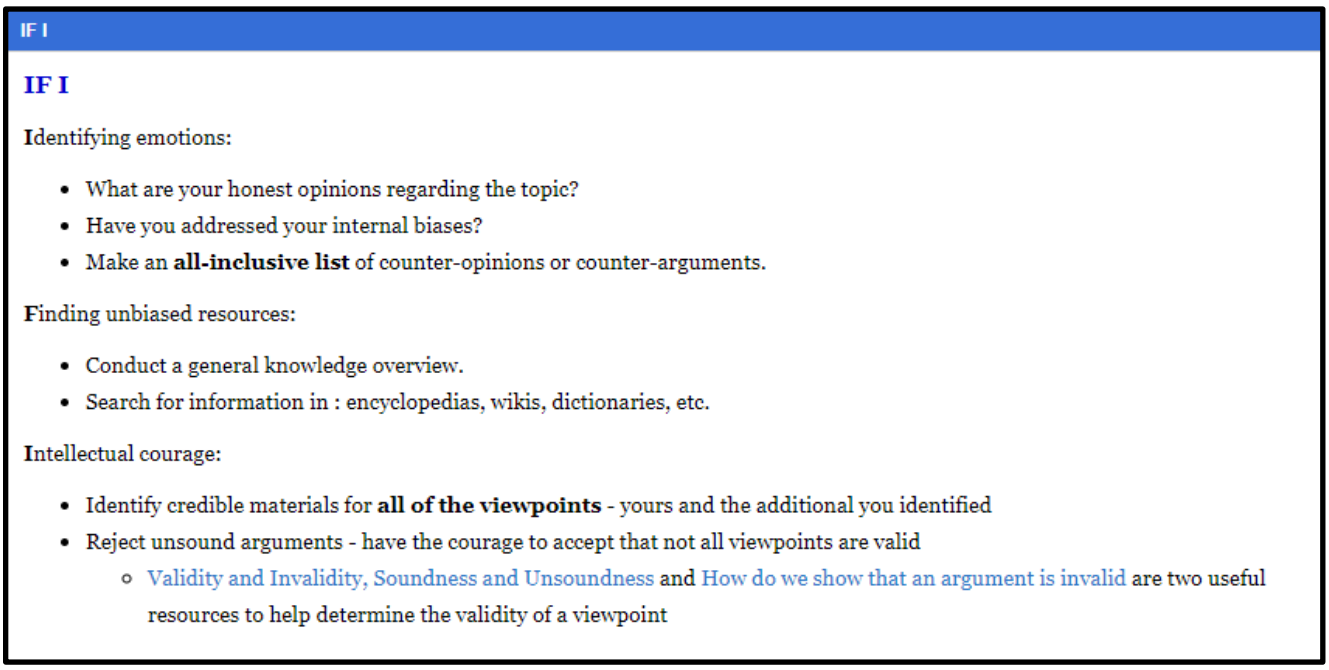

Figure 2: The first part of the tool – IF I [14]

Meanwhile, APPLY is the secondary and source evaluation portion of the mnemonic tool.

- **A***uthority established.*
- **P***urpose/Point of view of source.*
- **P***ublisher.*
- **L***ist of sources (bibliography).*
- **Y***ear of publication.*

This section of the tool moves to more inspection and evaluation of the resource being used. By reviewing the authority, students can investigate the affiliations and credentials that authors, publishers, or even organizations hold. It is the most similar portion of the tool to previously discussed resources, such as CRAAP and RADAR. When moving into the APPLY section, students should be able to take the background knowledge developed during the IF I step to effectively maneuver through this step. This review of authority (A) directly leads to the purpose (P) for the resource. Looking at author agendas, resource perspectives, and resource conclusions can help students understand the purpose and relevance of a source. Additionally, students can use the context clues provided by where a resource lives to help them navigate the biases that may not be immediately apparent from an initial perusal of possible resources they seek out for use in their own research. By reviewing the publisher (P), students can better understand the research landscape of their topic. They also can see the scholarly, popular, or commercial attributes and uses that a resource may have before getting attached to a particular resource.

A key aspect of this tool is the use of lateral reading by its users. By including the step of reviewing the list of sources (L), students can better appreciate and comprehend that, "[n]ot all resources will have a traditional bibliography; learners are encouraged to 'build' a bibliography with the information at hand" [12]. This can take the form of reviewing who is interviewed in a news article, or the companies profiled in a magazine article, or looking at the standard bibliography. Additionally, this step encourages students to recognize that at the end of everything they read, there may not be a list of references available. Both in research and in casual reading. Sometimes there will be a list of sources, but sometimes there is not. So students need to learn skills on building an unofficial bibliography to better evaluate what they are reviewing. The final part of this tool is the year of publication (Y). Year of publication is always going to be subjective based on the discipline, resource itself, and why the student is using it. Sometimes the most current resource is not the top resource for a topic, but then students need to consider why this is. By asking where and when the information comes from, students can learn how to check for outdated statistics or updated information. Figure three showcases questions and information sought during the APPLY section of the tool.

APPLY

APPLY

Authority

- Who is the author (may be individual or organization) and/or publisher?
- What are the credentials and affiliation or sponsorship of any named individuals or organizations?
- How objective, reliable, and authoritative are they?
- Have they written other articles or books?
- Is/Are the author(s) listed with contact information (street address, e-mail)?
- Do they specialize in publishing certain topics or fields?

