Fundamentals for PhD students at the Faculty of Health Care and Social Care, Trnava University in Trnava

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The document presents views of the author.

Please convey any comments, suggestions or remarks to rusnakm@truni.sk.

Thank you.

CONTENT

1. Introduction

I was approached by PhD students at the Faculty of Health Care and Social Care, Trnava University in Trnava to deliver a contribution at a conference that is regularly organized by them. The request was to talk about science and research in relation to accredited study fields at the faculty. Due to the fact that there are four non-medical study fields: laboratory work, nursing, public health and social work, I had to address issues valid in all four areas. Indeed, human beings are being studied in all four areas, although each area offers its own specific point of view.

This is also why I divided this article into two parts: the first deals with ways of thinking in science, moving from problem definition to result examination. The second part is focused on procedures and tools potentially useful for a researcher - PhD student. The hope is that the perceptive reader-researcher will gain a deeper insight into his/her work after going through both parts and will be motivated to draw on further sources and study more detailed publications or books. To begin with, I would recommend a condensed introduction to the philosophy of science [Popper 1983]. This simplified and shortened excursion into the thought of Karl Popper provides a sound philosophical foundation in a manner accessible to students. Another book I recommend is targeted at students of management. Nevertheless, I have found this book very useful to our students as it provides highly relevant and practical advice and procedures, in spite of the fact that examples used in the text are atypical for our students [Jonker, 2010]. Finally, I recommend a book focused directly on social work; it is well written and informative and nicely complements the first two books. [Matthews, 2010]

At the outset, the question we face is this: what is specific about a PhD that renders it different from other professional studies? The latest amendment to the Master Act (131/2002 Collection of Acts, Change: 250/2011 Coll.) defines a PhD degree program as follows: *third degree study program (§ 2. 5) focusing on the acquisition of knowledge based on the current state of the art in the given area of study and the particular contribution of the student resulting from scientific research and independent creative activities in science or research or individual theoretical and creative activities in the arts.* This definition is broad enough to allow its application across all disciplines. I find, however, that I am unable to come up with a sufficiently coherent response to the above question that would, moreover, unambiguously delimit our fields of study. Initially, I would like to highlight the phrase: *acquisition of knowledge ... resulting from scientific research*. If one interprets it narrowly, then we must assume that the result of a PhD must be knowledge and probably new knowledge. However, is it possible always and everywhere? What if the result confirms or refutes already existing knowledge? If we accept this premise, then we significantly increase the potentiality of our research. Personally, I tend to the more liberal definition of PhD studies in its "propaedeutic" aim in science and research. After completing a doctoral thesis, a PhD student should have acquired the ability to apply the skills and knowledge gained in conducting research. This naturally presumes that we know the content of the propaedeutic. In each case, however, the content is somewhat specific to each area of study. There can be no claim

to completeness. In my view, completing a PhD largely consists in coming to an understanding of the specific scientific philosophy and corresponding analytical skills, both quantitative and qualitative that undergird the area of study. This naturally assumes an ability to observe (which also entails studying of source literature) and then learning how to formulate aims and objectives. Once the aims are formulated and objectives are defined, an appropriate methodology should be identified to achieve the desired outcomes. Then, these outcomes need to be critically evaluated, interpreted and consequences drawn in terms of the aims of the thesis. The area specific issues are left to guarantors (professors in each area of study) to tackle.

