

Move 1: Methods

Contextualizing the Study Methods

Move 1 is “contextualizing the study methods”, that is, providing more background to situate your study in the larger field of research. This move is important as it provides information about how your study fits into the larger research space in your field. Authors use move 1 to set the scene for the study description. The section as a whole may contain either general knowledge in the field of study or also general information about the current study. References to previous relevant works are often included and sometimes the author states the methodological approach, description of the study site and may include information about the subjects taking part in the study or the objects of investigation. This move grounds the upcoming more detailed description of study methods.

There are six steps that can be used to achieve the communicative goal of Move 1:

- (1) Referencing previous works, and/or
- (2) Providing general information, and/or
- (3) Identifying the methodological approach, and/or
- (4) Describing the setting, and/or
- (5) Introducing the subjects/participants, and/or
- (6) Rationalizing pre-experiment decisions.

Referencing previous works, the first possible step in move 1, provides information about previous studies that relate to the present study. This step is indicated by reference to an author, date, or explicit mention of a study and seems to be a general requirement for studies.

Here are two examples of how you can accomplish this step:

- Example 1 (Agronomy):

This method was used in a previous study involving defoliation to allow for localized harvest determinations (Board et al., 2010).

- Example 2 (Chemical Engineering):

A model to predict the particle image diameter as a function of the distance z from the in-focus plane was proposed by Olsen and Adrian [14].

Providing general background, gives background (theoretical, empirical, informational, etc.) to the methodology of the study. You can use this step to give foundational knowledge to the reader in order to link information in the field to the reported study, orient the reader to specifics of the reported study, and make preliminary hypotheses or interpretations. Like the previous step, it appears to be required for methods sections in general.

Consider the following examples:

- Example 3 (Veterinary Medicine):

We hypothesized that the duration of diarrhea would be decreased from 144 (historical hospital mean) to 48 hours in horses treated with the test article (HP).

- Example 4 (Geological and Atmospheric Studies):

The larger sizes of GS mollusks could be attained either by growing faster (reaching a larger size at a given age) or by living longer (reaching a similar or even smaller size at a given age, but living for more years).

Identifying the methodological approach involves a specific listing of an approach name (experimental, quasi-experimental) or other ways of explaining the type of study you are conducting. This step is very common in most fields. The main goal of this step is to introduce the methodological approach or experimental design used for the current study to inform the reader of

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the selected approach, announce credible research practices known in the field, and possibly transition to describing the experimental procedures (see Example 5 and 6).

- Example 5 (Agronomy):

Experimental design was a randomized complete block with four replications.

- Example 6 (Art and Design):

Using a two-by-two between-subjects design, four different versions of the questionnaire were created with varying degrees of "product-product fit" and "brand-brand fit."

Describing the setting, details the characteristics of the environment where the research was conducted, which often answers the "where" question. Information may include details about the place and temperature; it may also include some temporal descriptors such as time of the year. It should be noted that this step may overlap with some steps in Move 2 (which describe the tools used or the experimental procedures conducted, as shown in Example 7), but it remains distinct from them in that "Describing the setting" specifically references the inherent characteristics of the context or environment in which the study took place, and not the characteristics of the materials used to accomplish the experiment or to affect some change in the subject that is being examined.

The following are examples of how you can realize this step:

- Example 7 (Veterinary Medicine):

The mares were admitted at day 310 of pregnancy, housed in wide straw bedding boxes and fed with hay and concentrates twice a day.

- Example 8 (Forestry):

All three studies were performed in the eastern half of the SRS in the RCW management area (US Department of Energy 2005).

Introducing the subjects/participants describes the subjects or participants in your study (animate or inanimate). For a study involving humans, this answers the "who" question. For studies without humans, the often answers the "what" question. It should be noted, however, that not all disciplines have subjects, but when subjects can be identified, this step helps to describe subjects/participants and their original/pre-experimental characteristics, properties, origin, number, composition/construction, etc. The step also details the process by which subjects/participants were recruited/selected (mainly if before the experiment), as shown in Examples 9 and 10.

- Example 9 (Applied Linguistics):

Participants in this study included 10 TAs enrolled in this French doctoral program.

- Example 10 (Biology):

The Mexican populations, Chetumal and Tulum (Mex-1 and Mex-2, respectively), have large resin-producing glands, while the Venezuelan populations, Tovar and Caracas (Ven-1 and Ven-2, respectively), have smaller glands.

When describing subjects in the Methods section, both the past and present tense can be used. Past tense is used to describe the participants and subjects selected by researchers to represent an entire population and the characteristics they possessed at the time when the study was conducted (Example 9). The present tense can be used when describing the general population from which the sample was selected to indicate that characteristics of the targeted population does not change (Example 10).

Rationalizing pre-experiment decisions can explain and justify decisions the author made to the scope and breadth of the project. Here, you may discuss how limited the study is, how practical considerations impacted the methodology, or provide other information that will explain research decisions. This information can include reasoning or rationale behind the experimental context, and setting and/or selection of methods regarding setup of the current investigation. The author does this in order to justify methodological choices (perhaps relating to the choice of subjects, setting,

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methodological approach, etc.) or to connect those methodological choices to the general research purpose, objectives or identified research questions. The use of this step can also help the author establish his/her credibility.

