

Introduction to Professional Scientific Communication
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Lecture - 08
Writing an Abstract

Welcome back to this course on scientific professional communication. So, we have been discussing about how to write scientific reports in the previous class we have discussed as to how you frame sentences some of the thumb rules for example, you should be having the first part of the sentence should start with something given that is the reader is expected to know by them followed by something new.

And then second aspect was that you are to keep the focus, and then you should always introduce first the lighter aspect of your findings, and then with you know in the new course you should bring in the more complex nature of your discoveries or inventions and so on.

So, that is with that little background we get into different sections of a report. So, one of the very important aspects of any scientific report is the abstract what do you mean an abstract? It is a summary of the discovery or invention or research project or review whatever research thing that you have done. So, it is normally returned in about 200 250 words up to 300 words and so on.

This is normally used as a kind of a summary for the paper or even you may be presenting your talk somewhere in a conference or seminar or whatever this abstract is shared with all the audience therefore, they are aware of as to what is that you wish to speak about there is a summary that is given therefore, this summary or the abstract is extremely important it is like your face your face is the identity for your body.

So, if I take a photograph of you and then wipe out your face in the digital image and show to anybody, it may be very difficult for anyone to identify that it is you unless somebody very close to you who know how do you stand how do you keep your hands or what kind of dress you wear its going to be extremely difficult therefore, the abstract helps in that right the face helps your identity likewise the abstract.

Because anybody wishes to read your paper or want to listen to your talk; would first read the abstract therefore, they have an idea as to what is that you are going to talk about. So, they are sort of having some preparation and the preparation could be that they are interested in the topic they read about abstract, they have more interest now come on listen or I may not be interested in the topic. So, when I read the abstract, I would not come right that also helps.

Therefore the abstract really really should be written well. If you indeed make the abstract exceedingly well you know interesting, even the second person for example, I do not work I do not work in this area, and the abstract is not well written; obviously, I will read I will not understand I will say you know this topic does not interest me, you know I do not understand.

But you made it so good; we are able to sell your ideas. So, well you are able to convince me, now will I find it interesting on this topic is interesting let me go on listen to him. So, this is another good way of advertising your work therefore, the abstract is very very important for your research.

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What is an "Abstract"?

A summary of the contents of a book, article, or speech.

How to write an abstract?

Abstract is like the TV commercial. Whether the reader would read the entire report or not depends on the interest you create on the topic of interest in the abstract itself!

Question is how to write an abstract this is something that you are going to look at.

So, what we do is that, we are going to look at some TV commercials, because abstract is like TV commercial that is what I said it is an advertisement for my research right

whether the reader would read the entire report or not, it depends on the interest that you create on the topic of your research in the abstract itself. So, that makes it much more interesting.

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Let us watch some TV commercials and rate them!

<https://www.youtube.com/watch?v=1-gsMqNCasc>
https://www.youtube.com/watch?v=jOka9EKlo7g&feature=player_embedded
<https://www.youtube.com/watch?v=XEHjCYQCS4k>
<https://www.youtube.com/watch?v=kBbBISctkv8&feature=youtu.be>

99acres.com
Dr Fixit
OLX.com
Rajnigandha

So, what I am going to do is I am going to play out four different you know you know the video files of the common or popular commercials TV advertisement that we see in the TV. So, what I would want you to do is. So, you go through all four of them, then make a list the list should be the one that you like the most followed by the second third and fourth meaning the fourth would be the one that list interested in or it was not convincing. So, let us watch these videos and then we will take up the discussion later.

[FL] Begam [FL] Shahajan [FL] [FL] oh ho [FL] Begam [FL] [FL] [FL] [FL] [FL] [FL] plot [FL] plot [FL] 99 acres dot com [FL] Babar road Hamai road Akbar road Jahangir road Anarkali road finance [FL] [laughter] [FL] if [FL] its sim here buy sell rent at 99 acres dot com.

No breaking news see ha no breaking news [FL] water proofing [FL] [FL] [FL] doctor fixit [FL] new code [FL] water proofing solution [FL] coat [FL] leakage [FL] new coat from doctor fixit the water proofing expert.

