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DSR: frameworks guiding experimental work in science

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Abstract
Scientific activities appear sometimes difficult for science students or young scientists because a large number of tasks have to be performed according to strict rules that are not always known or remembered. Electronic files guiding scientific activity, with a series of detailed steps and providing explanations about why these steps are needed, can be useful guides for scientists. Such documents, called DSR, are open documents that have been improving for years. They are used for improved traceability and quality, without replacing laboratory notebooks.

Résumé
Les étudiants des filières scientifiques et les jeunes scientifiques trouvent souvent l'activité scientifique difficile, notamment parce que le nombre de tâches simultanées ou successives, fondées sur des règles strictes de bonne pratique, est considérable. Des documents électroniques qui guident l'activité de recherche, incluant une série d'étapes détaillées assorties d'explications pour justifier ces étapes, peuvent aider les scientifiques. Ces documents, nommés "documents structurants de recherche", ou DSR, ont été progressivement mis au point. Ils guident le travail expérimental et théorique et évitent des erreurs, tout en augmentant la qualité et la traçabilité des travaux, sans remplacer toutefois les cahiers de laboratoire.

Keywords
planning, experiment, best practices

Mots clés
planification, pratique scientifique, bonnes pratiques

Introduction

Students in science and young scientists sometimes find the practice of science difficult, because it involves considering a lot of data at the same time, doing many different tasks simultaneously and following strict rules of best practices. Frequently experiments have to be redone not only because it is a "good practice" to find a confirmation, or validation (Fisher, 1937;

Harris, 1998) or because one has to determine the standard-deviation on final results, but also because some data are missing in the first runs, due to insufficient preparation and planning of experiments. The *Journal of Chemical Education* weighed in on the importance of this topic as early as 1933 (MacNeil and Falconer, 2010), but this applies in any scientific field and not only chemistry. It was noted that good note-taking skills in the laboratory are not only essential, but they are required (Sesen and Tarthan, 2010). The issue is often whether scientists write down enough details, but saying the disease is not curing it.

Based on the management of many students (from 14-years old to Ph.D) for decades, we progressively set up electronic files that all newcomers are happy to use in order to make good science, following rules of good practices (This, 2017a). These electronic files are certainly not electronic laboratory notebooks, of which purpose is to ensure the traceability of the origin of a discovery, in particular in case of disputes related to patenting (these are compulsory tools for private and public laboratories, as said below) but they can be included either in traditional or electronic notebooks; they are called for short "DSR" (Documents for structuring research). They contribute to compensate for limits of human memory and attention, helping to ensure consistency and completeness in carrying out scientific tasks.

In practice, they are empty *Maple* (Waterloo Maple Inc, Canada) files containing sections that are to be filled in successively, like detailed checklists, adding explanations for each step to be performed. The choice of the *Maple* software is based on the possibility to mix text, formal calculation, programming as well as numerical calculation.

There is an important difference between DSR and laboratory notebooks. Indeed laboratory notebooks are of compulsory use in private and public laboratories (Caprette, 2017; Ryan, 2017). This is so well known that we give here only one important reason of using laboratory notebooks, *i.e*. being official documents for assessing priority and possibility of patenting (this is why they have to be signed both by the operator and by a co-worker or supervisor).

DSR are no laboratory notebooks, but a way to help the young scientists to make a structured work, to be sure that their work will allow them to publish their results, to be sure to apply all the good practices rules for scientific activity (Bybee *et al.*, 2008; Score, 2008; Sone, 2014) and avoid forgetting important information. DSR are clearly important educational tools, but they can be helpful even for confirmed scientists, as they remind them of all the various tasks that have to be done during scientific research.

One has also to add that many universities and scientific institutions discuss the way scientific research can be done (Pagé *et al.*, 2014), but they don't deliver frameworks such as DSR. It is even a proposal that DSR could be discussed and possibly modified by the whole scientific community. And if it is true that some electronic laboratory notebooks include some sections, we observe that more details, such as in DSR, could be introduced.

Current DSR have three sections: (1) for the preparation of experiments, (2) for performing them, and (3) for the interpretation of results. For each field of each section, explanations are given in the documents, in order to guide the scientists. The content of the spreadsheet is not particularly novel- it is basic information that any scientist or science instructor knows and is hopefully teaching. However it is a fact that they can avoid mistakes by reminding steps.