By way of illustrating this model in practice (and its variations), I offer the following example. We had one student on the Board of Public Health who had submitted a thesis statement for approval by a commission. The essence of it was a translation of an EU directive and a review of its roll-out in all relevant workplaces in Slovakia. The commission argued that the proposed thesis lacked a research dimension and recommended that the purpose of the thesis be recast, making the research element its primary component. I assume that the reader of this article is basically in agreement with the verdict of the commission: the thesis proposed consisted in undertaking an important task in a professional manner, one moreover that was definitely necessary, but one that was not essentially a research endeavour. The commission recommended that the research component be reformulated in terms of its contribution to public health. I will not describe the high emotions stirred up in the process. Suffice it to say that the commission proposed several options: to assess the quality of the directive in terms of good practice, thus rendering it a species of qualitative research. Another proposal suggested an evaluation of the consequences of the introduction of the directive in terms of its impact on the performance of services before and after implementation. That would entail using a quantitative approach. Other options were also suggested. I use this example to illustrate the fine line between knowledge development and research. I believe that deeper debate on this issue at the faculty, but also in the wider academic community, is called for. This is no mean task and there is no quick fix, as we can see from the ongoing debate on this topic at the Association of Schools of Public Health in Europe (ASPHER) that has been going on for years.

So much by way of introduction. Now I will turn to the actual process of scientific research.

2. From question to results

As mentioned above, the researcher as well as the PhD student needs to be a good observer. Based on observations, initial questions are formulated. The researcher should try formulating his or her answers to the following questions - listed in Table 1.

• What does observation of reality lead to?
• What does it mean to solve the problem?
• Who is affected by the problem?
• What is the basic question- is it an open or closed one?
• How to develop an answer to the question and formulate goals?
• What is the nature of the research - more fundamental or more oriented to practice?
• What would be the most appropriate methodology?
• Which methods and techniques should be used to collect data?
• How to define your own role and position in this research?

Table 1 Initial questions before starting research

In looking at reality, a researcher constantly asks new questions: what do certain events mean? Why did they occur? etc. Consequently, a PhD thesis is different from the bachelor's and master's degrees. The student must become a researcher, observing the world 24 hours a day, thinking over the aims of his/her research proposal. Various aspects have to be covered. While the student seeks answers to questions drawn from own experience, s/he mainly relies on communicating with the environment. S/he assumes the role of researcher actively, drawing on all sources whether from discussions at the workplace or through participation in seminars and conferences. In addition, of course, one gathers relevant information from published works - articles in journals or books, or so-called grey literature. By grey literature we understand the sources of information that do not normally appear in reference catalogues, but which can be particularly useful in terms of information currency. They often consist in reports of various projects that describe research objectives, methodologies and interim results. Such information can be used as a source of inspiration or contacts to people who are grappling with similar topics. For further details on this issue, look up the National Repository of Grey Literature in the Czech Republic [NRGL].

In line with what has been said above, one can define the aims of a PhD thesis as follows: *conducting research [that] entails the deliberate and methodical search for (new) knowledge and insights in the form of answers to questions that have been formulated in advance*. [Jonker, 2010] The Slovak Law on Funding of Research and Development [2005] defines research as follows: *systematic creative activities undertaken in the field of science and research for the needs of society and for development of knowledge*. The OECD publication, developed at a meeting in Frascati, Italy, titled *The Measurement of Scientific and Technological Activities. Frascati Manual 2002, Proposed Standard Practice for Surveys on Research and Experimental Development* [OECD, 2002], is of fundamental importance to researchers. In order to win research grants financed by the EU, whether under the Framework 7 Programme or the latest Horizon 2020 Programme, familiarity

with this document is essential. Eurosceptics are well advised to also read this document. It is very well articulated and provides an introduction to current scientific thinking in Europe and throughout the developed world. It provides a number of examples of how to think about science and research. Finally, the document has been translated into Slovak and can be purchased via the website of the Ministry of Education, Science, Research and Sport of the Slovak Republic.

Apart from the above-mentioned programmes and documents, support for research in the EU is illustrated by the European Charter for Researchers. [EU, 2006] This is a set of general principles and requirements that specifies the roles, responsibilities and entitlements of researchers as well as employers and / or organizations funding researchers. The purpose of the Charter is to ensure that the nature of the relationship between researchers and employers or funding bodies is conducive to successful performance in generating, transferring, sharing and disseminating knowledge as well as technological development and the development of research careers. The Charter also recognizes the value of all forms of mobility as a means to enhance professional development of researchers. In this sense, the Charter creates a framework for researchers, workers, employers and founders to act responsibly and professionally in their work environment. The Charter addresses all researchers in the European Union at all stages of their careers and covers all fields of research in public and private sectors, regardless of the nature of the appointment or employment, legal status of their employer or the type of organization or institution in which the work is done.