[FL] ha ha [FL] led or [FL] sofa set [FL] [FL] or [FL] [FL] [FL] sell [FL] cell phone [FL] phone [FL] sell phone OLX dot in [FL].

D vector u ; so, how much time to so, (Refer Time: 06:42) 2 days 7 hours I do not know (Refer Time: 06:54) and you Indians I (Refer Time: 06:55) you find answers in the trees do not you [FL] it is a Indian values [FL] complements from India [FL] Rajanigandha [FL].

So, all of you have watched the video. So, what I also expected is that you sort of list as to which commercial you like the most. I cannot directly interact with you right. So, what I have done is, I have done a very similar survey with my class students here at IIT Kanpur. I have the list in this list the commercial which commercial the 99 acres dot com and the OLX these are the two top trending advertisements, that people found to be very very attractive whereas, other two the fix it and Rajanigandha advertisement for the least here is number 3 number 4 and so on.

So, this is the kind of a feedback I received from the students of this particular classroom and now you can connect your preference with this particular output therefore, you would know whether it matches with the majority. The reason I have shown this is that the commercials the TV commercials are very challenging task to develop and make the companies, which sponsor this basically for example, ninety nine acres is are portals that help people to buy land.

Now, they want people to go and log in and use their portal for the purchases right. So, they are compelling you. So, how they will do they make it. So, attractive or the OLX or whatever it is we make it attractive. So, they get only twenty seconds or twenty seconds that is the time that they get and within which they how to convey exactly what is the company about what is the product it is about why should be purchased or why should be used they are trying to convince you..

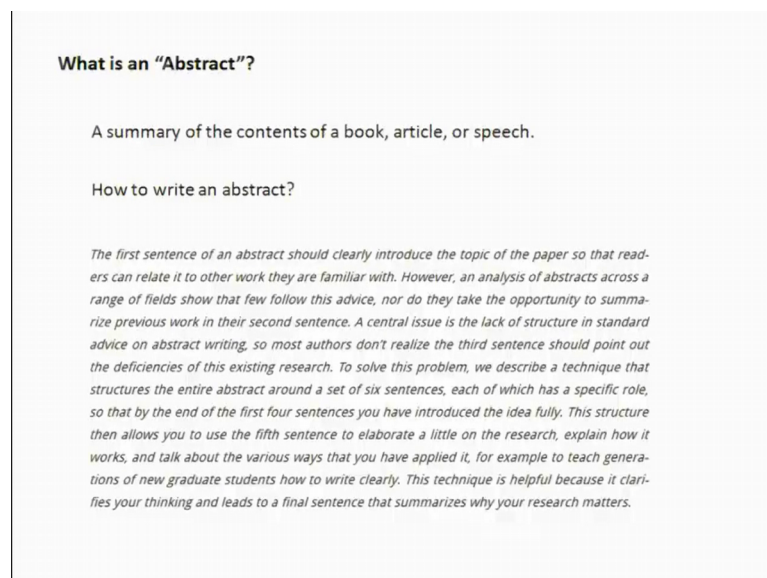
So, you have very limited time and you should attract the audience to sort of try out that particular product, later on the product or the web porter or whatever that they are selling. It all depends on how efficient how good whatever it is later on, but for a user who has not used or a potential customer who has not use it before for him or her to try out the advertisements to really help.

Now, unless the advertisement is able to convey, the good thing about that product or the portal or the company nobody is going to try out. So, the advertisement is like an abstract of the scientific paper that you are writing or abstract of the talk that you are about with

deliver. So, it has to be concise within fitting into say 200 words or 250 words, should be able to convey that they either come from your talk or if it is a research paper research report they take time to read they do you know spend time to read your report or thesis or paper and so on and if they do well if they follow will they are going to appreciate you.

So, you have to keep the audience with you right for that you are invite them first the invitation is nothing, but your abstract. Therefore, it is extremely important that you learn how to write an abstract that is something that we are going to discuss in the lecture today.

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What is an "Abstract"?

A summary of the contents of a book, article, or speech.

How to write an abstract?

