Prof. Jack Halbrook
https://www.etis.ee/CV/Jack_Holbrook/eng
jack.holbrook@ut.ee
Visiting Professor,
Centre for Science Education,
University of Tartu, Estonia, UK.
https://www.ut.ee
Editor; IISRR - International Journal of Research

Steps in Writing a Research Article; Principal and Practices

Jack Holbrook

Abstract:
This article seeks to give guidance to prospective authors on the focus and emphasis in writing a research article with special reference to articles submitted to IISRR-IJR. It is based on a presentation to IISRR addressing the major aspects of a research article, following the guidelines and spirit of articles as indicated in the website. The article recognizes the need for a meaningful title, abstract and introduction before drawing particular attention to the choice of research questions as opposed to hypotheses. The article continues with a focus on a literature review, methodology, results, discussion and conclusion. This article does not claim to be exhaustive, and seeks to pay particular attention to articles with an educational focus. The structure of the article is related to the guidelines put forward for authors in writing for IISRR-IJR.

Keywords: *Focus, Methodology, Research Questions, Hypotheses, Implications*

1. Introduction to this Article:

Writing a research article can be a challenging experience. It involves a number of steps that are seen to be in line with the requirements of the journal in which it is intended the article is to be published. The guidance for this article is the International Journal of Research, published under IISRR. Nevertheless, irrespective of the journal, the article needs a title, an abstract and key words. These appear at the beginning of the article, although this does not mean that they are the first part of the article to be constructed by the author. On the contrary, they are probably the last part to be finalized, although in this article, the writing components are considered in the sequence in which they appear in the article.

A research article is expected to portray meaningful aspects, or outcomes of a research study/project of interest both to the author, the journal in which it is published and of course, the reader. As such, the article is more than information or opinions; it is putting forward original findings, in a responsible and valid manner, from a qualitative, quantitative, or mixed methods study. It needs to be an article that is in a format suitable for publication and having a focus that is within the scope of the journal in which it is to be published. In seeking to publish the article and share with others, the author is expected to portray original, meaningful and valid research,

as well as this being based on a theoretical underpinning. Furthermore, the article needs to be meaningful, lacking in plagiarism, being both concise, but coherent.

2. Putting forward a Title:

The title of the article needs to reflect the major ideas being addressed. In a research article, it is not expected that the title is a question.

An example of a title- *'Students' Perceptions of an Intervention Course Designed to Raise Science-Related Career Awareness.'*

*(***Title taken from:** Soobard, R., Kotkas, T., Holbrook, J., & Rannikmäe, M. (2020). Students' perceptions of an intervention course designed to raise science-related career awareness. *European Journal of Educational Research*, *9*(4), 1539-1555. https://doi.org/10.12973/eu-jer.9.4.1539)

3. Writing the Abstract:

The abstract is a concise (around 200 words), single paragraph, summarizing the coverage of the article. It is intended to give the reader an overview of the whole article, paying attention to the rationale for the research, the general method used in seeking to address the research problem or problems, indicating the pertinent results or finding and the conclusions drawn. It is a standalone component and does not specifically refer to any other part of the article such as, for example, diagrams or tables.

An example of an abstract *(Number of words=152)*

This longitudinal study focuses on evaluating grade 7-9 school students' perceptions of intervention modules intended to be of mixed relevance, as well as promoting learning attributes to raise awareness of science-related careers. Students are taught through six purposely developed and designed career-related teaching–learning modules (C-TLMs). Each module is initiated by means of a career-related scenario, followed up by promoting conceptual science learning plus drawing attention to careers to which each module intends to relate. Student perceptions are obtained by means of a questionnaire after each module with respect to its relevance and also the mean by which the learning environment raise interest, enjoyment and motivation associated with career awareness. Outcomes show that, in general, students participating in this study agree that the developed C-TLMs are relevant and students value the learning experienced through the different module contexts. Nevertheless, student appreciation of the specific inclusion of career awareness components in the modules is (Ref) Soobard, R., Kotkas, T., Holbrook, J., & Rannikmäe, M. (2020)[1]. Students' perceptions of an intervention course designed to raise science-related career awareness. *European Journal of Educational Research*, *9*(4), 1539-1555. https://doi.org/10.12973/eu-jer.9.4.1539

