

Zeitschrift: L'Enseignement Mathématique
Herausgeber: Commission Internationale de l'Enseignement Mathématique
Band: 16 (1970)
Heft: 1: L'ENSEIGNEMENT MATHÉMATIQUE

Artikel: HOW TO WRITE MATHEMATICS
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Kapitel: 12. The editorial we is not all bad
DOI: <https://doi.org/10.5169/seals-43857>

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first five conditions in the definitions of p and q are the same; what makes them different is the weakening of the sixth.”

Often in order to be able to make such an emphasis in Chapter 2 you’ll have to go back to Chapter 1 and rewrite what you thought you had already written well enough, but this time so that its parallelism with the relevant part of Chapter 2 is brought out by the repetition device. This is another illustration of why the spiral plan of writing is unavoidable, and it is another aspect of what I call the organization of the material.

The preceding paragraphs describe an important kind of mathematical repetition, the good kind; there are two other kinds, which are bad.

One sense in which repetition is frequently regarded as a device of good teaching is that the oftener you say the same thing, in exactly the same words, or else with slight differences each time, the more likely you are to drive the point home. I disagree. The second time you say something, even the vaguest reader will dimly recall that there was a first time, and he’ll wonder if what he is now learning is exactly the same as what he should have learned before, or just similar but different. (If you tell him “I am now saying *exactly* what I first said on p. 3”, that helps.) Even the dimmest such wonder is bad. Anything is bad that unnecessarily frightens, irrelevantly amuses, or in any other way distracts. (Unintended double meanings are the woe of many an author’s life.) Besides, good organization, and, in particular, the spiral plan of organization discussed before is a substitute for repetition, a substitute that works much better.

Another sense in which repetition is bad is summed up in the short and only partially inaccurate precept: never repeat a proof. If several steps in the proof of Theorem 2 bear a very close resemblance to parts of the proof of Theorem 1, that’s a signal that something may be less than completely understood. Other symptoms of the same disease are: “by the same technique (or method, or device, or trick) as in the proof of Theorem 1 ...”, or, brutally, “see the proof of Theorem 1”. When that happens the chances are very good that there is a lemma that is worth finding, formulating, and proving, a lemma from which both Theorem 1 and Theorem 2 are more easily and more clearly deduced.

12. THE EDITORIAL WE IS NOT ALL BAD

One aspect of expository style that frequently bothers beginning authors is the use of the editorial “we”, as opposed to the singular “I”, or the neutral

“one”. It is in matters like this that common sense is most important. For what it’s worth, I present here my recommendation.

Since the best expository style is the least obtrusive one, I tend nowadays to prefer the neutral approach. That does *not* mean using “one” often, or ever; sentences like “one has thus proved that ...” are awful. It does mean the complete avoidance of first person pronouns in either singular or plural. “Since p , it follows that q .” “This implies p .” “An application of p to q yields r .” Most (all ?) mathematical writing is (should be ?) factual; simple declarative sentences are the best for communicating facts.

A frequently effective and time-saving device is the use of the imperative. “To find p , multiply q by r .” “Given p , put q equal to r .” (Two digressions about “given”. (1) Do not use it when it means nothing. Example: “For any given p there is a q .” (2) Remember that it comes from an active verb and resist the temptation to leave it dangling. Example: Not “Given p , there is a q ”, but “Given p , find q ”.)

There is nothing wrong with the editorial “we”, but if you like it, do not misuse it. Let “we” mean “the author and the reader” (or “the lecturer and the audience”). Thus, it is fine to say “Using Lemma 2 we can generalize Theorem 1”, or “Lemma 3 gives us a technique for proving Theorem 4”. It is not good to say “Our work on this result was done in 1969” (unless the voice is that of two authors, or more, speaking in unison), and “We thank our wife for her help with the typing” is always bad.

The use of “I”, and especially its overuse, sometimes has a repellent effect, as arrogance or ex-cathedra preaching, and, for that reason, I like to avoid it whenever possible. In short notes, obviously in personal historical remarks, and, perhaps, in essays such as this, it has its place.

13. USE WORDS CORRECTLY

The next smallest units of communication, after the whole concept, the major chapters, the paragraphs, and the sentences are the words. The preceding section about pronouns was about words, in a sense, although, in a more legitimate sense, it was about global stylistic policy. What I am now going to say is not just “use words correctly”; that should go without saying. What I do mean to emphasize is the need to think about and use with care the small words of common sense and intuitive logic, and the specifically mathematical words (technical terms) that can have a profound effect on mathematical meaning.