The first sentence of an abstract should clearly introduce the topic of the paper so that readers can relate it to other work they are familiar with. However, an analysis of abstracts across a range of fields show that few follow this advice, nor do they take the opportunity to summarize previous work in their second sentence. A central issue is the lack of structure in standard advice on abstract writing, so most authors don't realize the third sentence should point out the deficiencies of this existing research. To solve this problem, we describe a technique that structures the entire abstract around a set of six sentences, each of which has a specific role, so that by the end of the first four sentences you have introduced the idea fully. This structure then allows you to use the fifth sentence to elaborate a little on the research, explain how it works, and talk about the various ways that you have applied it, for example to teach generations of new graduate students how to write clearly. This technique is helpful because it clarifies your thinking and leads to a final sentence that summarizes why your research matters.

The abstract is a summary content of a book article speech you know abstract summary how to write an abstract. So, this is again you know it is taken from the same site we can go and read there, that this talks about you know how do you write an abstract this is a paragraph that is given. So, I can read out the first sentence of an abstract should clearly introduce the topic of the paper. So, that reader can relate it to the other work they are familiar with. So, you have starting with something given right. So, you have to start from something the majority of the readers would k. Now, therefore, now they are primed as to what you are trying to do.

However an analysis of the abstract across the range of will show that few follow this advice remember, we discussed that every sentence in even when you introduce any topic that has to be given then you bring in new thing that is not being followed.

So, now do they take the opportunity to summarize previous work in their second sentence, they do not even summaries what is known before right. A central issue in the lack of structure of standard advice and abstract writing so, most authors do not realize that third sentence should point out the deficiencies of the existing research. So, you now say this is what known and then you say this is exactly is unknown this is exactly is the problem this is exactly is the question..

So, you have to say that is something that is something important and then you introduce to solve the problem, to address the gap, to address you know whatever (Refer Time: 12:35) you know we come up with some method and then do that should be the you know statement let us see how it is written here.

To solve this problem we describe a technique that structure, the entire abstract around a set of 6 sentences each of which has specific role. So, that by the end of the first four sentences you have introduced the idea fully. So, what this paragraph states that you know they are proposing a 6 sentence guideline, the each sentence has a specific function and if you follow this you are able to structure your abstract beautifully. This structure allows you to use the fifth sentence to elaborate a little on the research explain how it works talked about the various ways that you have applied it.

For example: to teach the generation of new graduate students how to write clearly exactly the mandate of this course. This technique is helpful because it clarifies your thinking and leads to your final sentence that summarizes your research matters because it is a take home message at the end you have to convey. So, this is an abstract about abstract writing. So, beautifully written and it says that they have developed is 6 line approach guideline let us see what this.

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The six key sentences of an abstract are:

1. Introduction. In one sentence, what's the topic?
2. State the problem you tackle
3. Summarize (in one sentence) why nobody else has adequately answered the research question yet
4. Explain, in one sentence, how you tackled the research question
5. In one sentence, how did you go about doing the research that follows from your big idea
6. As a single sentence, what's the key impact of your research?

How to write an abstract?

The first sentence of an abstract should clearly introduce the topic of the paper so that readers can relate it to other work they are familiar with. However, an analysis of abstracts across a range of fields show that few follow this advice, nor do they take the opportunity to summarize previous work in their second sentence. A central issue is the lack of structure in standard advice on abstract writing, so most authors don't realize the third sentence should point out the deficiencies of this existing research. To solve this problem, we describe a technique that structures the entire abstract around a set of six sentences, each of which has a specific role, so that by the end of the first four sentences you have introduced the idea fully. This structure then allows you to use the fifth sentence to elaborate a little on the research, explain how it works, and talk about the various ways that you have applied it, for example to teach generations of new graduate students how to write clearly. This technique is helpful because it clarifies your thinking and leads to a final sentence that summarizes why your research matters.

These are the 6 key sentences that should be there in an abstract.

The first one is the introduction in one sentence you are introduce what is the topic what you are discussing about. The second you have state the problem you tackled. So, you have to say exactly what is that, you have addressed third is your have to summarize in one sentence why nobody else adequately answered the research question maybe you are used to a different method or you have devised something novel strategy whatever it is..