[1] Soobard, R., Kotkas, T., Holbrook, J., & Rannikmäe, M. (2020). Students' perceptions of an intervention course designed to raise science-related career awareness. *European Journal of Educational Research*, *9*(4), 1539-1555. https://doi.org/10.12973/eu-jer.9.4.1539

4. Putting forward keywords:

Following the abstract, up to five keywords are, in general, specified, which highlight the major, or essential ideas/terms presented in the article. These are valuable in enabling electronic online searches to recognise the focus of the article. An example of key words is - "Career-based teaching-learning module (C-TLM), learning environment attributes, relevance, science-related career awareness." (*same reference as earlier*)

5. Writing the Introduction:

An introduction places the specific research being undertaken within the more general field. It seeks to indicate the significance of the research being undertaken within a broad overview and, as such, seeks to 'set the scene'. The introduction, as a background, can serve one of three functions -

a) give the broad picture in which the research has a specific component,
b) seek to oppose existing norms, or draw attention to a research gap, and/or
c) highlight the important characteristics of the research direction.

The background is likely to be, initially, general on international aspects/concerns, but gradually becomes more focused, leading to the area of concern for the research being presented. Any statements, or claims made in the introduction are most likely to need a reference. A major consideration is that the introduction leads to the goal(s) of the research (in general terms), or the aim of the particular research area.

The goal/aim is a general statement associated with the research, which can be further detailed through research questions, or hypotheses. However, depending on the research, the aim may be more appropriately given after the literature section, especially when this section puts forward literature definitions.

6. Example indicating the Aim of the Research:

This study aimed to distinguish between a teacher's post-CPD self-efficacy status and the attainment of a sustainable level of teacher ownership based on underlying philosophical ideas, in this case, related to a motivational context-based, science teaching approach (Valdmann et al., 2016)[2], after reflection and teaching over a period of time, post-CPD.
The follow-up research questions were given as -

1) In what way can sustainable teacher ownership be meaningfully defined, distinguishing this from teacher self-efficacy and a 'sense of ownership'?

[2] Valdmann, A., Holbrook, J., & Rannikmäe, M. (2020). Defining teacher ownership: A science education case study to determine categories of teacher ownership. *Journal of Baltic Science Education*, *19*(4), 657-674. https://doi.org/10.33225/jbse/20.19.659

2) What characteristics of science teacher ownership based on dimensions of variation can be determined 3 years post-CPD, designed to operationalize a philosophy and teaching approach?

6.1 Specifying Objectives if appropriate:

By and large objectives are unnecessary if the aim(s) of the research are followed up by research questions to investigate. The objectives take the place of, or tends to repeat, the aim. Thus, the objectives are sub-components of the aim and are often more applicable when hypotheses are stated (which tend to be a more specific reflection of the objectives).

An example of objectives being stated, based on the aim given as the title: **A Study comparing Teaching Effectiveness of In-Service Teacher with Pre-Service Teacher at Secondary Level** (aim not specified in the text)

6.2 Objectives stated:

1) To study the level of teaching effectiveness of in-service school teachers at secondary level.
2) To study the level of teaching effectiveness of pre-service school teachers at secondary level.
3) To compare teaching effectiveness between in-service and pre-service teachers at secondary level.

7. Hypothesis put forward for this Research:

Ho_1. There are differences in levels of teaching effectiveness of in-service school teachers at secondary level.

Ho_2. There is no difference in levels of teaching effectiveness of pre-service school teachers at secondary level.

Ho_3. There is no significant difference of teaching effectiveness between in-service and preservice teachers at secondary level.

(ref) Haldar P.P. & Chel M.M. (2020)[3]. A Comparative Study of Teaching Effectiveness of In-Service Teacher with Pre-Service Teacher at Secondary Level. *IISRR-IJR, 6(3),* 106-112.

