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ABSTRACT

Fostering deep learning and clear understanding of ideas and methods presented in a scientific literature is one of essential skills for the current generation of learners. The workshop presented the set of techniques and tools for analyzing various types of written materials, including magazine articles, research paper, book chapter, op-ed, etc. An illustrative hands-on activity was used for an illustration of the presented concepts.

KEYWORDS

Deep Learning, Engagement, Critical Thinking, Source Analysis, Rubric

INTRODUCTION AND MOTIVATION

Critical analysis and understanding of increasingly high volumes of information coming from various sources is one of most important factors determining the success of a learner. The learning can take onto various forms, however it is equally important for a high-school student, a university graduate, a beginning researcher or an established academician. The proposed workshop established the need for a systematic approach to source analysis, presented the summary of scientific and pedagogical methods for extracting essential information from sources of various styles, lengths and sophistication, and concluded with an interactive long activity to support the concepts learned.

The workshop's main goal is to engage the conference participants with various backgrounds (graduate students, post-doctoral fellows, beginning career researchers, educators and established professionals) into a lively and active workshop-style activities, follow up summary and discussion directly related to main conference theme of conducting post-educations research and source analysis. It meets the conference objectives of promoting innovative ways of understanding, summarizing and processing written material.

PRELIMINARIES

According to Collins English Dictionary [1], source analysis is defined as:

- A point or place from which something originates
- A spring that forms the starting point of stream
- A person, group, etc that creates, or originates something

Source material is thus can be defined as an article or work of art that presents a model for studying new material, and in some cases provides ideas and inspiration for new discoveries. There has been a significant amount of focus on studying the impact of proper source analysis onto learning outcomes [3,5].

According to Cornell Library Guide [2], typical source analysis includes a number of formal steps, including Initial Appraisal and Content Analysis. Initial appraisal is focused on formal and technical details about the publication, including formal data about author, publication date, edition, publisher and journal title. Content analysis looks deeper into intended audience and area of expertise presented in the source. It also addresses author's writing style, coverage, clarity, objective reasoning and even outside evaluating reviews [2]. While extremely useful, the above steps mainly focus on technical representation of ideas, format of the representation, and quantitative characteristics of the writing. However, this type of analysis is not conducive to understanding the source value, analyzing the process of expressing the ideas clearly, summarizing them in a concise form, and understanding the main message the author tries to convey.

However, it is essential for the current generation of learners to be able to understand different writing styles, have some feedback that their grasp of concepts expressed in the source is correct, be able to extract and focus on the main ideas, their validation by the source author, possible applications and future work, and concise summary of the material.

LEARNING OBJECTIVES

The workshop bridges the gap between more formal understanding of source analysis and, in a way, an engaging storytelling. The workshop is based on a series of in-class interactive activities, intended for graduate students and senior level undergraduates, conducted as part of CPSC "Research methodologies" course at Faculty of Sciences, University of Calgary. This interactive Source Analysis activity was inspired by the Writing Analysis workshop, delivered by Invited Speaker Dr. Hakan Erdogmus, in Fall 2011 [4] to the eager audience of 20 students. Hakan Erdogmus has a vast technical background and has published in the field of test-driven and agile software engineering [6]. While being a professional software design engineer, he has mastered and promoted a deep understanding of expressing ideas clearly in the scientific papers, and critical analysis of our own writing. His idea was expanded, enriched and incorporated into yearly activity which focuses not only on writing but also on critical source analysis, and can be expanded to an audience of 20 to 200 people without sacrificing its effectiveness.

The following learning objectives are expected to be achieved by the Source Analysis Made Easy workshop participation:

- Ability to carry out critical analysis of literature/sources
- Ability to separate the main idea from the supplementary materials
- Ability to identify main parts of the source (summary, motivation, methods, validation, conclusion)
- Ability to critically and objectively evaluate own as well as external sources (novel, sound, correct, etc)
- Ability to create a short 1 sentence and 1 paragraph summary of a source

THE PROCESS

The supplementary materials for the workshop include:

- ✓ A learning source (research article), 5-15 pages
- ✓ A workshop rubric
- ✓ Pens, pencils, erasers
- ✓ Highlighters

The learning sources could be: a magazine article, a self-written report, a book chapter, an op-ed, a white paper, or even a form of artistic impression. It can be published or unpublished, authored or self-authored, and the ideal length is 5 to 15 pages not including references.

Workshop participants must independently, within a certain time period, complete the rubric based on the learning source (Fig. 1).

