**3. Lecture notes 3.**

**How to write a scientific article**

Today we you will learn about one of the key competencies of a researcher, namely, the ability to write scientific articles. This topic is so vast and important that we will devote enough time to its study and will be result-oriented all the time. As you understood from the previous lecture, research in various scientific fields has its own specifics. I hope these lectures help you write and publish an article in your specialty and thus meet the requirements for a master's degree.

By the end of this lecture you will know the structure of a scientific article;

You will understand the main challenges related to the writing of a scientific article in English and how to get help;

You will be able to prepare a brief review in your field of research

Why is it so important to publish scientific articles? If you look at Wikipedia for the term Publish or Perish, you can better understand this. By the way, the earliest known use of the term in an academic context was in a 1928 journal article

Publish or perish is an aphorism describing the pressure to publish an academic work in order to succeed in an academic career. Successful publications bring attention to scholars and their sponsoring institutions, which can help continued funding and their careers.

Funding is good, isn't it? Career development is also important. But if your research is poor, none of this is ever going to happen.

Let's take a look at the true motivation

As you already know, any research plan addresses 4 important questions

What do you intend to do?  Why is this work important?  What has already been done?  How are you going to do the work?

So, when the study is completed, you can to declare

My work is relevant and novel and I would like to show my priority in this area and share my findings with other researchers and get their feedback to continue my research and provide other scientists with my feedback

And you start work on the manuscript, the so-called paper, that is, the document that you are going to submit to the journal.

Of course, the requirements of different journals to the structure of the manuscript may differ slightly, but the main components of any scientific work: articles, conference presentations, and your master's thesis are always the same. Let's start with the title

Your title should be specific, clear and concise. You must be able to communicate effectively the main idea that your paper focused on, within 80-character limit.

Then you have to provide: Names of the Authors. Authors' affiliations. Addresses. E-mail of a corresponding author.

The **Abstract** is going next.

It has to be properly structured, i.e. answer the four questions: what was the aim of the study? How did you approach it? What were the main results? What is your contribution to science? You should try to limit and avoid the use of strange abbreviations and acronyms.

In my experience, it's best to prepare your final abstract after you've finished your work, because this part is very important. Each researcher will first look at the abstract to make a decision to read your full article.

**Keywords** must accurately reflect the content of the manuscript and correspond to the title of an article

Then PAQS, if it is necessary, as we talked about last week.

**Introduction**

An adequate literature review has to be provided in this section.

The processes closest to that described in the present work should be briefly reviewed.

The review should end with a "gap sentence" which clearly states what has not been published in the past, neither by other groups nor by the authors and their group (and presumably will be done in the present work).

There should be a clear statement of the research hypotheses and aims.

**Materials and experiment methods**

You should first briefly describe the material used, then exactly the experiments and at the end the statistics used, preferably internationally recognized tests and software.

This is necessary to meet the criteria of "reproducibility" needed for scientific publication. This part must be presented in such a way that any other scientist should be able to exactly repeat your work and obtain the same results as you did.

It has to be described clearly, step by step from beginning to end. You have to use SI units only.

If any animal or human tests were performed in your research, you were required to have permission and indicate this.

**Results and discussion**

It is advisable to divide this section into separate "Results" and "Discussion" sections. This lessens the chances of mixing "facts", i.e. results, with interpretations, speculations, and extrapolations.

In many cases, it would be best to present all of the results in a separate "Results" section, and then, after all the "facts" are on the table, to interpret these results in a separate "Discussion" or "Speculations" section. It is usually important to acknowledge alternative viewpoints and to reference them.

Do not forget about your hypothesis and accordingly specify your results.

**Conclusions**

The title, body, and conclusions should be tightly coupled. Conclusions must be based on the results presented in the paper and cited references.

Remember that the abstract and conclusions are two different things. You have to use other expressions to show the correctness of your hypothesis, the importance of your results and your contribution to science in general**.**

**Acknowledgments**

You have to specify the grant number and its title and/or the names of scientists to express your gratitude. You can see the example here. According to the demand the Science Committee of the Ministry of Education and Science of the Republic of Kazakhstan such acknowledgements must be provided for every publication on the project with state funding.

The article should have enough references from the past 5 years to show the relevance of your research. Avoid citation errors. Be sure to include relevant publications that are important to this area. Be sure to include some contemporary international (published outside of Kazakhstan or Russia) reviews and articles. Specify DOI or URL if necessary.

The number in the list of references depends on your article, for research papers it can be 10-20, for review papers - much more.

Be prepared to provide a cover letter, such as the one shown on the slide, and details of two or three potential reviewers of your paper, including their affiliation and email address.

Summary - the main elements of a scientific article:

Title. Names of the Authors. Abstract. Keywords. PAQS numbers. Introduction.Materials and experiment methods. Results and discussion. Conclusions. Acknowledgments. References

What do you think will happen to the early career researchers if their poor articles submitted to the peer reviewed journal? You can find the answer in the article 10 tips for writing a truly terrible journal article. Publish or perish? In this fun but informative post, Editor Bert Blocken highlights some of the major mistakes early career researchers make when preparing and submitting a manuscript to a scientific journal

If you screw up, it might be publish and perish. Poor articles, even a single one, can ruin a scientist’s career. If you submit a truly terrible article, it might be rejected by the editors or reviewers, in which case the damage will be significant but limited. The worst thing that can happen, however, is that your poor article slips through the review process. In that case, when the article is published, it will be digitally archived and will remain visible for the whole world forever

You will have time to read these anti-tips and remember what not to do. However, how to get help when working on an article? Here are some tips

Work closely with your research advisors. Provide them with experimental details and research results, your findings to discuss

Search for answers and ask questions on the Research Gate  and other platforms

Read more! Use Elsevier Author Services. Why? Find the answers on these sites and watch their video.

Learning Outcomes

You learned about the structure of a scientific article

You understand the main challenges related to the writing of a scientific article in English

You learned about Elsevier Author Services

You are able to prepare a brief review in your field of research