7.1 Writing Research Questions or Writing Hypotheses?

Research questions seek to elaborate on the aim(s) of the research and stipulate what the research is seeking to achieve i.e., the research provide answers to the questions put forward. Research questions are specifically needed in qualitative research, where they usually begin with

[3] Haldar P.P. & Chel M.M. (2020). A Comparative Study of Teaching Effectiveness of In-Service Teacher with Pre-Service Teacher at Secondary Level. *IISRR-IJR, 6(3),* 106-112.

'what', or 'how' implying that the implication of the research is seen as a major focus, rather than the analytical findings. Also, as research questions draw attention to reflections on the implications of the research, they are appropriate for both qualitative and quantitate research and most education journals tend to publish articles based on research questions. An example of research questions is given below –

RQ1 How do students perceive the relevance of teaching/learning modules, developed to promote science-related career awareness?

RQ2 Which learning environment attributes do students appreciate as meaningful for the development of science-related career awareness teaching/learning modules?

(ref) Soobard, R., Kotkas, T., Holbrook, J., & Rannikmae, M. (2020)[4]. Students' perceptions of an intervention course designed to raise science-related career awareness. *European Journal of Educational Research*, *9*(4), 1539-1555. https://doi.org/10.12973/eu-jer.9.4.1539

Hypotheses on the other hand, are statements in quantitative research, in which the investigator makes a prediction, or a conjecture about the outcome of a relationship among attributes, or characteristics. A hypothesis is often put forward in the form of a null hypothesis (Ho) and tends to be more common in scientific research, or in quantitative studies. Also, the research tends to be limited in scope to addressing the appropriateness of the hypotheses. Examples of hypotheses[5] are –

H_{01}: There is no significant difference in attitude towards e-learning between male & female under-graduate and post graduate students.

H_{02}: There is no significant difference in attitude towards e-learning of undergraduate and post graduate students with regards to their education focus.

H_{03}: There is no significant difference in attitude towards e-learning between rural and urban area under-graduate and post graduate students.

(ref) Ghatak, D. & Das, P. (2021). Attitude of College & University Students towards E-Learning in Kolkata and North 24 Parganas Districts, *IISRR-IJR, 7(1),* 81-91.

7. 2 Hypotheses focus on the outcomes of the analysis and it is thus not surprising that the follow up beyond the analytical research outcomes is limited. Also, such articles tend to have very short discussion sections, which basically repeat the research findings. Hypotheses thus focus on the quantitative nature of the research. Where research is qualitative and, for example, the actual nature of the attitudes is of interest in the example above, then research questions are more appropriate, allowing a focus on the implications of the

[4] Soobard, R., Kotkas, T., Holbrook, J., & Rannikmäe, M. (2020). Students' perceptions of an intervention course designed to raise science-related career awareness. *European Journal of Educational Research*, *9*(4), 1539-1555. https://doi.org/10.12973/eu-jer.9.4.1539

[5] Ghatak, D. & Das, P. (2021). Attitude of College & University Students towards E-Learning in Kolkata and North 24 Parganas Districts, *IISRR-IJR, 7(1),* 81-91.

findings through a discussion, especially in relation to findings by others. In educational type research, it is thus usual to find research questions being stipulated. *(In the above example, the discussion and conclusions are given together and take up 9 lines)*

8. Developing a Literature Review:

The review is a careful examination of the body of literature, related to the field of study and research findings, these being associated with the research questions, or covering the background for the hypotheses. The importance of this section lies in the clarification of the meaning of existing terminologies, or theories and the strength of prior research undertaken by others, related to the field of study the literature review is a mechanism by which the research is viewed as part of a cumulative process.

The purpose of the literature review remains the same regardless of the research methodology used. It indicates an essential awareness of the research outcomes which are already known, associated with, or around the focus of, the research being undertaken, thus allowing an extensive preview of findings by previous researchers. An important step in this is to be able to express the review in an appropriate and sequential manner.

In reflecting on prior literature when addressing problems, it is appropriate to proceed from the general situation to the more specific problems. The steps to cover, with respect to research field, are expected to relate to prior findings that substantiate aspects associated with the research the researchers have chosen. The use of the internet and search engines has opened up opportunities for accessing a wealth of in-depth literature material. But in searching the literature, key terms need to be carefully specified. For example, if these so-called key terms find too many references, then the search terms are not sufficiently refined, but if too few references are located, then the search topic expressed is likely to be too narrow.