3. Basic and applied research

Research is a specific form of goal-oriented behaviour. This means that one attempts to achieve a goal or set of goals that are clear and well-defined. The approach to the research undertaking can be defined in accordance with the way a problem or a set of problems have been formulated. The above-mentioned Slovak Law on Funding of Research and Development [2005] defines *basic research as a systematic creative activity, with the main objective of acquiring new knowledge, regardless of the prospects of direct practical application.* A brief extension is needed to fully grasp this definition, namely: *(basic research) includes conducting research that contributes to general knowledge, and this knowledge can be expressed in the form of evidence models and concepts, and (large) theories*. After having defined the problem, the researcher continues by determining what information is available for certain areas (e.g. in the form of theories expressed in serious publications) looking for gaps by comparing them with available knowledge, attempting to eliminate gaps in knowledge through generating new knowledge based on research and finally, through conducting such research, adding to the existing stock of knowledge (e.g. in the form of an article or a report).

Applied or practical research – or practice-oriented research – consists in systematic creative activity aimed at obtaining new knowledge for direct application of the results into economic and/or social practice [2005]. In our case, we could add that applied research is also a source of data, observations, methods, concepts and views, often derived from knowledge gained through basic research that is useful in solving certain problems. It seeks to obtain knowledge of these issues and also contribute to solving problems. The role of the researcher in applied research is examining the problem and formulating relevant (research) questions. It considers various forms of assistance (in the form of theory, methodology and practical guidance), which seek to develop responses using these resources. Finally, it offers solutions to stakeholders and other interested parties. Applied research therefore uses the same "method" as scientific research.

Finally, I will restate a key element of the above-mentioned Law which defines *development as systematic work in the field of science and research utilizing patterns and knowledge gained through research or as a result of practical experience in the development of new materials, products, equipment, systems, methods and processes or their improvements* [2005]. I am uncertain whether this definition sufficiently enables us to distinguish between research and development activities. Given the theme of the article, however, I will not continue to develop this issue.

4. Problem definition

The first step in the research process begins with defining the problem. The process of formulation of the problem is not usually straightforward. One often returns back to this step at later stages of the research. An interim report is developed at this stage to clarify the methodological procedures according to the perceived and possibly changed circumstances. The interim evaluation of the PhD thesis is part of the pre-defined *essay to thesis examination* process. According to the Ministry of Education [Ministry of Education, 1997] rules on this subject, part of the thesis statement consists in an essay /short written explanation (thesis) for the PhD thesis. The rules, however, do not lay particular stress upon the importance of this step. A prospective PhD student presents his/her research concept (thesis statement) to the same commission that will later assess the full thesis. In this case, the definition of the problem has a dual function: on the one hand, it is an important way to achieve a balance between the interests of the university (tutor or head of the research project) and the researcher (student); secondly, it creates an opportunity for the student to identify what is perceived as a problem. It helps to shape and focus the research. It states what is needed to be done as well as the probable results - knowledge, models, suggestions for improvement, change and why this is important. A research question or set of questions describe research objectives in understandable ways. The research questions have to be in accord with existing theoretical knowledge or established conceptual models. At this stage, it is still possible to guide the student, to narrow down or to broaden the scope and to discuss the planned methodology. From what has already been said, talk of the *theoretical part of a student thesis* is inappropriate because this part is naturally based on knowledge of the problem in world and at home. The PhD student has to demonstrate the motivation that led him/her and the mentor or tutor to attempt to solve the proposed problem by using certain methodologies and approaches.

