

The Formulae for Writing a Good Scientific Academic Article

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Abstract

Although the humanities and sciences differ and the structure of an academic article may vary, I would like to suggest that there is a basic set of parameters that may be used to develop a sound academic paper, at least in the scientific disciplines. Given the fact that the sciences deal more with hard evidence and quantitative results, there is a clearer structure for the presentation of such results and answering a particular set of questions of even confirming a hypothesis. This is not as relevant in the context of the humanities which may be considered less structured or less a matter of proof as such and thus less dependent of a clearly defined formulae for writing an academic article. Thus, this brief paper is more useful in the context of the sciences where the following structure applies: introduction; methods, results and discussion and conclusion. In the foregoing I will unpack useful “tips” that assist in developing an argument accordingly and thus communicating one’s findings in a way that is easily understandable and as a result makes for a good academic article.

The Introduction

In general, there is a specific stylistic methodology that assists in forming a coherent and powerful introduction in a research article, especially in the domain of or in scientific disciplines. Swales J et al. [1] defines a model for writing such an introduction in terms of “moves” and “steps”. The “moves” are subdivided into “steps”.

The first rhetorical “move” consists in setting boundaries wherein the research area or territory is defined. To the extent that this research area is significant or at least well-established, the importance of the research area is established. In this way one claims a certain centrality. Here one needs to highlight previous work in this area. The next “move” consists in highlighting a blind spot or at least a “gap” in the existing literature. At this point the writer needs to indicate certain limitations to current research in the demarcated area. Another possible “step” is to expand on an existing tradition or line of argument that perhaps has not been probed deeply enough.

At this point, the writer has prepared the reader for the “coup”, wherein the writer now establishes how the current paper or research material will adequately “fill the gap”, that is to say, provide new and pertinent knowledge to develop current research or at best, develop and generate new knowledge. The writer will thus outline the purpose of the current paper, including a summary of principle findings and one possible step is to also outline the structure of the paper [2].

By following this schema, a clear articulation of the context of the study is established. Moreover, its relevance and potential for developing the terrain is argued for. The last “move”, namely defining the objectives of this study, may in many cases mean articulating a clear hypothesis. This ought to be followed by a brief account of what these findings were and

if the hypothesis was proven true or not. In this case, the reader knows the trajectory of the project and the value it may hold. In addition, a clearly defined outcome in the introduction gives the reader clear bearings and thus makes later sections, such as the methodology and results, easier to follow and clear in terms of what the quantitative data might imply both in terms of the paper in question and the larger questions so far as the future research implications might be.

The key point in terms of such a formula is to taper one's language from the general to the more specific, narrowing one's focus towards the paper in question itself. One begins citing references that introduce the research area in question and then as the reader becomes aware of "gaps" so the need for the current paper is argued for. By the time one reaches "move 3", it is best to use the present simple tense in describing the work of the paper itself.

In my own role as a lecturer in academic writing for doctoral students in English where in general their first language is Hebrew, the structure outlined certainly assists students in writing a coherent introduction and developing their project with both precision and clarity. It furthermore assists in finding accurate words without being wordy and perhaps most importantly creates a seamless flow, which is the basis for good writing and communication of ideas, however technical in scope.

Methods Section

The methods section ought to describe the procedure employed for getting the results. Generally, when describing the methods employed, one should use the past simple in passive voice. For example: "the samples were collected...". One should begin with a general statement about the method, followed by a justification for this approach and then details regarding the steps taken. One compares this to existing methods (usually described in the present simple) and one should also mention possible difficulties with the current method in question.

The validity of one's study is judged based on the soundness of the methodology. One needs to communicate information about a new procedure, a new method, or a new approach so that everyone reading it can not only carry it out and obtain similar results, but also understand and accept one's procedure. At the outset, one offers a general overview by outlining the parameters of the work, for example the number of tests, the equipment/materials/software used and perhaps also the purpose of the investigation. This helps the reader get a general idea of the section. One should also provide a general background about the materials or about the source of the materials/equipment.