And then say explaining one sentence how you tackle them such question your approached method you may develop a new model system and so on, and then the fifth sentence is how did you go about doing the research that follows from your big idea. So, what did you do and finally, you say; that what is the key impact you are finding on the research domain right.

So, let us now see because these are the 6 key sentences that formed abstract, and we have read an abstract about the abstract writing let us see how these 6 key fit in here let us see the first one introduction. In one sentence about the topic now you read the first sentence of an abstract should clearly introduce the topic of the paper therefore, the reader can relate the work. So, you know this line about abstract explains the very purpose of the abstract why should you state the problem.

So, now you see exactly what is lacking. So, that is what it is and analysis of abstract across the range of field show that, few follow the advice that is the abstract needs to introduce the topic you know that particular advice is missing. Now do they take opportunity to summarize previous work they start from you know exactly what they have done without saying why they should do that and why they have done all right.

The third point summarize why nobody else adequately answered it possible, a central issues in lack of structure nobody really thought about it nobody gave the guidelines nobody came up with that methodology therefore, it is lacking. And then explain one sentence how you tackle that problem, to solve this problem we describe a technique that structures the entire abstract instead of 6 sentences that is something that we are now discussing. So, they are exactly saying how they develop the matter.

In one sentence how did you go about doing the research that follows from your big idea, this structure then allows you to use the fifth sentence to elaborate here little on the research explain how it works talk about various ways and all those things here, you get little room to really extrapolate your research and finally, the final sentence is the take home message what is the impact that you are made with the research that you are done.

So, these are the examples to show how to write an abstract. I am sure this particular concept really helped you, you can practice it more unless you practice you are not going to get it. We will be giving you some of the assignments based on such principle, and I am sure you are going to get benefited.

So, what we are going to do now is that we are going to look into one of the abstracts of one of the research papers, I am going to dissect how well they have written and the how does it really help in others to understand what they have done, but what I insist is that the 6 you know lying tips that we discussed..

Now, this is something that you have to memorize you have to implement and you have to practice you take any problem who read any research paper, close it only remember what they have done and try to write and abstract for that you have to keep writing using all the tips that I said it has to be having you know the 6 key bullets in the abstract, you have do in every sentence you have to follow they given first followed by new, you have to keep the focus therefore, there is a cohesion.

The third it should be always the light should be given followed by more complex heavy subjects. If you remember these and the 6 sentences I am sure you can really write you could abstract, but again it is like I introduced any of the scientific writing technique is like a professional performing artist. Unless you practice unless really invest time you are not going to master it is not going to happen in one day, one week, one month you have repeat practice follow what people do take the inputs and try it out.

Let us see this particular abstract; this is the paper that appeared in the journal nature in 2010.

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Nature. 2010 May 20;465(7296):305-10. doi: 10.1038/nature09107.

Thousands of chemical starting points for antimalarial lead identification.
Gamo FJ(1), Sanz LM, Vidal J, de Cozar C, Alvarez E, Lavandera JL, Vanderwall DE, Green DV, Kumar V, Hasan S, Brown JR, Peishoff CE, Cardon LR, Garcia-Bustos JF.

Malaria is a devastating infection caused by protozoa of the genus Plasmodium. Drug resistance is widespread, no new chemical class of antimalarials has been introduced into clinical practice since 1996 and there is a recent rise of parasite strains with reduced sensitivity to the newest drugs. We screened nearly 2 million compounds in GlaxoSmithKline's chemical library for inhibitors of *P. falciparum*, of which 13,533 were confirmed to inhibit parasite growth by at least 80% at 2 microM concentration. More than 8,000 also showed potent activity against the multidrug resistant strain Dd2. Most (82%) compounds originate from internal company projects and are new to the malaria community. Analyses using historic assay data suggest several novel mechanisms of antimalarial action, such as inhibition of protein kinases and host-pathogen interaction related targets. Chemical structures and associated data are hereby made public to encourage additional drug lead identification efforts and further research into this disease.

Which talks about a screen you know that they have used a chemical screen that they have used to find some lead compounds to contain malaria it is the anti malarial you know lead identification. So, that is what shown in this screen. So, I do not want to read whole thing because you can pause the video and read and they justify everything whatever we said.