The search can also include theoretical considerations. However, an in-depth conceptualization of underlying educational theories and explanations of the background (i.e., a literature review) is probably best included in its own section, or sub-section.

9. Writing the components for the Methodology:

The methodology section gives details of the research process undertaken, which can be quantitative, or qualitative (or both).

9.1 Expected Aspects of Methodology:

The methodology is expected to cover the following five aspects and for the most part coverage is in this order-

a) sample(s), or population involved (number of students/teachers, etc.) and whether the sample is simply a convenient sample of individuals, intact classes or groups, or the sample is stratified in some way;
b) details of instrument(s), or (tools) developed/used;
c) the data collection process (how is the data obtained?);
d) data analysis (what type of analysis and analysis tools are used);
e) the validity and reliability of the research, plus any ethical considerations.

9.2 Indicating Population and Sampling:

This gives a precise definition of the population/sample. The whole idea of inferential research (using a sample to represent the entire population) depends upon an accurate description of the population. However, usually, just one sentence is necessary to define the population. Examples are: "*the population for this study is defined as all adult customers who make a purchase in a given store during the sampling timeframe*", or "*all homeowners in a specified city*". While the population can usually be defined by a single statement, the sampling procedure needs to be described in extensive detail. There are numerous sampling methods from which to choose, but it is important to describe how the researcher selected the sample, making use of specific places, times, etc. This is extremely important, because the reader of the article must decide if the sample sufficiently represents the population.

The sample are persons (students, teachers, etc.) who provide the data for the analysis. The sample can be purposeful, or representative. The sample needs to be such that the data collected can be meaningfully analyzed.

An Example -

Ten teachers, voluntary participated in this study. All teachers had participated in a one-year in-service CPD course prior to this study (Valdmann et al., 2016)[6] and were interested in exploring implementation of the CPD ideas in practice. All teachers volunteering to participate in the study, had a master's degree and were female.

9.3 Preparing the Instrumentation (Tools):

The instrument(s) is/are used for data collection. In an education sense, it can be teaching material, a test, questionnaire, interview, etc. If an instrument has been taken from another source, it is important to ensure it is suitable for your research environment. Important considerations are -

1) have you given sufficient details which allows others to reproduce the methodology?

[6] Valdmann, A., Holbrook, J., & Rannikmäe, M. (2020). Defining teacher ownership: A science education case study to determine categories of teacher ownership. *Journal of Baltic Science Education*, *19*(4), 657-674. https://doi.org/10.33225/jbse/20.19.659

2) have steps been taken to ensure the instrument is valid?
3) if used with students, is the instrument 'age appropriate'?
4) if using a Likert scale, do you use 3-point, 4-point, or 5-point?

Example of an instrument devised for teacher interviews (as per previous ref)

'Describe how you applied the approach seen as the focus of the teacher in-service programme in teaching the last topic you taught?'

Where teachers were not sufficiently specific and a deeper understanding of the aspects being presented was needed, one or more additional questions were asked, based on the teacher's response. These additional questions tended to relate to the philosophy behind the teaching approach e.g.

1) *What were the goals for teaching the latest module?*
2) *How did you motivate students? (Related to the first stage in the teacher approach)*
3) *How did you use inquiry-based teaching? (Related to the 2nd stage in the approach)*
4) *How did you incorporate any decision making in the teaching? (Related to the 3rd stage in the approach)*

9.4 Indicating the Data Collection Procedure:

This section meaningfully describes the manner in which the data is collected. For example, it indicates whether the data is written, or is the completion of google forms, etc. The time for data collection needs to be specified. The data collection can indicate whether or not data is collected at one, or a number of times. It is important that any ethical considerations are address - e.g., students not identifiable, permission gained for personnel to be involved in the research, data stored in a secure format with carefully limited access.

Example of data collection (as per previous ref)

One interview lasted approximately one hour, and all 10 interviews were conducted over two consecutive days by the first author in similar conditions as is usual for out-of-school meetings. All interviews were audio recorded and transcribed verbatim. All teachers agreed to a recording of the interview being made and all were assured that the data collected would be kept confidential and teacher names would not be disclosed.