Finally one should stress that these DSR are based on various epistemological models, but with a strong Baconian and Popperian direction (Bernard, 1865; Meyerson, 1908; Normandin, 2007; Popper, 1959; Popper, 1972; This, 2009). More precisely, it is assumed (more below) that sciences of nature are advancing through the following steps: (1) identification of a phenomenon; (2) quantitative characterization of this phenomenon; (3) grouping the data into quantitative laws (*i.e.* equations); (4) by induction, looking for a “theory”, *i.e.* a group of equations corresponding to “mechanisms”; (5) looking for a prediction based on the proposed theory; (6) testing quantitatively the theoretical

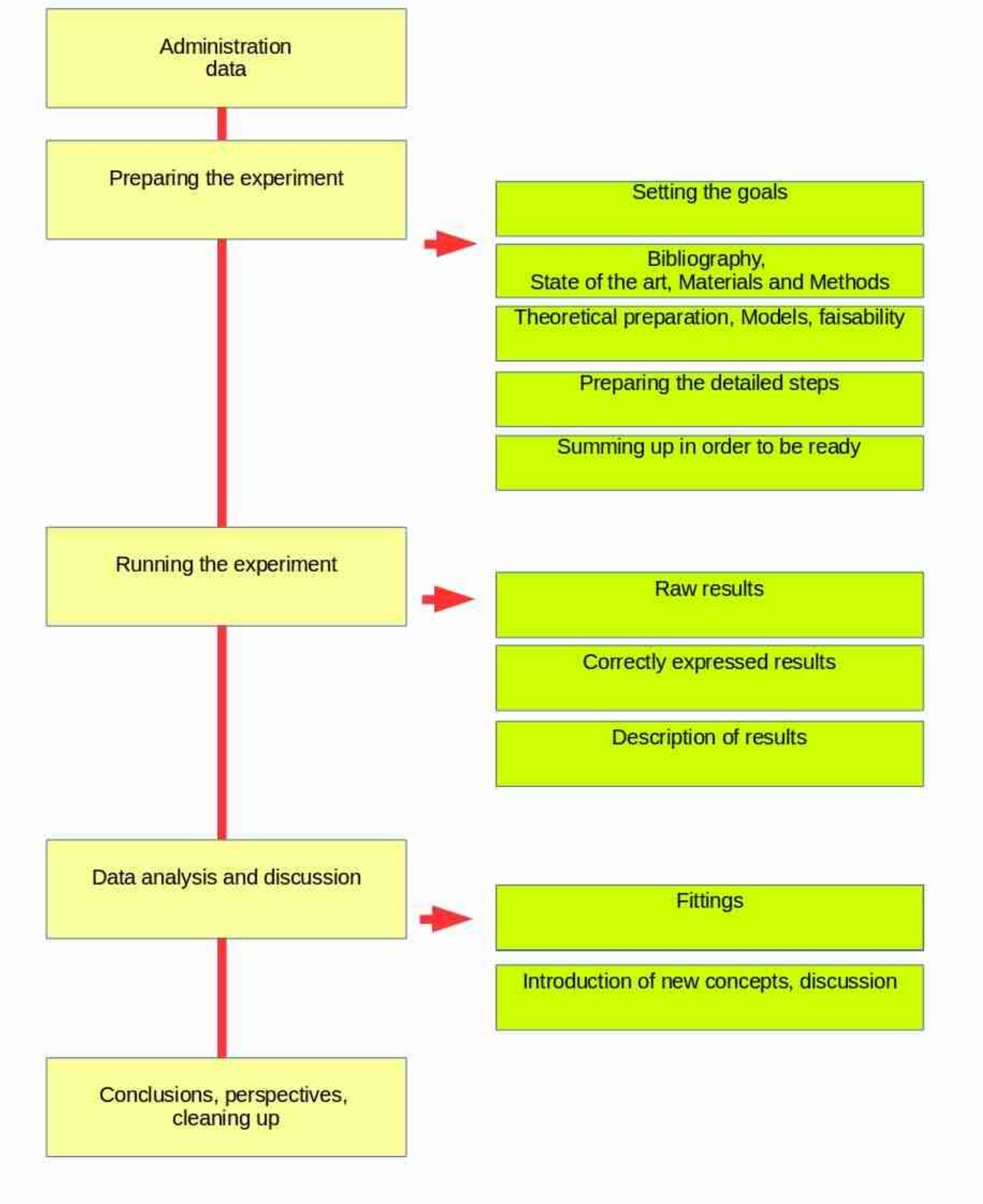

Figure 1. The various parts of DSR documents.