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Context (known and unknown)	Context	With approximately 243 million cases and 863 000 attributed deaths reported globally in 2009, malaria is one of the most severe infectious diseases, primarily affecting the world's most disadvantaged populations. Of the four typically recognized <i>Plasmodium</i> species causing disease in humans, <i>Plasmodium falciparum</i> causes most mortality, mainly in children below the age of 5, and <i>Plasmodium vivax</i> most morbidity, additionally representing a reservoir of latent infection that hampers current control and future elimination efforts. No
Need (why this study)	Need what we have	new class of antimalarials has been introduced into clinical practice since 1996, because of the intrinsic difficulties in discovering and developing new antimicrobials, as well as a relative lack of public and private resource commitment towards antimalarial research. Today, the last class of widely efficacious drugs, the artemisinins, is being compromised by the rise of <i>P. falciparum</i> strains with reduced clinical response to artemisinin-containing drug combinations. The genomics revolution has not yet led to new antimalarial medicines and target-based lead discovery has produced disappointing results, generally for lack of whole-cell activity as documented for antibacterials. To secure this property in all chemical starting points for new antimalarial leads, we have tested
Task (what we did)	Task what we want	the approximately two-million-compound library used for high-throughput screening at GlaxoSmithKline (GSK) for inhibitors of <i>P. falciparum</i> 's intraerythrocytic cycle, the parasite's growth phase responsible for disease symptoms, which is amenable to <i>in vitro</i> culture. This paper describes 13 533
One line outcome	Object of the document	compounds confirmed to inhibit parasitic growth by more than 80% at 2 mM concentration, 82% of which were proprietary and thus unknown to the general research community.

Let us dissect the; you know abstract into four major bullets one is exactly the same thing the context known and unknown the need why did you do the study. Unless there is a need for the study to be done there is no point in doing it, it was already somebody else then you do not need to repeat that. So, you are always doing something because that is not done before that it is required that is important..

So, that needs to be justified that is called as why this study and task, basically what we did exactly what did we do and then the outcome right. So, we are going to dissect the abstract that is just now shown here, the context is you are going to say the background that is basically that is what it is.

So, it depending on what you are saying depending on the complexity the 6 bullets that I said need not be 6 sentences, but that is the kind of a flow that you have to keep for example, context you are going to introduce the topic. So, you want to say there how important my study is right. So, with approximately 243 million cases and whatever attributed deaths reported globally in 2009, Malaria is one of the most severe infectious diseases primarily affecting the world's most disadvantaged population.

So, they are saying why Malaria is an important you know infectious disease that one needs to study of the four typically recognized. As the 14 species there are talking about that there are different species that that. In fact, you know there is a reservoir of latent

infection and therefore, it hampers the way you know develop some drugs which can eliminate you know take care of future efforts.

So, they are saying that what is the challenge, I am now saying what needs why this study is required that is what they are saying no new class of anti materials has been introduced into clinical practice since 1996, that is when first one was introduced and since then no new class of antimicrobials anti Malarial have come in because of the intrinsic difficulties in discovering and developing new anti microbial as well as relative lack of public and private research commitment towards the drug, you know anti malaria research because these are mostly in the underdeveloped country where people do not fund lot of research and so on.

So, they are saying why this study was required right. So, they basically they are trying that it is important to find lead compounds, new lead compounds which can fight malaria. So, that precisely they want to bring homo point that this is the problem, they define the problem and they say why this problem the tackling this problem is important.

So, what they did just one liner they secure this property in all they say that to secure this property, where the property the genomics revolution has not yet led to any new antimalarial medicine target based lead disgrace produced disappointing result because there was a hype that if you have sequence the genome I will identify what is the (Refer Time: 22:29) target will target and so on therefore, people are waiting that you know one the sequence thing will be complete and I can develop some lead compounds, now that did not happen therefore, you know there is a need then they are done.

So, what they are done is we have tested approximately two million compound library used for high throughput screening, in inhibitors for this particular falciparum species and then they identified certain new targets right that is what they have done one line outcome. This paper this particular report describes 13000 find that 33 compounds confirmed the inhibit parasite growth, that is a huge discovery because the impact could be phenomenal because many of them now are marketed as drug because it is 2010. So, that has made a huge impact.