The following examples illustrate this step.

- Example 11 (Veterinary Medicine):

Owner consent was obtained before enrollment and was a requirement for entry.

- Example 12 (Curriculum and Instruction):

The VET College that participated in this study was selected because in this college much attention was paid to teacher learning and their professional development.

Move 2: Methods

Describing the Study

Move 2 is “describing the study”. This is the main part of the Methods section where you fill in the details of what was actually done in the research. This move may contain information about how the data were acquired for the current study and may include a description of the data. If any variables are included in the study, authors mention them and explain their purpose in Move 2, sometimes commenting on why some variables were not included in the current study. Authors also describe their experimental procedures and note any tools/instruments/materials/equipment they used to carry out the experiment or to acquire data. Rationale for why some choices were made when data were acquired or the experiment was carried out may also be included. Brief statements of preliminary results may appear in this move as well.

There are seven steps that can be used to achieve the communicative goal of Move 2:

- (1) Acquiring the data, and/or
- (2) Describing the data, and/or
- (3) Identifying variables, and/or
- (4) Describing the experimental procedures, and/or
- (5) Describing tools/instruments/materials/equipment, and/or
- (6) Rationalizing experiment decisions, and/or
- (7) Reporting incrementals.

Acquiring the data refers to authors’ illustration of the process of collecting or recording data (either primary or secondary). This step describes how the data were obtained (e.g., via sampling, selecting or measuring processes) and also what was done to the data (including, but not limited to preparing, tabulating or estimating the data).

Here are two examples of how you can accomplish this step:

- Example 1 (Agricultural and Biosystems Engineering):
In the quadrats, the density and cover of plant species were recorded.
- Example 2 (Microbiology):
Fluorescence was measured during the annealing step of each cycle.

Describing the data elaborates on the characteristics of the data (e.g. measurement units, scales, etc.), physical or abstract qualities or quantities. Sometimes authors describe data by indicating the scales or specific representation. Consider the following examples:

- Example 3 (Food Science):
Amounts were expressed as ratios to the end value under each respective packaging and temperature condition.
- Example 4 (Geological and Atmospheric Sciences):
The Ased and Amar data series have an average sampling resolution of 6.6 Myr (+/-3.5 Myr, 1?) and approximately 85% of the data are characterized by a sample spacing of =10 Myr.

Identifying variables provides readers with a general description of the variables in the current study, to distinguish between those variables used or those manipulated and also to show how the variables may influence the study outcomes or results. Variables in the Methods section are defined as constant conditions/factors and conditions/factors subject to change, under which the experiment occurred (see Example 5 and 6).

- Example 5 (Veterinary Medicine):
The dogs were assigned to a control group and a treatment group with 6 animals in each group.

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- Example 6 (Sociology):

We group the independent variables included in the analysis into objective social locational variables and subjective life- course fit variables, as well as a dummy variable capturing participation in ROWE (see Appendix for survey items included in each group).

Describing experimental/study procedures describes what was done to cause an outcome related to or leading to specific results, illustrate how experimental steps were completed, and provide sufficient description for future replication of the study. You can accomplish this step by outlining what was done for the actual study or experiment in step-by-step actions.

The following are examples of how you can realize this step:

- Example 7 (Curriculum and Instruction):

At the initial login, participants were asked to record their steps for 4 days over the following week.

- Example 8 (Geotechnical Engineering):

The mold was then attached to the bottom pedestal of the test cell, the membrane stretched over the bottom end platen and sealed using two o-rings

When describing procedures in the Methods section, authors use both active and passive voice. Very frequently, the verbs in the active and passive voice are used in the Past tense (Example 7 and 8). However, in some disciplines, authors may choose to use the Present Simple Tense to describe the experimental steps of their study (e.g. I exclude small state-owned banks from the sample).

Describing tools/instruments/materials/equipment describes the materials (physical or abstract) used in data acquisition or experimental procedures. This information is useful for the reader in case the study may be replicated by another researcher. Sometimes the overall goal of a sentence is to describe tools, but other times there are overarching goals.

It must be noted that while the origin or nature of the tools/instruments/materials/equipment may be described, this step does not include the process of obtaining or creating them, nor does it explain how they were used or what specific actions were taken with them in the course of the study.

It is also worth mentioning that this description of tools/instruments/materials/equipment may not only appear in description of experimental procedures, but also when the author is discussing other parts of the data acquisition or analysis process.

Examples of this step are as follows:

- Example 9 (Microbiology):

The basic liquid medium (BLM) used for the activation of the cultures consisted of chicken feather meal 20; NaCl, 0.5; KH₂PO₄, 1.0 and K₂HPO₄, 6.0 at pH 7.5.

- Example 10 (Applied Linguistics):

The MLAT (Modern Language Aptitude Test) is usually administered in two versions—full and short. Since the short version contains all sections relevant to vocabulary learning, it was the version selected for the current research.