1. Preparing the experiment

Name of the scientist:

Explanation
Any document should be signed, in particular in this new era of digital exchanges. Do you know the story of Leo Szilard discussing with Hans Bethe: when Bethe was speaking, Szilard was taking notes. Bethe asked him if he was stoling his ideas, and Szilard answered: "No, on the contrary, I note that they come from you".

Date of creation of this file:

Explanation
This indication (as all others) has a reason to be here: in particular, works should be:
- of high quality
- tracable.
We shall discuss later the question of quality, but tracalbe means that one should be able to reproduce all the work, not by fear of fraud (only "small people" have small ideas; invidiuals of quality have ideas of quality) but in order to understand possible differences with a reproduction of the experiment.
Moreover, indications such as this simple date allow personal evaluation, and we can later calculate how much time was needed to do this work, and to compare with what we guessed to need, in order to improve our estimation skills.

Goals of the work:

Explanation
Any experiment has a goal. Which one do you have with this one?
Here, the question is not to give title (this was already done), by a clear explanation of the goals. Or course, there is a possibility of repetition, but one wants to be perfectly cltear.
Be careful that a project is better when it has many goals at the same time. And don't be shy or too concise. Explain, explain, and explain again.
More generally, always try to be twice clearer than you think that you have to be.

The reasons of this experiment:

Explanation
I know too well that many friends confuse the goals and the reasons of the experiment... but you should guess that if there are two different slots, it means that there is a difference, that you have to understand. Here, you are invited to explain:
1. why you do the experiment;
2. why you have the goals that you explained above.

Figure 2. The beginning of the first part of the Maple version of DSR. Each slot contains first an explanation about how it should be filled in. The documents is highly structured by the use of "sections" and "sub-sections" (see Supplemental Material : N3AF, 2017, 4(3)).

prediction. Of course, there can be differences depending on various sciences, but DSR can be adapted to the various needs.
The DSR documents can be improved, and they have been indeed changed for years. Various formats of the DSR are given in Supplemental Material (.mw, .pdf, .html, for example) (This, 2017b).
In this article, a description of the content of DSR is given (italics), with explanations (roman); a flowchart summarizing the main steps of the whole process is shown in figure 1.

First part: planning experiments

Although we don't have figures to demonstrate it, we have been observing in our research group that insufficient planning of experiments is a major cause of failure, and this is why this part became progressively longer with years. It includes information for traceability and quality (Grogan, 2008).

Title of the work: Here DSR users have first to consider the question "What is a title?". It is an important one, as DSR are later used for publication (internship reports, scientific publication).
Of course, some *Guide to Authors* from scientific journals explain how titles should be designed, but this information is needed and helpful well before an article is prepared. Moreover, designing a proper title is also a way to envision more throroughly the work to be done. And the title of the work is also often a useful basis for discussions between a scientist and his/her mentors or hierarchy.

Name of the scientist: Some fields of DSR documents are useful in view of knowledge production, but others are important for educational reasons. In particular this one is used for making scientists aware of ethics and property (Du and Kofman, 2007). It is also useful in teams in which intellectual exchange is considered as a useful tool for efficiency.

Name of the file: Using codes makes files more easily to be recovered in a research group where results can be discussed in common. Even if DSR are not electronic laboratory notebooks, they can follow the same ISO 17025 rules (Du and Kofman, 2007).

When this file was created: This field will be used as others later in the file for keeping track of the research agenda. Indeed this field was first introduced because it is part of quality process (Chotkowski La Follette, 1982), but also because it gives the possibility, at the "evaluation step" (below), to evaluate the time that would be needed, so that a better prediction of time needed for the various tasks and a better planning can be made in the future. It can be good training that students use the date format of the international standard ISO 8601 (Kühn, 2017).

