

	PRIMARY SOURCES	SECONDARY SOURCES	TERTIARY SOURCES
CONTENT	First description of original research (how it was done and results) and theory, arguments, solutions etc. that follow from the original findings.	Typically summarize information from multiple primary sources addressing the same issue in order to describe and critically discuss the state of the art in that area. Basically, a source is a secondary source of particular information if research underlying that information is cited from other sources. If it is not cited, it is NOT a reliable information source!	Provide much more general information as a summary of multiple primary and secondary sources, typically as general reference and starting point for further information search – terminology and definitions, main authors, main publications, main theories, etc.
WHEN TO USE	Essential for finding the best and most up-to-date solutions for specific problems or questions. Essential for formulating arguments and counter-arguments – evidence quality can ONLY be assessed based on primary sources!	Essential for complex study of a topic – state of the art in specific areas of knowledge, research directions, most important findings, conclusions based on the entire body of research to date, state of the theory, etc. Helps to find relevant primary sources – top-quality and most relevant sources are commonly cited.	General overview – provides definitions; lists key theories and authors; good for finding key words for database search when addressing a particular question. Study of basics – general concepts and directions
NOT SUITABLE FOR	Not suitable for general overview or fundamentals (not the first type of publication to “get initiated” into a field) Theoretical overview not a comprehensive secondary source – only provides narrow context for the study	Not to be cited as evidence for highly specific claims – primary sources should be cited as evidence (secondary sources typically only provide a part of the story and can be biased by the author’s point of view and interpretations)	Does not allow deep understanding of a topic; usually not sufficient for finding solutions to highly specific problems To be cited as source of research findings or conclusions Not sufficient resource for academic essays Not sufficient as support for arguments
PROS	Most detailed sources describing how empirical support was obtained (procedures, reasoning, calculations, etc.) – allows evaluation of the entire process using principles of critical, mathematical, analytical thinking (rather than simply	Provides comprehensive overview Often reader-friendly for academics and professionals (not general public) – emphasis on clarity of arguments Cites sources that are the most relevant and up-to-date at the time of publication	Fast introduction into a broad area (general “scaffolding;” allows people new to the area to make sense of further information) Mostly reader-friendly Often easily accessible

	relying on the reader's trust in the author's competence and credibility)		Should contain generally accepted knowledge – good tertiary sources should not get outdated quickly
CONS	<p>Very narrow focus</p> <p>Provide overview of research and theory that might be misleading – not comprehensive, but serving as context for the presented study</p> <p>“Raw material” only – does not usually provide practical solutions, must be processed further in context of other research</p> <p>Scientific jargon – advanced education needed (theory and methodology in a specific area) to correctly interpret key parts</p>	<p>Get outdated fast – new findings might shift the presented arguments, provide better solutions or cast doubt on the ones previously recommended</p> <p>Reviews can be biased by the author's motivations (e.g., only presenting evidence supporting a theory while omitting research supporting alternative explanations)</p> <p>Often expensive, might not be available in local libraries, usually not legally available online</p>	<p>Merely an interface of references to actual relevant information, rather than source of directly usable information (depending on type – some can be intended for basic practical use, but not for expert analysis of a problem)</p> <p>Generalized statements – does not by itself allow deep understanding of issues and processes</p> <p>Not always up-to-date (must be chosen with critical eye)</p>
STANDARD EXAMPLES	<p>Research articles – IMRAD structure (Introduction, Method, Results and Discussion)</p> <p>Research articles also include META-ANALYSES (statistical analyses of studies on a particular question – compute overall effect size; assess level and sources of heterogeneity in research findings and level of publication bias)</p> <p>Monographs introducing original theory</p> <p>Theoretical studies</p> <p>Theses and dissertations (research part only)</p> <p>Any original research reports (unpublished internal reports; published proceedings; conference contributions, etc.)</p>	<p>Handbooks and similar edited publications</p> <p>Monographs</p> <p>Review articles</p>	<p>Textbooks</p> <p>Dictionaries</p> <p>Encyclopaedias</p> <p>Manuals</p> <p>Popularizing and educational publications for the general public</p>

<p>WHAT TO REMEMBER</p>	<p>Key part of research studies are sections describing methodology and results ABSTRACT provides summary of all key points – enough if only basic mention is needed or to see if the study is relevant for you Found through Google Scholar and other databases, access provided by MU (see tutorial) Critical QUALITY assessment needed – trustworthy journals and articles are normally indexed in Web of Science/Web of Knowledge, Medline or at least Scopus; standard long-standing journals have an “impact factor” (does not apply to new journals); standard articles should be cited by other good-quality articles in the area; most credible journals published by one of several large scientific publishing houses (see tutorial)</p>	<p>One should pay attention to publication year and also look at research published after to see if there was significant progress in knowledge Review articles can be recognized by the word “review” in title</p>	
--------------------------------	--	--	--

WHAT ARE SCIENTIFIC INFORMATION SOURCES?

