Scientific quality

Quality of a scientific publication

In order to assess the quality of a scientific publication, we should distinguish between an intrinsic evaluation and an evaluation on the basis of external indicators.

- An intrinsic evaluation by an independent expert in the domain treated by the publication is generally considered to be the best way for assessing the scientific value of a paper. Of course, the main problem is to find such an expert. Aspects that should be considered in this evaluation are:
    - Is the author acquainted with the up-to-date knowledge in his/her domain?
    - Does the paper start from a relevant non-trivial question, and is this question clearly formulated in the framework of the subject?
    - Does the author use the appropriate methodology for obtaining a well-grounded answer to this question?
    - Are the results of his/her investigation sufficiently convincing for justifying the conclusions drawn by the author?
    - Is the paper well written, with a clear structure that underlines the problems, the methodology, the results and the conclusions?
    - Do the conclusions constitute a valuable step forward in our knowledge? (This value can be purely theoretical in our conceptual understanding of the phenomena – which in a later stage may eventually lead to useful applications – or they can be of direct usefulness. Is there a possibility for special applications in the developing world?)
- Indirect evaluations are often performed on the basis of external indicators that try to measure the *impact* that a paper has (or potentially may have) on the further development of science or on interesting applications. The indicators may be:
    - The number of citations that the paper receives in the subsequent literature. This criterion is very seductive because it is quantitative in nature and therefore an easy measure. Disadvantages are:
        - it may be abused (friends citing each other),

        - a citation may contain very negative criticism,
        - the number of citations measures more the popularity of a subject or the size of the specific scientific community than the intrinsic value of a paper,
        - the main problem is that it can take several years before you can really assess the value of a paper on this basis.
    - A surrogate indicator often used is the so-called "impact factor" of the journal in which the paper is published, since this measures the average number of citations received during two years by all papers in this journal. Since there is a clear correlation between this success factor of the papers and the severity of the peer review process of the journal, a high impact factor guarantees somehow a positive intrinsic evaluation. The drawbacks are nevertheless:
        - Individual articles may have citation numbers that strongly deviate from the average in the journal.
        - Since a high impact factor gives the publisher a commercial advantage, the selection process of a journal may be biased towards more popular subjects.
        - This modern hype of the impact factor is one of the causes of the abusively high subscription prices of some journals, which make them unaffordable for the poorer universities in the developing world. We should not encourage this...
    - Whereas the publication in a high-quality journal should certainly be appreciated, we should certainly not look down on the publication in an Open Access journal. This modern way of freely sharing the results of your research with the whole world is certainly to be preferred above burying a paper in an obscure local journal.

Quality of an individual researcher

Individual researchers should be assessed on the basis of their c.v., in which their list of publications (assessed as described above) plays an important role. Other elements of the evaluation are:

- What is the number of publications relative to the number of years devoted to research, and taking into account the rest of the duties of the person (didactical and managerial tasks, other services for the community,...)?
- Taking into account the financial possibilities, does he/she participate in conferences with scientific contributions and publications in the proceedings?
- What is the scope of the subjects investigated: is there a nice spread or is the same subject treated over and over again? Whatever is the case, is this justified by the nature of the problems investigated?
- Is the environment of the researcher stimulating his/her research or does it rather work against it? How does this influence your assessment?

Quality of a research group

A team or research group should be assessed on the basis of the composition of the group, i.e. on the quality of its members and their publications (assessed as described above). Furthermore, one should consider the following:

- Does the group have a coherent research plan, or is everybody following his/her own favourite programme?
- How good are the prospects for a successful elaboration of the work plan? Are all necessary expertises present in the group? Is the infrastructure appropriate?
- How good are the leadership qualities of the group leader? Can he motivate his people? Does he have both scientific and managerial skills?
- How good are the international contacts of the group?

Quality of a research project

The main criterion for success of a research project is the quality of the researcher or the research group that proposes the project. Nevertheless, a few additional considerations should be taken into account:

- Does the project description indicate that the group is sufficiently acquainted with the up-to-date knowledge in this domain? Do they have broad and adequate access to the international scientific literature?
- Does the project start from a relevant non-trivial question, and is this question clearly formulated in the framework of the subject?
- Would answering this question (or solving this problem) really be an important step forward in the development or progress of our scientific knowledge? Would it be useful for the developing world?
- Is the proposed methodology for obtaining an answer to this problem appropriate?
- Does the group possess the necessary skills for applying this methodology? Or does the project contain an element of upgrading their skills to the required level?