How to determine whether a student (or anyone) should be a co-author?

A publication is often the end-goal of a research project. Often these projects are collaborative, and might extend over the life-time of several successive collaborative groups of undergraduate researchers. While many people contribute to the end-product, not all contributions are of the same flavor. Some people might spend more time on the project than others, or someone might have had the "big idea", while someone else did all the simulations.
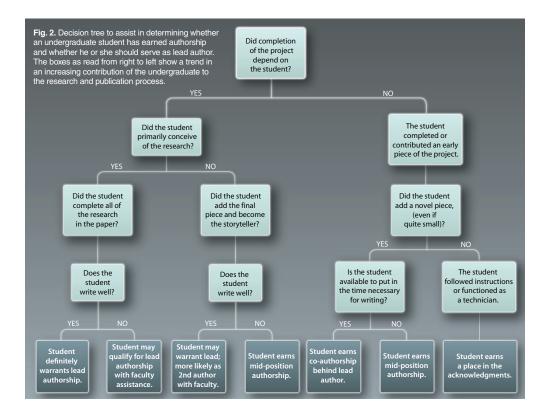
Who should be listed as a co-author on the journal, and who should be acknowledged in the "Acknowledgments" section? Here are some guidelines:

Someone who is listed as a co-author should satisfy *all four* of these criteria:

1. substantial participation in conception and design of the project, or in the analysis and interpretation of data;

2. substantial participation in the drafting of the manuscript or in the substantive editing of the manuscript;

3. final approval of the version of the manuscript to be published;

4. ability to explain and defend the study in the public or scholarly settings.

People who do not satisfy all four of these criteria, might be suitable for the acknowledgments section. Also, be sure to acknowledge any funding for the project.

See the flow chart below for more detail. More details and useful information can be found in [1].

Fig. 2. Decision tree to assist in determining whether an undergraduate student has earned authorship and whether he or she should serve as lead author. The boxes as read from right to left show a trend in an increasing contribution of the undergraduate to the research and publication process.

[1] R.L.Burks and M.M. Chumchal, "To Co-Author or Not to Co-Author: How to Write, Publish, and Negotiate Issues of Authorship with Undergraduate Research Students", *Science Signaling* **2** (94), (2009).