9.5 Specifying the Data Analysis :

Data analysis refers to the method, or the various ways, in which the data is to be analyzed. The analysis plan should be described in detail. Each research question, or hypothesis usually requires its own analysis. Thus, the research questions, or hypotheses should be addressed one at a time, followed by a description of the type of statistical procedures that are to be performed

to answer that research question/hypotheses. State the variables included in the analyses and identify and mention the dependent and independent variables, if such a relationship exists. Decision making criteria (e.g., the critical alpha level) should also be stated, Where analysis is via a statistical procedure, or procedures, there is a need to indicate the statistical program and method(s) being used?

9.5.1 Example of data analysis (as per previous ref):

Familiarization with the empirical material obtained was undertaken by two independent science education researcher staff who independently undertook steps 1-3 as indicated below and then jointly collaborated in the remaining steps.

1) *Read the whole text.*
2) *Read again and mark where the interviewee gave answers relevant to the main interview question.*
3) *In these passages, the researchers looked for the focus of the teacher's attention which could indicate meaningful aspects in the teaching approach described. A preliminary code was given for each meaningful description related to each teacher's predominant way of understanding the 3-stage teaching approach.*
4) *These coded descriptions were put into categories, based on similarities and differences. Categories description units were re-coded to better fit the description.*
5) *Dominant areas of responses into which descriptive categories could be meaningfully sub-divided were discussed.*
6) *The agreed responses areas were labelled as specific dimensions of variation, which were taken to be meaningful for pointing to the teachers' variation in implementing MCST.*
7) *Labels (initially codes but later descriptive names) were assigned to each category of description.*

Where appropriate, responses deemed to be sufficiently similar, were condensed into a single code agreed by the 2 researchers. The coded responses were compared and discussed between the researchers, recoding as appropriate, so as to minimize the categories of responses.

From analyzing the transcripts, 7 separate areas of responses (labelled dimensions) were initially identified by agreement between the researchers, although these dimensions were subsequently reduced to 5, after discussions and re-interpretations were considered. The researchers eventually agreed that 5 dimensions accommodated the clarity and diversity of the teacher comments. These 'dimensions of variation' were identified as: reflection type, student's motivation, inquiry activities, student decision making, and purpose of teaching.

The process of analyzing data was iterative and comparative, involving continuous sorting and re-sorting of the data. This process was undertaken several times, comparing teachers' answers

associated with categories. The major dimensions of variation were finalized only when they led to agreed characteristics of different categories within a dimension, enabling a hierarchy of the categories to be established. The discussion continued multiple times arranging and rearranging the category descriptions until not only were the categories of responses minimized, but also aligned with meaningful levels of sophistication. Insofar as meaningful diversity permitted, three categories were eventually agreed among the researchers for each dimension of variation. However, in cases where the description of categories from the teacher responses were found to be overlapping, care was taken to ensure meaningful differences were established across at least 2 of the 3 categories per dimension of variation, as illustrated in table 1. As a final stage, the categories were compared and contrasted, to enable meaningful describing of the categories' similarities, while also identifying their uniqueness.

The hierarchical nature of the eventual categories of ownership was established as one of the leading principles in the analysis. This led to three categories being created.

10. Indicating the Validity and Reliability of the Research:

If researchers develop their own survey, then steps describing how to be aware of the validity are important, as well as a description of reliability measured. When using an existing instrument, researcher wish to obtain the same reliability measurement as the author of the instrument. Where the instruments or tools are designed by someone else, then it is appropriate to describe the previous validity and reliability assessments.

10.1 Validity:

Validity refers to the accuracy, or truthfulness of a measure. Is it measuring that expected? There are no statistical tests to measure validity. Validity is determined to give an indication of the acceptability of the research approach (qualitative) - often judged using expert opinion, or analytical outcomes (quantitative). Researcher can state steps taken to assess validity in terms of-

1) *Face validity* – this is the likelihood that a question is misunderstood/misinterpreted. Pre-testing an instrument is a good way to increase the likelihood of face validity.
2) *Content validity* - this refers to whether an instrument provides adequate coverage of a topic. Expert opinions, literature searches, and pre-test for open-ended questions
3) *Construct validity* - this refers to the theoretical foundations underlying a particular scale, or measurement. It looks at the underlying theories, or constructs that explain the phenomena. Confirmatory factor analysis is often used to explore how individual items contribute to an overall construct measurement.