The research question is an important starting point for the derivation of sub-questions. The formulation of only a limited number of sub- questions is a challenging task. The researcher is often hijacked by the extension of the problem when s/he formulates a large number of sub-questions that end up exceeding given resources (time, funding, etc.). This is why I recommend formulating a maximum of three sub-questions and formulating related hypotheses. Sub-questions are used for closer determination of data collection and analysis that the researcher finds necessary to answer the research question. One should also consider the preliminary conditions, such as requirements for the design and implementation of research and possibilities for the exploitation of results.

In the following table (Table 2) there are several control questions to help determine whether the formulated problem together with sub-questions is suitable for a thesis statement, thus:

- Definition of the problem provides reliable and objective reasons for research and its goals;
- Definition of the problem is clearly related to the study field (when public health, not physiology);
- The concepts of plan, construction-design and execution of research actually can contribute to finding answers for the question;
- Research is feasible in relation to the environment in which it is implemented and the necessary resources are available;
- Research is justified, meaning that what is disputed and what is mutually consistent are clearly, completely and accurately defined.

Table 2 Verification of problem definition

If the student is able to formulate definite and clear answers to the above questions, the definition of the problem is complete. The next step is to convince the tutor and the commission. But this is another issue.

We have already mentioned that knowledge of the current situation at home and around the world is an essential part - the very basis for the formulation of the problem, sub-questions and hypotheses. The postulated objectives have to find support in published scientific literature to establish the so-called theoretical footing. The description of the literature has to clearly demonstrate its link to the research aims. It does not have to prove that the researcher knows, for example, how blood circulates, but it has to demonstrate that the students' hypotheses are newly made and provable through research. For a description of the current state of the art, it is necessary not only to look into abstracts databases, for example MEDLINE and SCOPUS, but also to read the full texts of articles or several monographs. Often it is necessary to look into grey literature. Before immersion into the ocean of literature written on the subject, it is useful to draw up a basic reading map – a plan for reading books on the subject or finding articles. The student must identify the leading academics ("gurus") in the chosen area. The thesis statement should also describe the student's efforts at collaboration and/or gaining an understanding of practical sources of reports, activities of other researchers, and so on. Unfortunately, the majority of relevant publications are by renowned authors that have published in English, so lack of English knowledge will make undertaking a PhD thesis exceedingly difficult, if not impossible. Google translator can be of limited help, but it is not a panacea. Many of the commissions that approve thesis statements require students to demonstrate command of English and interviews are often conducted in English, too.

5. We progress further

The next section will briefly touch on the selection of methodology, processing of results and will close off by looking at the “discussion” part of a thesis. We will also reflect on how to work with source literature. We are still following the postulated goals as described in the previous sections.

a. Methodology

A well-chosen methodology should comply with defined objectives. That is why the selected methodology should lead to answers to questions or hypotheses. Some probabilistic model(s) to establish relationships between measurements are definitely required in the case of quantitative research. Qualitative research does not necessitate use of such tools. The investigator should consider whether the intended procedures are feasible and whether there are sufficient financial and physical resources to carry out said procedures.

This is usually an important limitation. Research often requires costly equipment, access to information that has to be bought, laboratory work, chemicals etc. If a doctoral student does not work in a team involved in a project funded by a grant, delimiting the research topic and available resources is difficult. In such cases, the role of the tutor and subsequently the commission is vital. In countries with well-developed R&D structures, doctoral research is almost always conducted within the frame of a research grant. However, this is not the case in Slovakia. Most doctoral research projects are funded from public funds in our country. It is important for tutors to pay attention to this state of affairs. Resources are a limiting factor on the scope of any methodology. In addition, one resource that must not be underestimated is that of time. Enthusiastic doctoral students often ignore this aspect and develop overambitious proposals that cannot be implemented in a given time frame. Tutors should pay particular attention to this issue and guide students accordingly. Also important is to pay attention to the scope of the proposed methodology (number of measurements, volume and accessibility of source literature, etc.).

