

**Course Name: I think Biology**

**Professor Name: Divya Uma**

**Department Name: Biology**

**Institute Name: Azim Premji University**

**Week:2**

**Lecture:10**

W2L10\_How to Find Reliable Information?

Good morning. My name is Divya and I'm from Azim Premji University and I'm going to be talking about how to find reliable information, as part of process of science and this is for I think biology NPTEL course. So we are going to look at how do we access information. Say let's suppose we have been as students you have been assigned a particular topic where you have to find some information and write an assignment on that. These days there is so much information out there, it's flooded with information and the challenge is to find reliable information. So you need to understand how to access that reliable information, how to filter excessive information and only get what is needed for us to complete an assignment.

So there are many ways to do this. In the traditional old school you know, say 10 years back there were people used to go, students used to go to library where there are books, there are journal articles, there are magazines where you can browse through them and get that reliable information. Of course students still do this but what has become routinely common these days is to access information on your mobile or on your laptop with the help of internet. Google search engines have become so powerful that you can access information within seconds.

So I'm going to walk you through one specific example and say you know how to filter that information to get more reliable information that you need. So let's take an example of chocolate because we all like chocolate and let's say we want to find out about how, how chocolate is made, how chocolate is produced. So I'm going to go here to Google and look at chocolate. And when I say chocolate just give a keyword as chocolate it gives a lot of information about chocolate pricing, what are the different brands of chocolate, whether it's white chocolate or not, whether it's Ferrero Rocher, where is it available in India near close to your house etc. and etc. right.

These are all mostly sponsored advertisement which comes on the first page of when you say chocolate on Google search engine. Of course there is Wikipedia article where if you click on

that, then it does give you some information about how chocolate is made, where does it come from right, it talks about history, it talks about you know adaptation of chocolate, European adaptation, solid chocolate, where all has it travelled, where does the word come from, the etymology, types of chocolate etc. and production. So Wikipedia is a good source of, good first source of information where you want to know about a topic which you don't know anything about. But of course you should not stop at Wikipedia but you should refine your search and look at some other articles.

So please when you are looking for a new article or when you are looking for new information don't stop at the first website you get but look at several other web pages. So if we scroll down or if we narrow, okay let's narrow our search to chocolate pollinators. We want to find out who pollinates chocolate and how is chocolate pollinated and you will find that insects in fact pollinate chocolates and in fact there is a certain kind of fly, a tiny fly which pollinates chocolate. So there are again several web pages here, which talks about chocolate and you can see that this is the flower of the chocolate plant, cacao flowers and how pollination works. It also shows you that there are flies which actually pollinate chocolate but you can also hand pollinate chocolate.

So what happens in the absence of flies and what actually which kind of fly which pollinate chocolate. So this itself is lot more specific than going through Wikipedia or other common you know by using very generic keywords to search. So what I am showing you right now is how to use very very specific keywords to streamline your search. Okay so you find certain blogs like this or a specialist web pages such as Scientific American like this, how pollination affects chocolate production or Science Friday, it says meet the flies that pollinate cacao trees. So these are specific websites which gives you reliable information about chocolate production.

But of course as a novice you won't know what are reliable, what websites are reliable and what is not. That's why you need to read at least few four or five websites in order to find out okay what is actually reliable, what is a paid website, what is not and what is actually scientifically correct. If you are a science student and if you want to dig deeper and get scientific articles then there are several ways to do it. I am going to show you one way.

It is known as there is a page known as Google Scholar. It gives you scholarly articles, that means it will give you articles which are published reports. So let's again, I am going to search as chocolate pollination and it will give you all the published articles on chocolate pollination. There are several important features of this Google Scholar window and I am going to talk, take you step by step about what to look for in this Google Scholar page. So all these are papers, published papers in various journals and basically it gives various kinds of information.

So you can say that here on the left side you can see that these are published, you can kind of custom, you know you can have a custom range of say that okay I want to read articles

published only in the last five years. So you can go to customs range and say from year you know, 2015 to 2022 and that will result in only those articles which were published in this period. Let's say if we say anytime then it will give you all old and as well as new articles published in this particular period.

Then let's look at some other features of this Google Scholar page. So there are several of these things. So cite means how many, how do you cite this page? I will come to this a little later.