Apart from the fact that these publications are authored by experts from a particular field, a true, “fully-fledged” scientific source is mainly characterized by being **peer-reviewed**. This means that the relevance of content and the quality of arguments are reviewed by other (preferably independent) experts in the same field. For sources officially published by publishing houses and academic institutions, the peer review is an inherent part of the publication process and follows specific formal steps: The authors send the electronic manuscript to the journal editor, who invites usually two or three (anonymous or – more recently – non-anonymous) independent reviewers, who read the manuscript, not as “expert authorities” who know what the publication should look like better than the authors do, but rather as colleagues and potential consumers of the information communicated by the manuscript. In their review, they summarize what they see as strong and

weak points (inconsistent or erroneous argumentation, underreported methodology, methodological shortcomings, neglect of previous relevant research findings, etc.) and suggest corrections or – if the problems are too profound – recommend that the manuscript not be published. The final decision, however, is made by the editor, who can accept the manuscript, ask for revisions based on the reviews (a much more common scenario), or rejects the manuscript altogether.

The peer review process is essential for maintaining the scientific standard and reducing bias, since the motivation to publish rushed-out texts of poor quality or to “sell” particular points of view while disregarding competing views or counterevidence is, unfortunately, strong even among the academics. It is important to understand that the cornerstone of scientific knowledge does not reside in personal opinions of individual experts but rather in a free debate of many experts, each contributing their knowledge and perspective to test the other’s arguments and reveal potential weaknesses, leading to overall progress in understanding. Below, you will find the most common instances of publications which cannot always be considered as fully-fledged scientific sources, especially because they are not typically subject to a standard peer review.

POTENTIALLY PROBLEMATIC SOURCES

Main attributes that make sources potentially problematic (commonly more than one are present):

- No peer review
- Unstable, easily changeable content, with information that is difficult to track and verify (typically web-based content, oral statements or various unofficial statements)
- The primary function of the text is not to provide information but something else (e.g., student theses)
- High risk of misinterpretation (information presented out of context and/or ambiguity)
- Conflict of interests

The following sources cannot be recommended as “default” sources to base your project on; however, there are situations in which these sources can be useful or even cited in your essay/thesis.

Popular science and educational literature – aimed at the general public, these publications (popular science books and magazines, self-help books, etc.) can be typically recognized by providing “ready-made” instructions, recommendations and explanations, presenting scientific data almost as facts. It is not expected that the reader will evaluate the content critically in terms of trustworthiness or quality of evidence, since

they normally lack the necessary specialized knowledge to do so. The author is thus seen as an expert authority who relies on the reader's trust that they know what they are talking about and which information is reliable, verified and relevant. These types of sources are great for education of the public with regard to various relevant issues (e.g., increasing health, fitness and wellbeing) and can even serve as great inspiration for topic selection for student essays; however, the information they communicate need to be approached critically and should be tracked in primary sources rather than cited directly from these publications. The major sources for any academic projects should be those in which the quality and strength of research evidence can be directly evaluated based on the information provided.

Wikipedia – this highly specific source has a lot of both pros and cons stemming from the fact that it can be (at least theoretically) edited by anyone and is used by millions of people worldwide. The advantages include a relatively high objectivity (advocates of different perspectives would not allow the inclusion of controversial and unsupported statements) and up-to-dateness with regard to hot topics. Neither of these, of course, can be 100% guaranteed, but the way Wikipedia works makes it relatively reliable. Disadvantages include high instability of content and possible errors due to temporary publication of unsupported statements, “trolling”, unintentional mistakes in information presentation, deletion of subjectively undesirable content, etc. In any case, Wikipedia is categorized as a tertiary information source. Moreover, it is not clear who are the different “reviewers” and final “curators” of the content. It is definitely a great resource for general reference regarding the state of the art and for looking up highly relevant primary and secondary sources (which are normally cited here); however, it is not appropriate to cite Wikipedia directly in academic papers and student projects. Content instability should perhaps be considered the main reason to avoid citing Wikipedia even with respect to definitions or other general, seemingly uncontroversial information.