My approach is simple. I advise students to begin with estimating the required sample size. This advice is not always welcomed. Answers tend to be vague, for example: "XY also had this number of samples"; or: "My colleague said that it must be 100". All statistical packages and publications on statistics have a chapter on required sample sizes. Here we should recall the phenomenon called "information overload" or “big data”. That is when the researcher attempts to collect all possible or obtainable data. S/he inevitably ends up not using part of the collected information, or collects irrelevant information, or information excessive for or additional to that required to meet the specified goal(s). We witness this particularly where students collect data "just to be sure" that nothing important is missed. In any case, relevant data and data strictly based on the objective stated should be collected. The researcher should also think of potential confounding and bias - this issue is discussed in detail in my book on health statistics [Rusnak, 2010].

What to do in cases where the length of the PhD programme is too short to allow for the collection of the required data set? There are several approaches to this problem. One option is to treat the thesis as a pilot study that will, if successful, lead on to a full-length research project. In my opinion, this approach stands to reason. After all, even with a limited set of data, it is possible to demonstrate that scientific and research techniques have been learned and applied. Naturally, there are several other possible options. Tutors and PhD students are usually quite creative in finding solutions.

I would like to draw attention to the very important matter of ethics. Students who work with human data should carefully consider all ethical and legal restrictions. I recommend that all students familiarise themselves with the guidelines issued under the 7th Framework Programme. The guidelines delineate the fundamental ethical issues of research and outline possible solutions. Data protection and privacy, informed consent, research on human embryos and foetuses, dual-use goods[1], animal research and research conducted in developing countries are among the topics discussed. [EUROPEAN COMMISSION, 4/11/2010]

Now I would like to turn to techniques of data collection, particularly the use of questionnaires. The problem is that doctoral students have a predilection for designing new or adapting existing questionnaires. I recommend that students familiarise themselves with methodologies for creating and analysing questionnaires. A lot of foreign literature is available on this topic. For Slovak literature on this topic, see for example my book on biostatistics [Rusnak, 2010] and a recent book on analysis of data drawn from questionnaires [Chajdiak, 2013]. For foreign literature on this topic, see a publication on designing of questionnaires and scales for students from non-clinical fields [McDowell, 2006]. A publication on the application of questionnaires in social research will suit PhD students in this area [Foddy 1994]. A book on analysis of questionnaires using statistics will be useful for all students [Falissard, 2011]. The European Union and most of the Member States systematically conduct surveys on issues related to health or levels of satisfaction. Methodologies for standardized questionnaires and interviews that may inspire students can be found in Nosikov's work [Nosikov, 2003].

In conclusion, I should touch on issues of statistics and information technology. Often work is presented in Word with tables in Excel. It is best to integrate the work and preserve original formatting by using the PDF file format. Very often I see statements on the statistical methods used without specifying the source of the methods. I recommend not only specifying the statistical methods and programs used (including versions), but also describing the statistical procedures in the chapter containing the results and to provide these alongside the relevant tables.

In sum, the methodology should be simple, straightforward and clearly connected to the stated objectives. There is no reason to re-invent the wheel (e.g. to ignore the existing standardized questionnaires and invent your own questionnaires that have not been validated). Rather, utilize what is already available and build upon this foundation.

[1] The term is often used in politics and diplomacy to refer to technology that can be used for both peaceful as well as military purposes. Within research, the dual use should be considered a potential misapplication of research. This means that the research activity involves creating materials, methods or knowledge that could potentially be misused.

b. Results

Based on the results, we either confirm or negate hypotheses and thus achieve the research objectives. When a research objective is not clearly described right from the start, the results can neither confirm nor negate it. Again, less is often more and the tendency towards "big data" should be avoided. Results need not be presented as a work of fine art, i.e. colourful and in 3D. Results should be black and white, two-dimensional and without ornamentation (this particularly relates to graphs and tables). They should be clear, understandable and unambiguous. For example, when percentages are shown in a row or a column, it should be obvious how they have been derived (% of what?). When statistical significance is provided in results, it is also important to specify the statistical test used to establish it and to specify which variables did (or did not) vary significantly. When a table with multiple variables indicates that the differences were statistically significant, you should specify which of them were (or were not) significant.