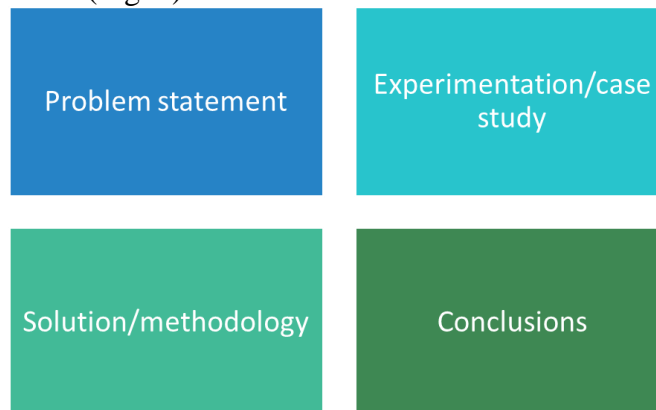


Fig. 1 Workshop rubric

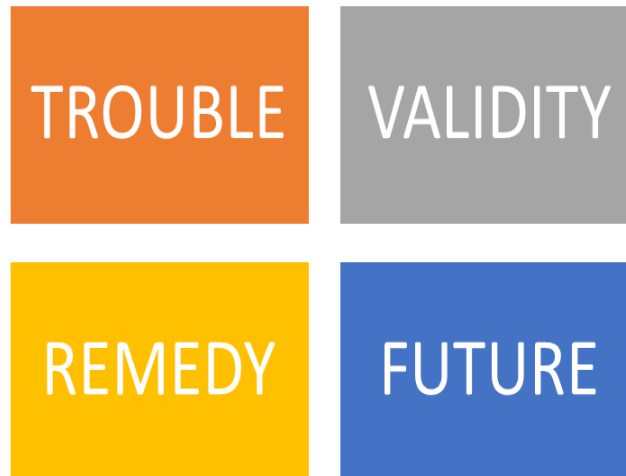


Fig. 2 Workshop rubric made easy

As shown in Fig 2, these concepts can be expressed in a more accessible format as Trouble (Problem), which is addressed through the Remedy (Methodology), verified by presented evidence of Validity (Experimentation) and will be most likely used in the Future (Conclusions). The goal of the workshop is to show the learner the way to fill out this rubric after reading the article for 10-15 min, and then receive a feedback on how well his understanding of the presented material matches the content of the learning source. This later part or a feedback mechanism, is a crucial part of the process. Below, I summarize the formal representation of steps learners must complete during the workshop, that assist in reaching the learning objectives.

Process Stage 1 – analysis (25 min)

- ✓ Read an article (10 min)
- ✓ Highlight answers to the rubric on the article (5 min)
- ✓ Write down main ideas in the rubric's four quadrants (10 min)

Process Stage 2 – feedback (5 min)

- ✓ Pass filled out rubric to evaluator
- ✓ Evaluator grades each of the answers on the scale (0 to 5)
- ✓ Total score is computed (0 to 20)
- ✓ Graded rubric is returned to the rubric author

Process Stage 3 – statistics (15 min)

- ✓ All values are added up
- ✓ Selected high and low score answers can be read (w permission)
- ✓ Disagreement in grading are discussed
- ✓ Statistic per article or per evaluator (if the same source was used multiple times, or the same person handled more than one source) is computed

CONCLUSIONS AND OUTCOMES

The above process thus serves the following purpose. It provides a way to easily understand even a complex material in 4 easy steps, a way to critically analyze information presented as a scientific article, a book chapter, an op-ed etc, a way to analyze its own writing, a way to validate own analysis by a peer or a mentor, a way to receive feedback on analysis, a way to generate overall statistics for a group of people or for a learning source.

Future improvements of both process and analysis of the results can focus on:

- Analysis of different learning styles of students (level, subject)
- Analysis of different sources (length, subject, style, format, audience)
- Analysis of time need to perform source analysis
- Analysis of quality of feedback
- Advanced statistical analysis for a group of learners or for a given source

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BIO

Marina L. Gavrilova is an Associate Professor in the Department of Computer Science, University of Calgary and an Editor-in-Chief with TCS Journal, Springer. Her research interests lie in the area of biometric security, cognitive sciences, pattern recognition, social networking and cyberworlds. Prof. Gavrilova is a founder and co-director of the Biometric Technologies Laboratory and the SPARCS Laboratory, and published over 150 journal and conference papers, edited special issues, books and book chapters, including World Scientific Bestseller (2007) – "Image Pattern Recognition: Synthesis and Analysis in Biometric" and top selling "Multimodal Biometrics and Intelligent Image Processing for Security Systems" IGI (2013). She is a member of Editorial Boards of eight international journals. Prof. Gavrilova has given numerous Invited Keynotes and Invited Panel Lectures, with research profiled at National Museum of Civilization, on the Discovery Channel and at Canada-UK Colloquium on National Security.