Estimation of the time needed for running the experiment: This field is useful both personally and collectively. First it is good in scientific life that one can try to predict how much time will be needed for a particular experiment, because this helps keeping an agenda and planning works. For sure, it can be sometimes difficult to follow an agenda, and a time window can be given instead of a single estimation.
It has to be added that there is no need to stick to this prediction, and research has to be done at its pace. However, in view of future tasks of coordination, management or direction, it is important to know how much time one needs personally, before asking allocating time resources for others.

Goals of the work: For sure, the goal of science is making “discoveries” (Popper, 1959; This, 2009). But if an experiment was decided, it is probably because a particular question was introduced as a step for discovery. In this regard, the title should be “Goal of the work”, with no plural, and accordingly, the first goal is the study of this particular question.
This is explained in the “explanation” part of DSR, for this particular entry. However it happens in scientific research that secondary goals have to be used when the primary one could not be reached (FAO, 2017). Also it is good to consider that there can be milestones, and scientists are invited to give them clearly here.

The reasons of the experiment: Having a goal set is certainly useful, but is this goal well chosen? A new opportunity of discussing the goal from a broader perspective is proposed here: if a goal was decided, why was it chosen? Keeping a written track of the reason of the choice is perhaps a good practice, and in our experience it proved useful sometimes for being able to justify choices, in particular to reviewers. This field is also the place where the initial question has to be discussed and justified, in particular in view of the particular scientific strategy of the scientist.

Bibliographic research: This part can of course be very large, and the short explanation given in the DSR is certainly not enough to teach how to make it well. For more guidance, specific references are to be used (York University, 2017). Anyway, some sub-fields are given in order to help scientists to do it without having to move away from the work, such as:

● *estimation of the time needed for this bibliographic research:* Sometimes young scientists can spend too much (or too little) time on this part. Predicting a duration of the initial bibliographical research, or deciding for the amount of time allocated to this tack, can be important for planning and work in general, as written before.

● *giving again the title of the work:* This will be used for focusing the bibliographic research, because as bibliographic work can be almost endless, from article to article, it needs pruning.

● *for each word of the title, a sub-field for which a specific research is done:* Grouping all the bibliographic research being done in this DSR avoids the distribution of pieces of information in many different files. Here the scientists are invited to make a research for at least each word of the title of the work. In particular, it is a good idea to make three parts: one for the state of the art about the question studied, one for the technical implementation of the experiment, and one for the data analysis and discussion methods.

● *should the initial research question be changed (slightly)?:* Sometimes the bibliographic research can lead to a redefinition of the initial scientific goal of the planned experiment. Scientists are invited to ask themselves if this is the case. This does not imply that a published research cannot be repeated, but if such a decision is taken, there should be a justification for this choice (Peng, 2009).
One should also observe that if the research question is changed, after this first bibliographic survey, another round of bibliographic research can be necessary.

Preliminary observations: Frequently a particular research is done because previous experiments indicate that there was a possibility of a discovery or call for complementary work. Preliminary observations must guide the work being done. Finally, this field can give scientists the idea to make preliminary, such as non quantitative experiments, but it should be discussed whether it is a good idea, because it can take time. A proposed answer to this temptation of non quantitative research is to observe that it should be very short, otherwise it is probably better to make a very strict, rigorous, precise and quantitative determination.

Which theoretical assumption is tested by the experiment?: In our research group, we work with the debatable idea that experiments have to be done in order to test theoretical assumptions because scientists have to refute old ideas, or previous theories, or models, which are always insufficient (a reduced model of reality is obviously insufficient, being reduced, and not the reality itself) (Popper, 1972; Lecointre, 2012; This, 2009).
Of course, one can also make scientific research by simply using new analytical tools, without trying to refute previous theories: in this case, users of DSR have simply to write it down. More generally, DSR are guides that should help.
This field of DSR is useful for training users to be happy with negative results: if a prediction is proved wrong and if there was no logic or experimental mistake, it means either that the theoretical ideas on which it is based need improvement, or that a mistake in the theory is to be discovered, for example. Users have to recognize that guessing wrongly is fortunate,

because there is a possibility of a discovery. Here, the field also contains the two sentences : "*The theoretical analysis is*:" and below "*Accordingly, one asks if:* "

