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REPORT FROM A WORKSHOP*
(INVITED CONTRIBUTION)
General issues in science education

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QUALITY CRITERIA FOR RESEARCH PAPERS ON SCIENCE EDUCATION: HOW CAN THEY BE USED TO IMPROVE MANUSCRIPTS SUBMITTED FOR PUBLICATION?

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ABSTRACT: This contribution to the conference describes a workshop on quality criteria for research papers in science education. The activities and the outcomes of the workshop are reported, including its concise evaluation and some suggestions for manuscript improvement. [*Chem. Educ. Res. Pract. Eur.*: 2000, *1*, 27-30]

KEYWORDS: *quality criteria; research papers; manuscripts; workshop*

* *Editor's note*: The workshop was an activity of the 5th ECRICE.

INTRODUCTION

Journals of research in science education are very important for disseminating research outcomes (De Jong et al, 1998). Writing a research paper on chemistry (or broader: science) education is rather a difficult task. Writing that paper in such a way that it will be accepted by the editor(s) of a suitable research journal is, nearly always, even more difficult. In such cases, it is very important to know the *quality* criteria of the journal under consideration for the submission of the paper and to apply these guidelines which, eventually, are used for reviewing manuscripts.

This workshop is aiming at improving the ability of the participants in writing papers for journals of research in science education. This implies an exchange of ideas, collaborative reflection, and learning from fellows' experience on the part of all the participants. About 60 conference participants attended the workshop.

WORKSHOP PROCEDURE

The activities in the workshop were executed according to the following schedule.

Developing a provisional list of quality criteria

A brainstorm session about relevant criteria for research papers on science education initiated the workshop. Each participant had to discuss the issue with his/her neighbour, and, later, each couple reported plenary. In this way, the participants created a provisional list of quality criteria themselves.

Structuring the list

The *Journal of Research in Science Teaching* (JRST) uses a checklist of main categories for paper reviewing purposes. These categories are (Good, 1993):

- title of paper;
- abstract;
- introduction/rationale/theoretical framework;
- method;
- findings/interpretations;
- references;
- general features.

One of the workgroup leaders used the JRST list for the structuring of the provisional list, by classifying the criteria reported by the workshop participants in accordance with the JRST categories. The outcome was briefly discussed.

Revising the list

The group was then divided into three subgroups. Each subgroup was guided by one of the workshop leaders. The participants worked together in teams of two. They had to apply the already generated structured list of provisional criteria to reviewing a research JRST-article (Boujaoude, 1991) which was handed out to them. This review process served as a tool for revising the provisional list of criteria. Each team has to respond to the following guiding questions:

(i) Which criteria are very/not useful?
(ii) Which specific criteria are not useful?
(iii) Which specific criteria should be added?
(iv) Which specific criteria should be changed?
(v) Which specific criteria should be removed?

The responses of the two-member teams were reported plenary and were further discussed extensively.

Applying the list at home

At the end of the workshop, each participant received a copy of an extensive JRST list of guidelines for reviewing qualitative research (Good, 1993). They also received a copy of a paper (Eybe and Schmidt, 1999) that was accepted for publication in the *International Journal of Science Education*. Both could be useful for the participants when they are preparing their own papers at home.

OUTCOMES OF THE WORKSHOP

Provisional list of criteria

A number of quality criteria for manuscripts on science education research have been reported. They can be summarized as follows:

- good summative title;
- clear description of the objectives;
- insight into the author's guiding pre-understanding/conceptualization;
- correctness of concepts involved;
- awareness of modern learning theories (if relevant);
- containing innovations;
- stimulating new ideas or challenging existing theories;
- detailed description of research methodology;
- check on the validity and reliability of the procedures used;
- conclusions which are solely based on the collected data;
- containing message(s) for practitioners;
- clear structure;
- consistency in arguments, style and format.

Comments on the provisional list

Concerning the usefulness of the generated criteria, the following were considered as very useful:

- clear description of the objectives;
- stimulating new ideas or challenging existing theories;
- detailed description of the research methodology;
- check on the validity and reliability of the procedures used;
- containing messages for practitioners;
- consistency in arguments, style and format.

The following criteria should be added to the list:

- containing sufficient crucial information;
- concise way of reporting the research methodology;
- good references, but not too many;
- provision of keywords;
- the use of 'I' or 'we' too often by the researcher(s) should be avoided.

EVALUATION

The participants were highly motivated to cooperate, both in the team and plenary work. Most of them expressed their feelings of satisfaction explicitly. Some suggested the following action for further improvement of such a workshop in the future:

- select a shorter article from the JRST;
- provide everybody with sufficient time for reading the whole JRST article (perhaps before the workshop);
- provide more time for reflection on the title of the workshop.

The workshop organizers feel that the workshop was a success. By using this kind of design within training courses for (young) researchers in science education, e.g. during seminars or summer courses for Ph.D. students, such a workshop can contribute towards the improvement of the quality of research manuscripts.

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