Online blogs and other online content curated by individuals or organizations with high risk of conflicts of interest – the content is potentially unstable, and, usually, there is no peer-review at all. These platforms are often used primarily as a tool for individuals or groups to express their own, subjectively preferred views freely without facing potential objections regarding ignored counterarguments and counterevidence, problematic information sources, logical inconsistencies or downright false statements, which would normally be pointed out by reviewers in the peer-review process. These texts can provide an interesting read and inspiration, and, in some cases, can even be carefully cited to present a particular perspective on an issue. However, one must be extra careful not to present subjective opinions and potentially biased, unscrutinised conclusions as facts and/or support for critical arguments (which, after all, applies to all publications in general). An advisable strategy in such cases would be to look up the sources the blog is referring to and check how these sources are discussed elsewhere (other perspectives, objections, etc.), and also look for other sources on the topic, as they might provide alternative, equally or even more relevant arguments and perspectives.

Student theses and dissertations – these can serve as valuable original research reports, but one has to keep in mind that the research and the reports were not put together by trained specialists but by students with varying levels of critical thinking and research skills. In fact, these texts are directly intended as “tests” of these competences, rather than actual contributions to the field. Methodological requirements are typically much more lenient here, especially in lower-degree theses, and errors, biases and other limitations of content are commonplace. On top of that, theses and dissertations are not peer-reviewed (official evaluation statements by theses readers serves as a basis for grading and defence; formal revisions are not typically allowed). Therefore, even an excellent dissertation can only be seen as a yet-unreviewed manuscript (also referred to as a **pre-print**). It is not uncommon for students (and their advisors) to subsequently submit a concise version of such a thesis to journal peer review as an article manuscript. In general, theses and dissertations do provide original data or even ideas that might be highly relevant and innovative for a particular field, which is why it is better to cite them than omit them if you are aware of them. However, the content should be approached critically to see if methodological and analytical standards are comparable to those in peer-reviewed research reports in similar areas.

Untrustworthy pseudo-scientific (self-proclaimed scientific) sources (“predatory” journals and other) – at first glance, these sources look like standard scientific articles and journals (title, structure, website layout, editorial board, author information, etc.). However, the primary reason these journals or whole publishing houses are established is not publication of high-quality research to promote knowledge but generating of profit for the house owners. These publications are typically published in an **open-access** form, which means they can be accessed online for free by anyone because the publication expenses are covered by the author (or their funding institution). Open-access publishing is a very common and desirable approach nowadays to ensure free access to relevant information; however, unfortunately, it has also resulted in a spate of new, shady publishers, who exploit the fact that many researchers and academics worldwide are strongly motivated or even forced to generate international-level publications (i.e., in English) but have very limited access to training and resources necessary for putting together a high-quality manuscript or even for conducting research that would meet the minimal standards to ensure “survival” in a peer-review processes in a standard international scientific journal. Correspondingly, acceptance criteria in predatory journals are often much lower compared to standard journals, and the review process itself might only be a formality (which, of course, is not publicly stated by the publisher). There are other common signs of predatory journals, which are summarized on Wikipedia ([Predatory publishing - Wikipedia](#)).

There are multiple ways to tell a predatory journal or publisher from a trustworthy publisher; however, the criteria are often much easier to evaluate for academics than for students. Luckily, there are several rules of thumb that should help you make relatively reliable distinctions. First, most high-quality research is published by several well-know scientific publishing houses. A look at electronic information sources at MU provides a solid overview of these. Any new publisher that suddenly “pops-up” on the “market”, especially if they come ready with a whole

scale of journals from multiple fields, should be scrutinized. A particularly telling sign of an untrustworthy publisher is an overall poor language quality of published articles with non-standard English, strange formulations and inappropriate terminology. Criteria like authors' experience with the peer-review process in the journal, the way the journal is promoted (e.g., spamming researchers with submission invitations, discount offers, invitations to join editorial boards, etc.), composition of editorial board, payment guidelines, etc., have been systematically evaluated by librarian Jeffrey Baell, who composed a list of potentially problematic publishers and journals with justification: [Beall's List – of Potential Predatory Journals and Publishers](#)