Calculation on which the experiment is based: This section has different uses. One is to avoid that the experiment will be useless. For example, the use of an equipment of insufficient sensitivity or the analysis of a small number of samples can lead to "failure". In particular, statistical tests are very important, and they can be used before experiments, based on the estimated uncertainties. Also scientific theories and models are not like opinions, but ideas based on calculation (Galilei, 1623). This is why some quantitative planning is gode to be done first.
Frequently, young scientists do not know which calculation they can make, but the sole presence of this field is welcome because it invites them to more training in calculus, and to use their skills in the particular context of experiments. As a hint, they are invited to use the Leibniz idea that formal calculus is based on natural language; this means that it is good training to translate the sentence of the previous field in formal, mathematical language (Knecht, 1981). Moreover in order to help them, some sub-fields are present, such as:

- *again, the initial question is repeated: I*n order to have it readily under the eyes, then it is made abstract, generalized (Cramer, 2006; Jeannotte, 2017).

- *a theoretical model is built:* This particular sub-field is based on detailed best practices documents on calculation in natural sciences that includes making a scheme, introducing formal symbols, looking for relationships (equations) between symbols, designing a strategy for solving systems of equations, making numerical applications, discussing the formal results... (Redhead, 1980).

Prediction of the time needed for the experiment: This field is repeated many times in this document, because it is good to be able to adapt one's ideas to new information.

General method that you want to use (only one sentence, only the general idea, and not the detailed method, as it will be explained later): It is a good practice to have a general idea of one's work before considering details (Descartes, 1637), what could be said differently: considering strategy before tactics (Sun Tzu, 2017). Before students discuss the experimental details, they are invited to formulate a general idea of the experiment that they plan. More precisely, they are invited to begin this cell with a sentence such as : "The general idea is..."

Scheme of the experimental method: Here an important precision is added in the explanatory part: "*Caution : here one should not make beautiful pictures, because it would be time consuming, but only to represent the steps, IN ORDER TO identify the main parameters and to introduce SYMBOLS, giving also numerical values expressed in the International System (IS) of Units*". Indeed, the proposal to make a scheme of the experiment is only because it helps to characterize the phenomena, samples, tools, and to introduce parameters with letters, or symbols, so that they are used later on, in "laws", relationships, models, etc. (Redhead, 1980). As it is good practice to always begin some calculation by introducing letters and symbols, instead of numerical values, and to use these symbols during calculation, instead of numerical values. This is also the opportunity to drop numerical data, after translation into SI units.

The detailed method: This section is the core of the first of the three parts of DSR, and it is no surprise that it is divided into sub-fields, with hints:

- *first, the description of all experimental steps, precisely described, with hardwares, processes, everything:* Here, a table with two columns is to be filled. The first column lists the various steps with numbering, and the second one is for the justification of the choices of methods, hardware, reagents, for safety concerns (American Chemical Society, 2017a) and commentaries.

This detailed numbered list is to be prepared before the experiment, and any intended action is to be described, so that all the hardware and all products and reagents are ready to be used, avoiding unintended processes.
When measurements are planned, their results are also planned: empty spaces are kept for the data to be recorded, as on a traditional laboratory notebook. Moreover, this field proposes to make three repeats for each data, preparing the calculation of a mean and a standard deviation. This table is to be copied and pasted later, in the "Results" section, but scientists are also invited to print it, and to glue the empty sheets on the laboratory notebook, in order to avoid having a computer on the laboratory benches.
Various advices are given for making this table, such as reducing the quantities of reagents and products (Grey, 1928). This is a best practice that anybody should know, but it is a fact that it is not always followed. Scientists are also reminded that experiments should be repeated, for example (Fisher, 1937; Tel Aviv University, 2017). The second column of the table in this field is for the justification of all choices: methods, tools, quantities, products, quality, variety, etc. Some hints are also given, concerning various characteristics of measurement tools (such as scale precision), but also about security sheets (American Chemical Society, 2017a), etc. Scientists are invited to explain any choice, because it is a good way to justify it and make it in a non arbitrarily way (American Chemical Society, 2017b).