In Example 9, the past tense is used to describe materials specifically designed or chosen for the study and that may not be familiar to the readers. However, the present tense (Example 10) can be used to describe standard or conventional tools or equipment that are likely to be familiar to the readers.

Rationalizing experiment decisions provides reasoning or explanation for choices made in the experimental process (e.g., in data collection or preparation, experimentation or even tool selection). This step is useful for justifying choices, connecting choices to research purposes and questions, establishing credibility, and indicating the purpose for certain experimental steps.

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The following examples illustrate this step.

- Example 11 (Curriculum and Instruction):

Moreover, since one aim of the study was to investigate students' impressions regarding the process enacted during the Role Play, it was decided that the same dimensions and indicators could be used to address this issue.

- Example 12 (Agronomy):

Yield was not determined by combine harvesting because of the wide range of harvest maturity dates within the study.

It should be mentioned that the presence of the "to + infinitive" verb structure does not always signify that authors are rationalizing their experiment decisions. They may use "to + infinitive" to just explain that something was done for a clear purpose or to complete a given step in the research procedure. For example:

The bootstrap analysis running 2000 iterations was employed to determine the sampling variance of the genetic similarities calculated from the data sets obtained with the different marker systems using the MEGA 3.1 Program.

Reporting incrementals, the last potential step, reports the preliminary findings, results of observations and/or measurements. It may serve as a way for the author to facilitate reader's understanding of the next steps taken or choices made in the experiment. In this way, these incremental reports could provide elucidation of the researcher's methods, and/or justification for why a technique or procedure was carried out. These are likely brief reports of what occurred in the experimental process, and they help the reader understand why the researcher completed the experimental procedures or made certain choices in a particular way.

This step should not be confused with actual study results. These reports are merely incremental findings or observations that the author thinks are noteworthy, and they may or may not be directly connected to the final study results.

Examples of the "Reporting incrementals" step are as follows:

- Example 13 (Biochemistry and Biophysics):

The final R- and R-free values after data refinement (details in the Supplementary Methods) were 21.6% and 28.7%, respectively.

- Example 14 (Chemical engineering):

Although the same amounts of reactants were used to produce the 508 and 625 nm particles, slight differences in stirring speed likely contributed to the size variations.

Move 3: Methods

Analyzing the Data

Move 3 is “analyzing the data”. In this move, the author explains *how* the data have been analyzed (without describing the results of that analysis). It previews essential elements of the study such as research goals, questions/hypotheses, methodology, and main results. Arguments about the value of the reported work may also appear here to substantiate the need for addressing the niche and the previously made call for action. An outline of the content of the paper may be integrated in this move as well to orient the reader. In addition to describing the specific actions taken during the analysis of the data, this move also includes actions taken in the stage or stages leading up to the analysis, during which authors prepare the data to be analyzed. The “Analyzing the data” move may also include a description of measures taken to establish credibility of the analysis, including the reporting of reliability, noting of limitations, or mentioning of follow-up work to the current study. Overall, this move provides information about what authors did to the data (including manipulating, screening, cleaning, coding and/or analyzing) after it was obtained.

There are three steps that can be used to achieve the communicative goal of Move 3:

- (1) Preparing the data, and/or
- (2) Describing the data analysis, and/or
- (3) Establishing credibility.

Preparing the data describes what was done to the data and how the data were prepared for analysis. That is, this step is used to explain data selection (e.g., sampling, screening, cleaning, inclusion/exclusion, correction) and data manipulation (e.g., transforming, coding, tabulating, estimating). In this step, you may also mention which data were included or excluded from the analysis.

Here are two examples of how you can accomplish this step:

- Example 1 (Community and Regional Planning):
Scores more extreme than the 95th (5th) percentile were set equal to the cutoff point.
- Example 2 (Forestry):
*All sites with *T. canadensis* in the overstory (47) were included in this analysis.*

Describing the data analysis provides a description of the actual analysis (with/without certain tools) in terms of how the data analysis was done and what procedures were used for analysis (e.g., statistical techniques, coding schemes, etc.) Consider the following examples:

- Example 3 (Animal Science):
*For all variables, least squares means were generated and, when significant ($P < 0.05$) *F* values were observed, least squares means were separated with pairwise *t*-test (PDIFF option).*
- Example 4 (Molecular Biology):
*The Student's *t* test was used to compare the difference between two different groups. *P* values less than 0.05 were considered statistically significant.*

Establishing credibility of analysis and/or data processing presents a rationale for the choice of data analysis processes, indicates statistical or other procedures employed to ensure credibility (e.g., reliability calculations), gives recognition to existing and/or pre-existing limitations, and/or explains or interprets certain observations or measurements (see Example 5 and 6).

- Example 5 (Geological and Atmospheric Sciences):
We only tentatively interpret the Amar data here, as its determination is complicated by uncertainties associated with the partitioning of marine and terrestrial deposits in the macrostratigraphy

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database (a subject of ongoing work).

- Example 6 (Community and Regional Planning):
Lastly, MM5 is intended to be a very conservative dissonance indicator, preventing potential misclassification of residents as mismatched as much as possible.