Decimal places should match input data. When I present age as an integer, its mean or standard deviation should not have 10 decimal places, but just one. For e.g. if I have 3 cases of children aged 5, 3 and 2 years, the average age should not be presented as 3.333333333, but either as 3 or 3.3 years. Note that this example is methodologically incorrect: given a set of 3 it is inappropriate to calculate an average. It is important to give some deeper thought to percentages. Each percentile represents $1/100^{th}$ of the cases. When a single decimal place is used in percentages, the number thus presented reflects $1/1000^{th}$ of cases. Hence, it is important to clearly identify the type of number.

In conclusion, I want to emphasize that using statistics is not about showing off one's ability to use a statistical software package. Rather, it is the correct interpretation, clear and practical presentation of the results that count. And note well: statistical results are not equivalent to certainty, but only talk of probabilities relating to the events observed.

c. Discussion

The most important part of doctoral thesis is the "discussion" section. Here the student must describe the critical thinking skills obtained / applied in the process of writing the thesis. In our part of the world, this section is undervalued. We find that students are not prepared to take a critical look at their results and to self-reflect on the process they have gone through. In the Anglo-Saxon world, the situation is quite different. Procedures of self-reflection over the results of a study are routine and embedded in the educational system. Since this habit of thinking is generally absent over here, it is difficult to convince students to critically discuss their own work.

What should be the content of a good discussion? First of all, what has been achieved and how the work is relevant to the profession both here and abroad. It should not

repeat what has already been described in the results. The discussion is a synthesis; it is not a reiteration of the same information. It is a critical view of one's own work, pointing out the limitations while not at the same time denigrating the project. It confirms that the author is self-critical, but also confident and not egotistical. It is wise to end off the discussion with a view to the future: pointing out future steps, possible future developments, etc. It is important to give the impression that, now that one has done the PhD, attention will not be directed somewhere else entirely (even if this is true).

So, how to structure the discussion? There are many recommendations. I have chosen one that outlines what to use and what to avoid in discussions [Hess, 2004]. The author outlines recommendations in tabular form (Table 3).

Elements to Include in the Discussion

- State the study's major findings
- Explain the meaning and importance of the findings
- Relate the findings to those of similar studies
- Consider alternative explanations of the findings
- State the clinical relevance of the findings
- Acknowledge the study's limitations
- Make suggestions for further research

Things to Avoid in the Discussion

- Over-presentation of the results
- Unwarranted speculation
- Inflation of the importance of the findings
- Tangential issues
- The "bully pulpit"
- Conclusions that are not supported by the data
- Inclusion of the "take-home message"; save this for the conclusions section

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Table 3 What to include and what to avoid in the discussion (according to [Hess, 2004 # 9679])

Detailed information on the discussion section can be found in a book published by the British Medical Journal [Peat, 2002], where the author describes the procedure of the discussion section, see Figure 1

Paragraph 1
What did this study show?
Address the goals stated in the Introduction

Paragraph 2
Strengths and weaknesses of methods

Paragraph 3
Discuss how the results fit into the state of current knowledge, published source literature

Other paragraph

Future directions
"So what?" and "where next?"
Impact on current thinking or practice

Figure 1 How to create a discussion in a scientific publication (according to [Peat, 2002])

d. Conclusion

In conclusion, the author should summarize achievements and indicate how s/he will proceed. It is desirable to avoid a formulaic repetition of arguments already covered and to be economical with words. The author should comment on the meeting or not meeting of goals. The author may also declare "my next steps will be to try ...", "I will try to gain support ..." etc.