Purpose/**P**oint of view of source

- Does the author have an agenda beyond education or information?
- What can be said about the content, context, style, structure, completeness and accuracy of the information provided by the source?
- Are any conclusions offered? If so, based on what evidence and supported by what primary and secondary documentation?
- What is implied by the content?
- Are diverse perspectives represented?
- Is the content relevant to your information needs?
- Why was the information provided by the source published?
- What are the perspectives, opinions, assumptions and biases of whoever is responsible for this information?
- Who is the intended audience?
- Is anything being sold?

Publisher

- Does the publisher have an agenda?
- When was the information published?
    - Publication date is generally located on the title page or on the reverse side of the title page (copyright date).
- Is the information provided by the source in its original form or has it been revised to reflect changes in knowledge?
- Has the publisher published other works?
- Is this information timely and is it updated regularly?
- Is the publisher scholarly (university press, scholarly associations)? Commercial? Government agency? Self ("vanity") press?

List of resources

- Where else can the information provided by the source be found?
- Is this information authentic?
- Is this information unique or has it been copied?

Year of publication

- Is this information current? Can you find more current or relevant information?
- Is the cited information current? Make sure work is not based on outdated research, statistics, data, etc.
- Is the information routinely updated?

Figure 3: The second part of the tool – APPLY [14]

Engineering Classroom Examples

Biomedical Engineering and Chemical Engineering Example

IF I APPLY has been used in conjunction with both the Biomedical Engineering Seminar course and the Exploring Chemical Engineering First-Year Seminar course. Both introductory courses are geared to early career undergraduates and held in conjunction with other general education requirements. These classes are one credit, fifty-minute classes that meet once a week. Each class begins with a cursory explanation of this method before moving into a few short examples that the class moves through evaluating together. In all cases, the starting point is the IF I and thinking about biases. This class evaluation method uses three examples that are handpicked by the instructor to share differences in “acceptable” and “further review needed” sources based on a topic. The terms “good” and “bad” are not used in this context. The reasoning behind this is that one resource utilizes sound research but is not relevant to the topic, thereby failing the APPLY portion of the tool. Another example clearly fails due to biased claims. This introduction portion of the class takes about fifteen minutes of the class period.

After these class examples, students are placed in small groups and assigned a topic that their group is investigating. Google Docs is the method of topic distribution and information gathering so that students have access to the class exercise after the class period ends. The groups are asked to review two given resources to decide on their acceptability using IF I APPLY and document their decisions with explanations. One question every group must answer is if they addressed their own internal biases on the topic. Putting the personal steps of the tool first helps students feel more confident in their answers for later steps. This group exercise generally takes about twenty minutes and is a way to engage students while moving from group to group.

The final fifteen minutes of each class is dedicated to reviewing each group's topic, articles, and decisions. The shared Google Doc is projected on the screen, thus giving a chance for each group to share their application of the tool, while also allowing students to engage with their peers. This is also a chance for a tool wrap-up and to answer any burning questions. The shared Google Doc link is emailed to the instructor after the class so that it can be posted to Canvas, the Learning Management System used at Penn State University.

Civil Engineering Example

IF I APPLY is also used to teach first-year civil engineering students how to evaluate sources, primarily those that deal with climate change and environmental science/policy. The session begins with an explanation of why students need to evaluate the information they find. This portion includes:

- Source must be appropriate for your current needs.
- A source that may not be appropriate in one case may be useful in a different context.
- Do not think about resources and information as "good" or "bad" - information selection and determining its usefulness is not a black or white, yes or no, process.

They are then introduced to the idea of personal bias and conduct an exercise where they are shown two pictures (or symbols) of competing products or institutions and asked which they prefer and why.

After all the introduction material is completed, they are finally shown IF I APPLY. This section begins by going over each step in the process in detail. Next, students review the first three steps (IF I) on their own, since that is the portion which is most personal to them. Two examples (an academic article and a website) are used as demonstrations, then the students have time to examine two more information sources on their own in class, using the APPLY portion to evaluate each while keeping the IF I part from earlier in mind. Finally, they have the opportunity to anonymously share what they think with the rest of the class using the collaboration board embedded into the Nearpod tool used for the course instruction.

Future Plans

The use of IF I APPLY as an information evaluation tool for Penn State engineers is very new. Since it is taught in first-year courses, there is an opportunity to assess whether it influences their information literacy skills throughout their studies. Integrating the tool into additional engineering courses so that students are exposed to it multiple times will help to determine its continued viability as a resource evaluation tool. Questions that librarians will need to consider for future evaluation include, but are not limited to:

- How are students assessing resources using IF I APPLY for the completion of their coursework?
- How and when are students choosing to use IF I APPLY?
- Does using IF I APPLY lead to a higher quality of citations used in their coursework?

As librarians at PSU continue to infuse more courses with IF I APPLY, the goal is to introduce this tool to the wider College of Engineering community.

Conclusion

As shown in this paper, IF I APPLY is one singular tool amongst many in the resource evaluation toolkit. What makes it different is its ability to center the student in the question, through the questioning of an individual’s own emotions, biases, and courage. By asking the students to center themselves in the process they are challenged to critically think through the

resources. In addition to the assessment ideas mentioned above, future research on this topic should involve the use of interviews to better understand what students feel while applying the tool to sources. But for now, it seems like the librarians have a very good start on introducing this tool to undergraduate engineering students.

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