When one details the methodology, include precise information such as quantities, temperatures, duration, sequence, conditions, locations, sizes and so on. One therefore indicates in the foregoing that appropriate care and accuracy has been maintained. Swales J et al. [1] thus defines the following rhetorical "moves":

- A. describing data-collection procedure wherein one indicates the source of one's data; data size; criteria for data collection; collection procedure and background details of data;
- B. describing experimental procedures wherein one indicates the main research apparatus; recounting of experimental process and criteria for success and finally
- C. describing data-analysis procedure wherein one defines one's terminologies; indicate process of data classification; analytical instruments/procedures and indicating any modifications to the instruments and procedures.

Results and Discussion

Here one has to describe and articulate what the data means or what one can observe in graphs and various kinds of ways in which data is displayed. One begins by stating the overall result reminding the reader of the aims of the project in terms of the methods employed. One needs to refer specifically or explicitly to a graph in question and state the results with a view to comparisons with previous studies. This then sets the stage, as it were to new findings or anomalies which make the study relevant. One must be clear as well on the method of analysis and any conceivable problem or limitations in the results. The logical consequence of that is to now state the implications of the result or results.

The past tense is usually used for this section, as this is not established knowledge. One may use the active or passive voice. One usually makes a statement and puts the relevant figure or graph in parenthesis after the statement. Moreover, rather than being wordy with a statement describing a graph as in: "treatment of cells with inhibitor was observed to block cell cycle treatment" should read as: "treatment of cells with inhibitor blocked cell cycle progression".

One should describe patterns or trends to notice in the visuals and where they come from. Use generalizations necessary to interpret the data in the text. This creates clarity, however, visual data should be clear enough that they could be understood without reading the text. Tables and figures should be sequentially numbered. Usually capitalize "Table/Figures". Avoid repeating results given in a table or figure. It is not necessary to describe every bit of data. Avoid showing data that is not necessary to illustrate the experimental point. Once one has observed something, one can then extract what the information suggests or means. One can derive certain kinds of knowledge or truths. As with the previous sentence, one moves from the general to the specific, the simple to the complex or more detailed.

One can sum up the "moves" already described as:

- A. Highlighting of overall observations,
- B. Indicating specific observations and
- C. Accounting for observations made.

This leads to the next rhetorical "move": where one indicates non-consistent observations. This enables one to evaluate one's

results and importantly reminding the reader of the aim of the study in the process. In this sense, one prepares the reader for the concluding section, where implications and contribution of the study will be communicated, as well as suggesting possible further avenues of research for future studies. In this way the field of knowledge is expanded, and the specific research territory first established in the introduction.

Conclusion

Often the concluding section is named: “discussion and conclusion”, rather than the “discussion” being attached to the “results” section. In either case, this section includes the restating of the objectives of the current study in relation to the background of the field. Just as in the introduction, one reminds the reader of the weaknesses in previous research and how this present study “fills the gap”, in the context of the methods employed to see if indeed new knowledge or an expansion of knowledge may be garnered. Then one summarizes the results. Now one is able to evaluate what one can learn from this, indicating the future necessary direction of

research; what is yet to be determined or made known and perhaps suggesting conceivable ways to solve such problems.

This reader should now get a sense of the significance of the research paper and its overall contribution, inspiring him/her to attach importance to the findings and at best, a kind of revelation at what has now been discovered, approaching certainty in the validity and truth of the results or findings. The abstract should consolidate all the sections in a seamless paragraph that summarizes accurately the purpose, procedure and results of the study within the designated area of research, further simplified with the use of 4-7 keywords. This in essence describes a scientific research paper, both in structure and method.

References

1. Swales J, Feak C (2004) Academic writing for graduate students, (3rd edn), Essential Tasks and Skills, Michigan University Press, Michigan, USA.
2. Glassman H (2010) Science research writing for non-native speakers of English. Imperial College Press, London, UK.

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