In our country, the section describing "recommendations for practice" is frequently presented. I recommend that students avoid this part and that tutors not require it. The attempt to formulate recommendations often leads to platitudes: "this/that should be done this/that way ...", "the state should increase funding for ..."; or distributing tasks to others: "the Ministry (government, etc.) should make…", "Members should promote ... ". Apart from the general vacuity of some recommendations, it can also lead to absurdities where PhD students in Public health explain to surgeons how to perform a surgery, etc.

6. Self-assessment

In this section, I present some practical advice on the procedure for processing a doctoral thesis. The author's self-evaluation should strengthen his/her confidence in the results of the thesis (Table 4).

- Is the introduction so attractive that it can "sell" the subsequent chapters?
- Is the text so clear and simple that even a layman will get the impression that s/he knows what the text is about? (e.g. avoidance of foreign words, complex formulations, etc.)?
- Was I able to clearly express the objectives and context? Am I too boastful or too shy? In what register is the text written (first person "I", as narrator, or impersonal, points of view, etc.)?
- Is it formally correct (grammatical errors, design, format, etc.), content corresponds to text, included a list of abbreviations, index?
- Has the abstract been faithfully and accurately translated into a foreign language and have the correct terms been used?
- Is cited literature current and relevant? Is it derived from reputable sources?

Table 4 Author's self-evaluation (according to [Jonker, 2010])

In undertaking the self-evaluation, a good habit is to turn to a family member or friend who is not an expert on the issue. If s/he understands the text, you have won. If not, try to think about what went wrong. Consider that even members of the commission, or other readers, are not necessarily top experts in the field, so you have to pay particular attention to this issue. On the other hand, avoid briefing them about commonly known facts, for example, do not attempt to explain the role of blood circulation, or the need for vaccination. In such cases it is sufficient to refer to source literature (with moderation).

Some practical points must be made. Tools for reasonable text formatting are essential. Word processing programmes (Word or Open Office, for example) are widely available. There are many excellent features offered by such programs: transition to a new page, content creation; image insertion, tables, diagrams etc.

To work with source literature, use can be made of tools such as EndNote (needs to be bought, but this is a standard and easily obtainable application), Mendeley (free) or Zotero (free). These reference managers allow for setting the format corresponding to different standards and creating the one that corresponds to the Slovak ISO690 standard. The closest, though not identical, standard is the Harvard system. Many descriptions of this standard can be found. I recommend that students familiarize themselves with the Rector's Directive of the University of Trnava no. 20/2011 on bibliographical registration, originality inspection, accessing, archiving and basic requirements for final, doctoral and habilitation theses. The EndNote 7 programme used for this article enabled its effortless referencing in accordance with the Harvard system.

Formatting references to literature is important, but in terms of content and outcome of the work it is especially necessary to emphasize the use solely of citations from full texts and not only from abstracts. Abstracts provide certain information, but not full information and often relying on them can lead to false conclusions. How to obtain full texts would take a separate chapter. I can recommend two ways. First log into CVTI SR

(1 EUR per year) and use remote, however limited, access to source literature. Many sources are in libraries, which offer the very convenient service of sending an electronic copy of full texts by email (e.g. Library of Medicine UK) for a symbolic fee. Unfortunately, our library at Trnava University does not offer this service. I also recommend Ahmad's guide on how to write a thesis [Ahmad, 2001].

Finally, think about the topic of the thesis continuously. That means to eat, drink and sleep your topic. Place the issue in the context of science as a whole and not only in your own narrow field. Read magazines, at least one specialized in your area of interest and at least one general one. Reading the magazine Space (Vesmír) and scrolling through the journal Nature have proved extremely effective for me. From one of my tutors I learned the habit of reading at least one book per semester and at least one research paper per week. In this way one participates in scientific debate of the faculty, the Slovak Republic and the world at large. It is important to go to conferences and not to be afraid of confrontation, debating and formulating one's own views. Publish and respond to grant calls. And finally, make use (not abuse) of your tutor throughout the research and writing of your thesis and not just in the final phase.