Cited by is how many people, how many other scientists have referred to this particular paper. So say for example, 53 people have cited this natural pollination of cocoa. 303 people have cited the chocolate tree, a natural history of cocoa. So depending on how many people have cited that kind of gives you an idea that okay whether this paper is, you know whether you can read that paper or not. Of course it's not the only index that okay how popular this paper is but this is one idea of how you know, how popular, or how widely cited that paper is.

And you can also read other articles. It says a tab called related articles here and it gives you any other, anything. Google picks up this keyword of chocolate pollinators and anything about chocolate pollinators gets picked up and you can read few more articles. But let's stick to this page. So here there is one article called as natural pollination of cocoa and it shows that there is a PDF available and a full view available.

For certain articles there is nothing, no information. So if you click here it will take you to that page and you can see that an abstract of that paper okay as well as the whole paper here though it doesn't say a PDF is available, it looks like the whole paper is freely available to you. But this is not always the case. Sometimes papers are not freely available and you will have to use, you will have to ask your library or there are other means to get access to a full paper. Okay so this is about how to kind of get some kind of reliable information.

I am saying that this is more reliable because this has gone through a study, a scientific study and it is also reviewed by other peers, other peer scientists sitting all over the world. They would have reviewed these articles and many would have confirmed that what they have written is actually true. So this is one way to find reliable information. So it really depends on what are the specific keywords which you use. So let's say for example I am going to change this to chocolate pollination by flies.

So there you get very specific articles about this, flies pollinators on two wings. So more since we have used flies in the keyword, Google again picks up that information and you can see that it is mostly about flies and anything to do with flies may or may not be do with cocoa, but it will pick up that information, cocoa and flies. Cocoa flower Diptera; their identity, pollinating activity and breeding sites is one such paper. There is one more website called PubMed Central, which is like Google Scholar but it is much older than Google Scholar which we all routinely use

to get scholarly articles. So this is how the page looks and you can again like exactly like Google Scholar you can type in whatever you want to see.

So I am going to say Diabetes and hit search and it gives me again various articles related to Diabetes. It takes up that keyword, and it is much more extensive than Google Scholar. So there are these many items related to Diabetes, but what is interesting here is you have various other resources in its database, such as books. There are other websites which are linked to it. There are gene banks information and then there is nucleotide information.

There is various other you know structure, taxonomy pertaining various other kinds of information pertaining to Diabetes can also be found. So this is a much more scholarly page if you want to kind of narrow down your search. And like Google Scholar you can cite it. So there is a cite button here, which will give you citation in various styles and you can also access the article either by clicking here and you can read the entire article here or by clicking the PDF option of this article. So this is known as PubMed Central and it is largely for life sciences, you know subjects related to life sciences.

So with this I want to kind of briefly highlight about the process of publishing itself, how science works and the process of publishing. In the previous two or three classes you would have learnt about the scientific process, how to think about the scientific process itself and how to ask questions, how to frame hypothesis, stuff like that. But when you are done with your results and when you have a full like a story of a study the next step is publishing. Of course you can decide to you know publish it in various ways. What is the point of publishing because you want other audience either in your related field or lay public you know to know what you have done and what is the contribution of your your project to the community of that particular you know particular topic, right.

So suppose I am a researcher working on diabetes I might have found out something new however incremental it is there might be some new knowledge which will help the body of the scientific body to grow step by step, little by little. So I am going to be specifically talking about publishing. So when you compile the data and when you are ready to publish you have to write, write it up in a formal way if you were to send it to a scientific journal. So often there are various kinds of scientific journal. These are all you know it is a company there are various journals some are the society journals are free of cost even to publish but there are other journals where even to publish your own work one has to pay for figures or even if you have colored figures you will have to pay so on and so forth.

But there is one more site known as "bioRxiv" where you can put up your preprint document. What I mean by preprint is before it goes to printing the formatted document which is actually if it is already published in a journal that is a different issue altogether but before actually sending

it to any scientific journal we can upload the article whatever we have written for completely free of cost and it goes it can be you know it is a repository or it is a storehouse for all the preprints. Now there are some advantages of it. The thing is this is again it is completely free of cost and anybody can upload their research work here and it will be read by a community of interested people who do related work and they can comment on it and it is quite supportive and you can actually benefit from that those comments and modify your work or modify even the writing so on and so forth so on and so forth. So this is known as bioRxiv and instead of you know sending it to a formal journal or even before sending it to a formal journal people usually they put up their articles in bioRxiv and get comments from it.