10.2 Reliability:

Reliability is synonymous with repeatability, or stability. A measure that yields consistent results over time is said to be reliable. When a measure is prone to random error, it lacks reliability the reliability thus refers to the reproducibility of the outcome, or the acceptability of correlations (e.g., using Cronbach alpha to indicate internal consistency).
There are three basic methods to check reliability-

i) *test and then retest,*
ii) *use of equivalent form,* and
iii) *determining internal consistency.*

Most research uses some form of internal consistency. When there is a scale of items all attempting to measure the same construct, then it is expected that there is a large degree of coherence in the way the items are answered. Various statistical tests can measure the degree of coherence. Another way to test reliability is to ask the same item, with slightly different wording, in different parts of the instrument. The correlation between such items is an indicator of reliability.

The research outcomes are rather useless unless they have a meaningful degree of validity and reliability and in this regard, it needs to be recognized that all research studies make some assumptions. For example, a sample represents the population; an instrument has validity and is actually measuring the desired constructs and also respondents answer an instrument truthfully. This applies to both qualitative and quantitative research.

In qualitative research, reliability is often expressed as trustworthiness (possibly from different perspectives, such as its dependability and quality assurance).

11. Putting forward Results:

The results section gives the findings. These findings may be qualitative, quantitative, or both. The findings are raw data, which can then be processed/interpreted (if appropriate), and can lead to results as an analysis of the data. If possible, express the initial findings in tabular format and ensure tables and figures are suitably labelled.

Following the tables, the findings need to be interpreted, but without duplication of the actual data in the table (that is seen as unnecessary repetition). Also, the clarification of a hypothesis, or hypotheses, through statistical tests are presented in the results section immediately after the findings. For analyses, indicate the significance level of data (e.g., $p < 0.05$). A summary of the results can to be included in this section, if, for example, some of the data analysis makes use of multiple tables in displaying the results, or the tables are very large. Often large tables, or multiple tables are included in an annex.

12. Writing the Discussion:

The discussion is a major component of an educational research article. Writing a discussion section is where the researcher indicates the implications of the research and its links to research by others. In this critical part of the research article, the process of correlating and explaining the data should be initiated. While this is the main point of the discussion section, the process is usually more complex. The outcomes rarely clear-cut and researcher needs to interpret the findings in light of research by others, especially that indicated in the literature review. Remember that 'no significance' is not the same as 'no difference', and researcher need to explain this in the discussion section where appropriate. For this purpose, experimentation processes can be criticized and attention can be drawn to whether the experimental design is sufficiently appropriate. Where this is judged not to be the case, there is a need to suggest modifications and improvements that can be made to the design.

The discussion seeks to discuss the significance of the findings, interpretations and/or analyses and interlink these with respect to that already stated in the existing literature. Such a discussion needs to be logical, linking to the aim of the research, without repetition of statements made in the results section. The discussion is expected to points out any shortcomings in the findings and how far the findings interrelate with, or provide alternatives to, the existing literature.
Thus-

1) Ensure the discussion is well sequenced with respect to the findings.
2) Avoid repeating the results, or the introduction.
3) Point out why the findings/analyses matter.
4) Avoid over-interpreting the data e.g., over-speculation.

The organization of the discussion is important. Before beginning, it is probably a good idea to develop an outline to organize thoughts in a logical form. For this, a cluster map can be used, or an issue tree, numbering of points, or some other meaningful organizational structure. To make the message clear, the discussion should be kept as short as possible, while clearly and fully stating, supporting, explaining, and defending outcomes and discussing other important and directly relevant issues. It is important to take care to provide commentary and not simply give a reiteration of the results. Side issues should not be included, as these tend to obscure the main message. The main value of the discussion is to help the reader determine what can be positively learned and what is more speculative. For this, it can be suggested that there are twelve steps to writing an effective discussion section.