7. Conclusion

A PhD thesis is by its very nature different from a bachelor or master's dissertation. It requires a lot of self-sacrifice and effort. It leads to knowledge and involves a lot of thinking. It is not straightforward, but often revolves in circles. Nevertheless, it brings with it the joy of exploration, of discovering something new, and becoming a member of a community of exceptional people with specific and shared interests. Optimally, completing a doctorate does not end with a certificate, but marks the start of a lifelong journey of discovery. Welcome to the world of science and ideas!

8. Bibliography

2005. Zákon o organizácii štátnej podpory výskumu a vývoja a o doplnení zákona č. 575/2001 Z. z. o organizácii činnosti vlády a organizácii ústrednej štátnej správy v znení neskorších predpisov. 172. Bratislava:IURA EDITION, spol. s r. o.

AHMAD, O., BOSCHI-PINTO, C., LOPEZ, A. D., MURRAY, C. J. L., LOZANO, R. &

INOUE, M. 2001 Age standardization of rates: a new WHO standard.WHO EIP/GPE/EBD. Available: http://www.who.int/healthinfo/paper31.pdf.

CHAJDIAK, J. 2013. Analýza dotazníkových údajov, Statis.

EU 2006. Európska charta výskumných pracovníkov, Kódex správania pre nábor výskumných pracovníkov. Luxembourg: Office for Official Publications of the European Communities: European Communities.

EUROPEAN COMMISSION 4.11.2010. COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS. A comprehensive approach on personal data protection in the European Union. COM(2010) 609 final. Brussels: EUROPEAN COMMISSION.

FALISSARD, B. 2011. Analysis of Questionnaire Data with R, Taylor & Francis.

FODDY, W. & FODDY, W. H. 1994. Constructing Questions for Interviews and Questionnaires: Theory and Practice in Social Research, Cambridge University Press.

HESS, D. R. 2004. How to write an effective discussion. Respir Care, 49, 1238-41.

JONKER, J. & PENNINK, B. 2010. The Essence of Research Methodology: A Concise Guide for Master and PhD Students in Management Science, Springer.

MATTHEWS, B. & ROSS, L. 2010. Research Methods: A Practical Guide for the Social Sciences, Pearson Education, Limited.

MCDOWELL, I. 2006. Measuring Health : A Guide to Rating Scales and Questionnaires: A Guide to Rating Scales and Questionnaires, Oxford University Press, USA.

MIN.ŠKOLSTVA 1997. V Y H L Á Š K A Ministerstva školstva Slovenskej republiky o doktorandskom štúdiu. In: REPUBLIKY, M. Š. S. (ed.) Zbierka zákonov č. 131/1997. Bratislava: Ministerstvo školstva Slovenskej republiky.

NOSIKOV, A. & GUDEX, C. 2003. EUROHIS: Developing common instruments forhealth surveys, WHO EURO, Amsterdam:IOS Press.

NUSL. Národní úložiště šedé literatury [Online]. Národní úložiště šedé literatury. Available: http://nusl.techlib.cz [Accessed 5.5. 2014].

OECD 2002. The Measurement of Scientific and Technological Activities. Frascati Manual 2002. Proposed Standard Practice for Surveys on Research and Experimental Development. Brussels: OECD Publishing.

PEAT, J., ELIOTT, E., BAUR,L., KEENA,V. 2002. Scientific Writing. Easy when you know how, London, BMJ Books.

POPPER, K. R. & MILLER, D. 1983. A pocket Popper, Fontana.

RUSNÁK M, RUSNÁKOVÁ V & MAJDAN M 2010. Bioštatistika pre študentov verejného zdravotníctva, Trnava, Typi Universitatis Tyrnaviensis, Vydavateľstvo Trnavskej univerzity.