So, you can see now how the abstract is structured is very important you know how they write the good papers that are published because they are able to sell their ideas. So, beautifully when they are writing; therefore if you look into the best journals you will

find the abstract is well written. If you go and look into journals that are not so, good not so, high profile not so, popular journals, you may find some other structures not written well the reason being not that the science may not be that good could be because they are unable to convey or bring out the novelty importance of the work..

Therefore, even if you have good data even your findings are good, unless you write well convey you are not going to get the kind of you know appreciation that you would get.

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Sample 1: This experiment will determine what will make enzymes effective and what will make them ineffective. We tested different samples of enzymes in a spectrophotometer and recorded their absorption rates. Six samples were placed in the spectrophotometer but two contained no enzyme; these acted as blanks for the other samples. The four remaining samples contained Catecholase ranging from 0.5 ml to 1.75 ml. The second half of the experiment contained four test tubes with a constant amount of Catecholase, but the pH levels ranged from four to eight. It was found that if the enzyme was present in large amounts, then the absorption rate was high, and if the pH level ranged from 6 to eight then the absorption rate was high. Therefore it can be said that enzymes work well in neutral pH levels and in large amounts.

Sample 2: This experiment was performed to determine the factors that positively influence enzyme reaction rates in cellular activities since some enzymes seem to be more effective than others. Catecholase enzyme activity was measured through its absorption rate in a spectrophotometer, using light with a wavelength of 540 nm. We compared the absorbance rates in samples with varying enzyme concentrations and a constant pH of 7, and with samples with constant enzyme concentration and varying pH levels. The samples with the highest enzyme concentration had the greatest absorption rate of 95 percent compared to the sample with the lowest concentration and an absorption rate of 24 percent. This suggests that a higher concentration of enzymes leads to a greater product production rate. The samples with a pH between six and eight had the greatest absorption rate of 70 percent compared to an absorption rate of 15 percent with a pH of 4; this suggests that Catecholase is most effective in a neutral pH ranging from six to eight.

<http://writing2.richmond.edu/training/project/biology/biology.html>

Context | Need | Task | outcome

So, these are some of the examples I am showing here this is example sample one which talks about again you are finding and the second one is about the same finding, but written in a different way let us see what they are sample one is this experiment will determine, what will make enzymes effective on what will make them ineffective. So, they say what they want to do.

Let us say what is written in the second sample, this experiment is performed to determine the factors that positively influence enzyme reaction rates in cellular activities since some enzymes seem to have more effective than others. Now it is very clear you know you are talking about enzymes and their kinetics what are the factors that influence the second sample makes it much clear in the way first sentence what they were doing.

Go back to the first one we tested different samples of the enzymes in the spectrophotometer and recorded that observation rate. So, they are talking about what

they are done, but why they have done they have not mentioned that is what mentioned beautifully the second one..

Catecholase enzyme at was measured through its absorption rate in a spectrophotometer using light with the wavelength of five hundred nanometer you see that. So, seeing what you are done does not make sense you have to see why you are then what you are done. So, that is why you know the second abstract is better although he talks about the same experiment.

You go back to the sample one 6 samples were placed in the spectrophotometer, but to contain no enzyme these acted as blanks for the other samples unable to follow right. So, you look at look into the second one. We compare the absorption rate in samples with varying enzyme concentration and a constant ph of seven and with samples with constant enzyme concentration and varying ph levels they basically they say exactly what they have done and then they narrate what they have found it.

So, I can read out, but I am sure all of you can also read this if you take time and read the first one and try to understand and then come to the second one, then you can appreciate how in a better way of writing the abstract makes it easy for you to you know follow and appreciate whatever discover is that they are made and reported in that particular popper right.

So, these are important, these are some of the tips that you know I could you know convey and I connected you with many other websites, and links that would help you to make you a better writer in communicating your ideas in scientific field and unless you practice read write and then take input and constantly improve you know it would take time, but this course is like an eye opener tells you that it is not that its easy..

But it is not difficult it practice you should be able to do better, but you need to learn you need to remember what are the important you know elements that you should consider follow when you write articles research papers, and we discussed so far the abstracts we will continue in the next class.