Reagents, with, for each, the name, chemical and physical parameters, SECURITY rules (give the Security document as an annex of this file), purity (did you check it? How do you know that the product that was used is really the one whose name was written on the bottle? Did you make any purification, supplier, etc.: If the previous detailed description of the experiment was well done, then it is easy to fill this cell in (American Chemical Society, 2017a).
Indeed, the work to be done in this field is then simply to group all information, which will be useful in view of scientific publication, but also for the discussion of the experiment. Of course, one need to collect here the IUPAC name of solvents, CAS numbers, but also their purity, grade, supplier…
The main point is however the hazard question: generally physical and chemical constant are needed to judge the danger of these reagents, but this is not enough. If users use reagents, they have to get the corresponding security file, and of course they have to read it, in order to decide for the security rules that they have to use. Concerning the end of the field, scientists are invited to know that it occurs that suppliers sell products with a lot more impurities than is displayed, or even make mistakes, changing one product for another! This makes checks necessary. Finally, the field contains the sentence "*Please don't kill you (and us)*", in order to emphasize the hazard issue.

Various products used in the experiment (such as food products); give all detailed information: brand, date, origin, batch number, etc.: For some researches, plant or animal tissues are used. In this field, one should write where these products come from, and give as much information as possible. The idea is obvious for senior scientists, but students have to know that in scientific publications, the choice of any particular detail has to be justified. Information on varieties, brands, batch number, etc. and more generally, quantitative information about these products anticipates potential questions of referees (Coyne, 2005).

Hardware: Again, if no step was forgotten in the detailed description of the experiment, this cell should be easy to fill in. If one has written "weigh (three times) the mass of a 250 mL Erlenmeyer", then the list of hardware must include the description of a particular scale. If one has written "record UV spectrum", there should be information on a particular UV-visible spectrophotometer that was used, the particular spectroscopic parameters which were chosen (and why), etc. DSR users are invited to give all details here: brand, model, specification, experimental conditions, date, time, temperature, etc. Also a list of software used (with references) has to be given (National Academy of Sciences, 1992).

How much time did you need in order to prepare the experiment: This corresponds to a previous section, and it is a way to improve planning skills, by a comparison of the predicted time for the preparation of the experiment, and the practical time used. Young scientists often under-estimate this time.

Here stops the DSR document before the experiment.

Second part: Results

Then comes the second part, about making the experiment. Now the various fields are:

Date: The reason of this field was explained before. At various steps of the work, time keeping is proposed.

Raw results: This field includes a copy of the table that was established previously, at the field "*Detailed description of the experiment*". But now, the data and various notes are introduced, during the experiment.
When measurement tools are connected to a local network (which minimizes hand writing and possibility of errors), their data are stored in files whose name is given here (directory, name of files, etc.). But sometimes, data or information are manually introduced, in particular when all hardware are not linked in a computer network.
Now the justifications of the second column are not needed any longer, and it is better when scientists write down instead some qualitative commentaries or remarks, or put pictures taken during the experiments.
Concerning qualitative results, scientists are reminded that there are many things to be observed during an experiment, and all this information is important either for the interpretation of results later, or simply for making new discoveries. The quality of a scientist is often linked to the ability to see what others do not, a scientific quality that has been called "serendipity" (Jacques, 1990; University of California Museum of Paleontology, 2017). All clues are then very important, and young scientists have to know that chemists of the past were even smelling, tasting, hearing… Today smelling and tasting are preferably avoided, but the idea remains.

Results properly expressed: Tables full of figures are difficult to read, and it is an important part of scientific activity to translate these tables into elaborated information from which "laws" can be inferred (Tuft, 2001). Indeed, students have to be trained to the use of histograms, curves, and various ways of displaying quantitative information (Khamat and Hartland, 2014; Nature Editorial, 2017). However a common mistake is to confuse results and models, i.e. interpretations, and to link dots on a diagram without any prior (good) reason to do it. This is why scientists are reminded here that for this “Results” field, data should not be fitted (it is proposed to do it in the next section of the DSR).

Estimation of uncertainties, confidence intervals: Of course, if one made replicates of measurements or experiments, she/he can calculate average values and standard deviations. Sometimes, uncertainties are also needed, to estimate results. Indeed no curve (below) should be given without information on the quality of the results (JCGM, 2008).

Description of the trends on diagrams (this description will be cut and pasted in the “Discussion” part of the DSR): In order to interpret results, one has to be fully aware of them. Of course, all the information that one has to interpret lies in the diagrams that were made, but it was observed that young scientists need help in order to make the interpretations. This is why they are invited to describe their results with words and sentences, so that properly expressed ideas ("the curve starts at zero", "the curve seems to increase linearly", "there is an asymptote"…) can be discussed later.