It is important to understand that scientific publications are not simply divided into high-quality literature and predatory journals. Rather than dwelling on a suspicious-looking article wondering whether it comes from a predatory or “safe” journal, one should always focus on identifying the most relevant, top-quality publications on the topic one is addressing in their paper. These are the publications your project should rely on. Researchers worldwide are strongly motivated to publish their best research in journals that are well-established in their field, either because of a long tradition of publishing pivotal, theory-shaping findings, because of a narrow focus on their highly specialized area, or because of outstanding methodological standards, which are translated into a highly rigorous and transparent peer review process. These journals are typically indexed in a large citation database called Web of Science and – if established earlier than in the past few years – have been assigned an **impact factor**, normally interpreted in terms of “the higher, the better” (the actual value, however, depends on research field the journal belongs to, hence impact factors cannot be compared across disciplines). In addition, published high-quality research is typically conducted by researchers working in well-established laboratories and institutions, whose portfolios are transparent and easily found online, so that you can track the history of their work and what they specialize in. Their list of publications is often relatively long and contains other articles published in prestigious journals, with a large number of citations. Of course, they can also be new research teams with young members; however, they would still collaborate with more senior experts in the field, and there is demand for their work.

Alongside prestigious journals and predatory journals, there is a wide variety of more local periodicals that focus on research which, in its scope, applicability or even quality, is unlikely to be published in a more prestigious international journal. These include research that might only be relevant to a local community of professionals (e.g., replication of an already well-established finding on a local sample) and preliminary studies (i.e., smaller studies to test whether a particular approach works as intended as a preparation for a larger study), but also low-cost research of limited quality (e.g., small, unrepresentative samples; weak justification of research objectives; employment of unverified, cheap and/or obsolete methods with a high risk of bias or error, etc.) or even texts with severe limitations that do not meet international standards of scientific writing (haphazard and unrepresentative selection of information; inconsistent argumentation; inability to submit a manuscript in English). There are also instances of local periodicals being established by local research or educational institutions with the sole

purpose of satisfying the “basic publication needs” of its staff members or employees of an “ally” institution, and the peer review process might be similarly provisional as in predatory journals. On the other hand, this group also includes high-quality periodicals that are aimed at a local readership for a good reason (e.g., providing information to doctors tailored to the Czech political and legislative environment). Overall, when turning to local publications, it is always good to ask what the reasons might be that the research was not published in an international journal.

Oral and other statements without an official record – these sources are not only unverifiable, but can also be easily taken out of context, and the risk of misinterpretation and miscitation is very high (just like in the case of misleading “news” in the media). Statements uttered spontaneously in a particular situation are often formulated in a different manner than thoughtful, carefully elaborated statements in written texts intended for publication. They can be unintentionally inaccurate or misleading because the speaker cannot find the right words at the right moment or has a lapse of attention, may refer to something else than the listener assumes, may be meant ironically or, generally, simply intended for the specific audience present in that particular situation. Since using someone else’s idea in one’s work without referring to the source is considered as plagiarism, if you hear an expert say something, for example, during a lecture that you really wish to include in your essay, the practice of first choice is simply to ask them if the idea was already published formally and where it can be found, so that you can turn to the “official” source. However, if you wish, for example, to quote an oral statement directly as an original and apt way of expressing an idea, it is always appropriate to ask the speaker for permission to make sure that they really identify with the statement and that you understood everything correctly. One should also remember that not all seemingly interesting and relevant utterances, even by experts, are suitable and relevant contributions to an academic paper on a particular topic. If it turns out the statement was merely a subjective opinion or an unsupported speculation, it might not be appropriate to include in any objective analysis at all. These rules do not only apply to oral communications such as conversations or lectures, but also formal and informal mail exchanges, and largely also conference papers and posters that have not been formally published as proceedings. Even highly interesting research presented at conferences should be viewed as work in progress which has not been peer-reviewed yet and might still be unfinished.

Last but not least, it is important to add that, aside from these potentially problematic sources, one should keep in mind the classification and functions of the different types of academic publications provided in the table at the beginning of this document. For example, textbooks might provide a great study material but are far from the best source to cite when referring to specific scientific findings and evidence, even though they might provide some information of this kind. When writing an academic paper, one should always look for the primary source of research evidence.