## **Technical Report Structure**

(CLEAR Instructor: Dynette Reynolds) dynette.reynolds@utah.edu

*Abstract*—When writing a technical report, you should begin with your conclusions first. While such an approach may seem backward, it is actually easier for both author and reader. This paper describes how to write using "Inverted Pyramid" structure.

## I. THE INVERTED PYRAMID

Many academic papers now follow an "inverted pyramid" structure. This kind of writing emphasizes the most important facts or conclusions first, then follows with subordinate details, including explanations of the methodology, evidence, or findings. This may directly contradict what your high school English teacher told you about writing. He/she probably advised leading into a thesis statement, capturing your reader's attention with an anecdote, beginning chronologically, etc. However, academic disciplines are increasingly abandoning that kind of writing. Instead, papers are often structured to facilitate faster reading, which means that the author must begin with his/her most important point and include as many of the 5Ws as possible in that first statement (Who, What, When, Where, Why). This usually involves re-writing the introduction after the rest of the paper is finished, so that the introduction more accurately reflects your conclusions.

Fig. 1 demonstrates the principle of "inverted pyramid" structure. The example comes from an actual article that appeared in *IEEE Transactions on Education*. While the authors did not use inverted pyramid structure in writing their report, their article lent itself well to such a revision [1].

A study of EE perceptions among high school females found that inviting female students to a one-day conference at the Technion-Israel Institute of Technology in Haifa increased interest in the field of electrical engineering and corrected their perceptions regarding work opportunities in EE. *[Findings stated first.]* 

Interest in EE as a profession increased among the attendees, from 19 out of 124 (15%) respondents at the beginning of the day, to 29 out of 45 (65%) at the end of the day. *[Details of first finding stated.]* 

At the beginning of the day, only four students were able to identify a specific EE topic. At the end of the day, 11 specific EE topics were identified by the respondents, including robotics, image processing, and artificial intelligence. *[Details of second finding stated.]* 

The authors infer from this study that exposing students to female role models will enrich individual perspectives of the profession. They recommend that EE be presented as realistically as possible to high schoolers in order to emphasize the multifaceted possibilities in the profession rather than just the technical challenges. The authors plan to conduct future studies of a similar nature. *[Conclusion, recommendations, and future plans stated.]* 

Fig. 1. Simplified inverted pyramid structure for technical papers.

II. INVERTED PYRAMID STRUCTURE WITHIN SECTIONS

The inverted pyramid technique should also be used *within* each section of your paper. The first sentence in each section should state the main point of that section. Then you may give the background or explain the methodology, chronology, etc. Every section should end with a conclusion that summarizes your main points and leads logically to the next section. Fig. 2 demonstrates how inverted pyramid structure can be used even in a Methods section. Note that once the overall methodology has been described, the later paragraphs follow a more traditional chronology to describe specifics. METHODS In order to examine student perceptions of the field of EE and to track changes over the course of the day, researchers used both questionnaires and ethnographic observations. Students attending the conference filled out questionnaires in the morning, before the conference began, and again in the afternoon, at the end of the conference. Researchers later analyzed the qualitative data using inductive analysis. *[General methodology outlined.]* 

*Morning Questionnaire*. The first questionnaire, filled out by all 124 pupils was distributed before the beginning of the opening session. It focused both on the pupils' preferences for possible future study at the Technion and on their current perception of EE. A copy of the questionnaire is included in Appendix A. *[Specific methodology]* 

*Afternoon Questionnaire.* The second questionnaire was distributed during the closing session of the day. It was completed by 45 students (the other pupils either left earlier or did not wish to complete the questionnaire). This questionnaire examined the pupils' perceptions of and attitudes toward EE at the end of the day. A copy is included in Appendix B. *[Specific methodology]* 

*Analysis of the Data.* After the data were gathered, inductive analysis was used to analyze the qualitative data. Categories were developed based on careful reading of students' responses. *[Final methodology]* 

Fig. 2. Methods section using inverted pyramid structure.

III. INVERTED PYRAMID STRUCTURE WITHIN PARAGRAPHS

Even at the paragraph level, the inverted pyramid structure works well. Most students are already familiar with the concept of a "topic sentence" that begins each paragraph and defines its subject matter. The topic sentence is simply the first step in an inverted pyramid structure. Begin with a broad, general statement that will be the focus of that paragraph, then discuss that topic in more detail in the rest of the paragraph. Each paragraph should discuss a different topic.

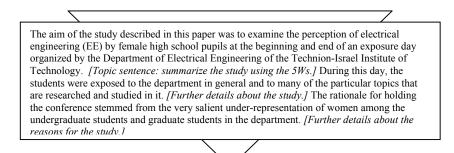


Fig. 3. Inverted pyramid structure at the paragraph level.

## IV. LIMITATIONS OF IP STRUCTURE

Many scientists still do not use IP structure in their writing, and this makes their work very difficult to read. IP not only helps a reader make sense of the paper, it also helps an author organize his/her thoughts better. Yet IP is not appropriate for every situation. Methods sections, for example, sometimes need to be organized strictly in a step-by-step fashion. Abstracts, on the other hand, should *always* be organized with IP structure so that a reader knows the conclusions right from the start. With a little practice, you will soon feel more comfortable with IP structure. You may even find that papers almost write themselves once you've decided what the main point of each section is.

## REFERENCES

[1] O. Hazzan, D. Levy, A. Tal. "Electricity in the Palms of Her Hands—The Perception of Electrical Engineering by Outstanding Female High School Pupils." *IEEE Trans. Educ.*, vol. 48, no. 3, pp. 402-412, Aug. 2005.