So I just wanted to introduce you all to this bioRxiv and see there are various subject areas which bio archive caters to, all the way from animal behavior and cognition to neuroscience, microbiology, genomics lot of stuff. So this was especially helpful at the time of pandemic where a lot of people were working on various vaccines for COVID-19 and they could benefit from it because they needed quick output and quick results, right. So people were uploading articles into bioRxiv. Ok, that's about various search engines and also how does one go about putting things on preprint before actual publications. I want to say few more things apart from using Google Scholar I want to say few more things about what not to do when you have an assignment where you are using online search bar syllabus.

Let's look at little bit about plagiarism because that's become a common thing where we have to alert students about what is plagiarism, what is the difference between copying something and writing in your own words reading some information and writing in your own words and citing that information. So, since there is a lot of information on the internet it's very easy to copy something, copy sentences from multiple sources and put it as your own and for instructors or for the audience who is reading that information they won't know where that information the student has got from.

So it's always a right practice to cite something wherever you have got that information from. If you have copied a sentence exactly from an internet then you have to put it in quotes and cite that resources but if you have read a paragraph or two from a particular website or a paper and it's actually recommended that you paraphrase that information that means you use your own words to write that same information and then you cite that particular resource where you have obtained that information from. So these are the practices which has to be followed but often what students we find students do is in a hurry of completing an assignment they will of course they will write that information in their own words but not cite that particular resource right next to that information but at the end they will put out a list of references but you won't know what paper they have cited or what paper they have used for what particular information.

So what is important to do is you write about one particular information and as soon as that sentence is over you actually open a bracket and put in that particular authors and year name and

so that, that reference is there along with that information and this is known as in-text referencing. Of course there are other ways of referencing but this is one popular way of referencing that information or citing that information. So you can either quote some words or some you know sentences if you don't want to change what the author has written or paraphrase it and write it in your own words. It is always in school when students are studying questions are given and certain answers are written but in the college level it's almost mandatory that you have to cite that information where did you get that information and you know what papers are you are referring to. So plagiarism has become an important topic to understand what is plagiarized information and what is not, so one has to be careful about that.

Of course now things like chat GPT have come up and that is going to revolutionize how we look at information and how we use that information. So it's not correct to use chat GPT, things like chat GPT or other AI resources just you can ask that question to chat GPT and say how does chocolate pollination works and it will give you a very nice essay about pollinators of chocolate and you can use that information right, but it is not correct to use these kinds of resources without acknowledging where you have taken it from. Also you yourself won't be gaining much knowledge if you use these external resources without actually understanding what's going on. Now let's come back to a little bit more information about how to actually cite this your you know whatever you are referring to. So there is a button here called 'cite' so if you click here it gives you different formats so MLA, APA, Chicago, Harvard and Vancouver are different formats in which you can cite this paper.

So these are the authors who have written the paper, this is an year in which the paper is published, this is the name of the paper or the title of the paper and you can say , you can see that it's a review article. So the difference between a review article and actual like an empirical study is that a review is a compilation of many studies whereas an empirical study is something which you have you know it can be a theoretical or an experimental study where it's a standalone study it's not a review article. So you will get some idea about what kind of an article it is, sometimes the heading itself says that or sometimes when you see a paper when you see a research article you will get the idea whether it's a review or actual study. This here agriculture ecosystems and environment is the journal in which a paper is published and it will have volume and page numbers typically. So these are all various styles in which you can cite the paper anything is fine, so you can just click on this right click and copy that particular information and you can put it as what are the references so if you are writing an assignment if and towards the end of the your assignment you have to list the references you have used so you can, you know copy paste this reference and put it up.

There are other ways other easier ways one can also cite an information if they say for example it's a big thesis you're writing and there are several articles that you have to cite if you can't every time you can't like go click here and paste it. There is other softwares which are known as

Zotero, which are freely available where you can actually download those softwares into your word doc or even google doc and just click on this paper and it will basically it will take that information all that author year and all the information which you need to cite it and it automatically incorporates those information into the reference section. So those are there are many ways to cite the paper. So this gives an idea about how reliably search for information starting from you know just knowing about where to find chocolates now we have kind of streamlined our information or access to information by giving specific keywords such as chocolate pollination or chocolate pollinators and by going into specific websites such as google scholar you can actually download research articles about this information. With that I would like to stop on how to find reliable information and in the next few chapters my colleagues from for this course are going to talk about other process of science. Thank you.