Other observations made during the experiments: This field helps to remind users that many observations can be usefully done.

How much time did you need for this "Result" part of the work?: Again, this field is for training in administration, but also for quality and traceability.

Third part: interpretation and more

Too often, young scientists find the discussion steps difficult, because it is true that, whereas it is a core task for science, they lack methods in order to do it. There are also reasons: for example, the French mathematician and physician Henri Poincaré explained that the making of a model from the "laws" included an induction process, and not only deduction (Poincaré, 1905). Based on epistemological studies, some fields are proposed here.

Date: The goal is the same as for the corresponding fields above.

Prediction of the time needed: idem.

Fittings: The same diagrams as before are displayed here but now data points have to be linked by particular curves based on theoretical assumptions, as fitting a curve means interpreting, wich is indeed discussion (Forster, 1999). Of course, when a fit is made, a quantitative estimation of the quality of the fitting (such as the residual sum of squares and its distribution, standard error...) is needed.

Formalization: introduction of new notions, concepts, quantitative parameters: Science means introducing new objects based on the laws, *i.e.* quantitative relationships that were discovered through the experimental work (Kuhn, 1962). Scientists are invited to do it here, using methods that can be discussed elsewhere.

Looking for laws, relations between parameters: Here scientists are invited to translate what can be observed on diagrams into equations. More generally equations have to be found between the introduced parameters of the previous field. In other words, when a trend is observed, it should be translated into mathematical language.

Numerical applications: Frequently determination of orders of magnitudes are needed in order to better understand equations. In particular, when large equations include many terms, it is good to be able to rank them by order of magnitude.

Discussion (explanation of results, trying to answer the « why » question using the bibliographic research): Scientists sometimes confuse using bibliographic data to confirm their results and discussing there results.
This is because the interpretation of experimental results is difficult, and it is proposed here to divide the difficulty into smaller steps, for which sub-fields are proposed :

- *here users are invited to copy the results (field above), and to discuss them:* Each sentence from the "Results" section can become a question such as "why so and not differently?" Of course the answer should be quantitative!

- *then, for each sentence, use the bibliographic data and propose a quantitative explanation of the results:* Scientists are reminded that they have to take into account all the previous works, in order to make a comprehensive model. All this should be quantitative, not only with words such as: "our results are compatible with data from xxx *et al*."

- *quantitative tests of the explanation:* Here users have to find the mechanisms that can explain the laws that were previously found, because laws alone are not the aim of science. It should be stressed that science should better refute wrong theories and that there are no "demonstrations".

Proposal of new concepts: Some consider as a good working assumption that any experimental

result should be considered as a particular case of a general category (or more than one general category) that we have to look for.
This is the place to do the job. Here it is to be observed that many scientific journals are very cautious about sentences such as “This is the first time that” or “Our original results show...”. Indeed one has to follow carefully the Instructions to Authors when writing a publication later.

Evaluation (did we reach the objective? etc.): Such a cell should finish the DSR, as it corresponds to the classic "Discussion and perspectives" that many articles include.

Proposals for the improvement of the technique and of the results: Frequently, users have to transmit their results to other users. It is helpful when they can propose improvement based on past experiments.

Conclusions: Same as in publications.

Perspectives: One should not forget to draw consequences of one's work, which means possibility of generalization, including tests of such proposals.

How much time did you need for this part: same as before.

Please don’t forget: 1. Did you check the spelling ? 2. Did you check the grammar? 3. Are there still adverbs or adjectives that you should translate into quantitative data? 4. Did you check the calculations (and how)? 5. Did you validate your work? 6. Do all diagrams have the right indications (units, abscissa, ordinate, title)? 7. Others. No comment needed.

Signature (for priority questions, patents, etc.): Lawsuits, patents, and careers have all been made or lost based on what was in, or not in, laboratory notebooks (Eisenberg, 1982; Meagher and Copeland, 2006; Taylor, 2006).

Finally, we have to add that DSR are *Maple* (or any software which allow formal calculation as well as natural writing...) files, but the same content could be implemented with word processing software. However using such software would lead scientists to use other software for computing, leading to an increasing number of files for the same work. It is proposed that this spreadsheet, after being discussed by the whole scientific community, could become a general tool for science education and research, perhaps with modification for particular scientific disciplines.

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