1) Organize the discussion from the specific to the general: for example, researcher findings, to the literature, to the theory, to practice.
2) Use the same key terms, the same verb tense (present tense), and the same point of view that you used when posing the questions in the introduction.

3) Take care in giving hypotheses as these basically address the analyses in the results section.
4) Support points in the discussion with the results. In this, explain how the results relate to expectations and to the literature, clearly stating why they are acceptable and how they are consistent, or link to previously published knowledge on the topic.
5) Address all the results relating to the questions, regardless of whether or not the findings were statistically significant.
6) Describe the patterns, principles and relationships shown by each major finding/result and put them in perspective. The sequence in providing this information is important; first state the answer, then the relevant results, then cites the work of others. If necessary, point the reader to a figure, or table in the results for clarity.
7) Discuss and evaluate conflicting explanations of the results. This is the sign of a good discussion.
8) Discuss any unexpected findings. When discussing an unexpected finding, begin the paragraph with the finding and then describe it.
9) Identify potential limitations and weaknesses and comment on the relative importance of these to your interpretation of the results and how they may affect the validity of the findings.
10) Summarize, concisely, the principal implications of the findings, regardless of statistical significance. Indicate how far these agree with the existing literature.
11) If appropriate, provide recommendations (no more than two) for further research. However, do not offer suggestions which could have been easily addressed within the study, as this shows there has been inadequate examination and interpretation of the data.
12) Explain how the results and conclusions of this study are important and how they influence our knowledge or understanding of the problem(s) being examined.

13. Stating the Conclusion:

The conclusion is really the answers in a precise format to the research questions based on the findings and the discussion of the implications. Simply, the conclusion usually means one paragraph devoted to each research question, or hypothesis.

Elements to consider for inclusion in the conclusion

Simple statement of the study's major findings. This mainly applies to responding to hypotheses. Explain the meaning and importance of the findings. This is the answer to the research questions. State any further implications of the research.

The conclusion is not expected to include limitations, nor recommendations. These can be stipulated (if appropriate) after the conclusion. In summary-

1) make sure the conclusions meaningfully answer the research questions/hypotheses;
2) do not include conclusions within the discussion section.

14. Writing of References:

These are given in alphabetical order. The IISRR-IJR journal indicates the use of the APA reference style. This refers to authors:

(a) if within the text, as name with date of publication e.g., Holbrook and Rannikmäe (2009), or

(b) given as the source of information stated, by name and date in brackets after the related text e.g.; Holbrook & Rannikmäe, (2009).

References include name(s), publication date, title, source (in italics if a journal) and digital object identifier e.g. Valdmann, A., Holbrook, J., & Rannikmäe, M. (2020). Defining teacher ownersip: A science education case study to determine categories of teacher ownership. *Journal of Baltic Science Education*, *19*(4), 657-674. https://doi.org/10.33225/jbse/20.19.659

Additional note:

1) Within the text, the 7th edition of APA states citing the 1st author, plus et al. - whenever there are more than 2 authors (plus date).
2) The reference section cites all authors, plus initials (unless > 10).

References for this Article:

Ghatak, D. & Das, P. (2021). Attitude of College & University Students towards E-Learning in Kolkata and North 24 Parganas Districts, *IISRR-IJR, 7(1),* 81-91.

Haldar P.P. & Chel M.M. (2020). A Comparative Study of Teaching Effectiveness of In-Service Teacher with Pre-Service Teacher at Secondary Level. *IISRR-IJR, 6(3),* 106-112.

Holbrook, J., Rannikmäe, M. (2009). The Meaning of Scientific Literacy. *International Journal of Environmental and Science Education*, 4 (3), 275–288.

Soobard, R., Kotkas, T., Holbrook, J., & Rannikmäe, M. (2020). Students' perceptions of an intervention course designed to raise science-related career awareness. *European Journal of Educational Research*, *9*(4), 1539-1555. https://doi.org/10.12973/eu-jer.9.4.1539

Valdmann, A., Holbrook, J., & Rannikmäe, M. (2020). Defining teacher ownership: A science education case study to determine categories of teacher ownership. *Journal of Baltic Science Education*, *19*(4), 657-674. https://doi.org/10.33225/jbse/20.19.659