



## Review Article

# WRITING SCIENTIFIC THESIS/DISSERTATION IN BIOLOGY FIELD:SITUATION OF RECOMMENDATIONS CHAPTER WRITING

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### ABSTRACT

In biology fields, postgraduate students must write thesis or dissertation to fulfill the requirements to obtain their degrees either MSc or PhD. Every thesis or dissertation contains many separated chapters and each chapter must be written in a way that must follow the standard writing style. In this study the chapter of recommendations was evaluated to explore the situation of how those students write the context of this chapter. The recommendations chapter was sufficiently studied and deeply analyzed in 124 theses or dissertations of postgraduate students in biology fields. Moreover 114 postgraduate students from the same field were interviewed and discussed to gather information about their background, knowledge and approach about recommendations writing style. The results revealed that most students had no right idea about recommendations writing and they did not read any article about how to write recommendations context. Most recommendations were vaguely, broadly and generalized written. Some of them were written advices or orders to others or written as general suggestion to the governments to be solved. Most of recommendations in most thesis or dissertations were not extracted from the research findings but referred to some information indirectly related to the main subject. The students used to mimic the previous graduated students in writing recommendations context and they did not pay high attention about the importance of the recommendations as future research. The Universities must re-evaluate the application of thesis or dissertation writing guidelines that were previously issued and sent to all faculties in order to make thesis or dissertations writing style more robust, scientific, useful, and internationally acceptable. The study as well highly recommends giving the students an obligatory course in how to write thesis or dissertations before starting their thesis or dissertation writing.

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## INTRODUCTION

Writing scientific article is one of the best tools to deliver the information from the researcher mind to the readers. Through past decades many writing styles have been established in order to find the best way to disseminate information and to register the scientific findings. Every writing style possesses specific features constructions to be convenient for special scientific fields. Biological fields are very wide subjects including biology, medicine, dentistry, ecology, agriculture, pharmacy and other field; they need suitable writing style to demonstrate their projects achievements. In Iraq, researchers and postgraduate students in biology fields follow the standard style in writing their scientific articles, theses or dissertations; every thesis/dissertation must be written to contain many chapters including; abstract, introduction, literatures review, materials

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and methods, results, discussion, conclusions, recommendations and references (Behrens and Rosen, 1997; Bunton, 1998; Bunton, 2005; Langdorf and Hayden, 2009; Nitecki, 2010; Ortinu, 2011; Lin and Evans, 2012). These theses or dissertations were written by postgraduate students from different biological fields. Therefore variation in writing style could be expected and may hold some errors both linguistically and organizationally. Previously (Salman, 2009), it was pointed out to a lot of grammatically and linguistically errors in those thesis or dissertations. Many chapters of large numbers of those theses or dissertations have been searched previously to detect any bias in context writing style (Yaseen and Salman, 2012; Yaseen and Salman, 2013; Salman and Yaseen, 2013; Salman and Yaseen, 2013). Those studies revealed that all studied chapters in those theses or dissertations were written randomly and far from the standard writing style. By the end of any thesis or dissertation in biological fields and after discussion the results, the students commonly write a chapter or a section for suggestion and future studies which is called recommendations.

Finding new data in any research is essential as it is one of the research aims but to propose new suggestions or recommendations is another important and vital aim to make active chain for scientific progression. Many categories of recommendation are frequently written, recommendations for the sponsor or the authority that covers the expenses of the project, recommendations for researchers and postgraduate students in order to do research projects elicited from data, recommendations that suggest new methodologies or to extend the scope of methodologies, recommendations to use new instruments or apply new technologies and recommendations to follow new access or widening the studied sample. Postgraduate students in Iraq should write their thesis or dissertation for other researchers to be read in the future. The recommendations aim to refine and improve the achievements of any research; otherwise the repetition of any research project will not get any benefit or gives nothing to the science. The recommendations must reveal change and progress in any field by suggestion new ideas or procedures. In the recommendations, the students or researchers must fix the prominent changes that needed to make the achievement more developed and more fruitful. In addition, from the study they have carried out they must document further research that they believe that can be performed in the future by identifying the gaps that yet need to be resolved or explored. Therefore the recommendation must form the start point for new research projects that other postgraduate students should start with. In addition the recommendations must include practical and clear suggestions that in future will result in improvement of the situation or solve some problems investigated in the study. The recommendations must be closely related to the finding of the research they elicited from and the researcher must not report any opinions even they are useful if they are not link with research findings.

Therefore the recommendation must not be written vaguely related to the carried out research findings in the thesis. It is well known that recommendation are reported as future research because either the researcher has no time to perform the research or has no finance to do the project. Unfortunately very few articles have been published worldwide about how to write recommendations context and what the points must the recommendations focus on. What is found in the literature is just guidelines on how to write thesis or articles but not concentrated on the details on how to write recommendations. However, some websites tried to mention some details about recommendations writing style (<http://blogs.bournemouth.ac.uk/research/2011/03/29/thoughts-on-writing-recommendations-for-a-research-thesis>; <http://simplyeducate.me/2014/07/29/thesis-writing-what-to-write-in-chapter-5>; <http://academicwritingtips.weebly.com/dissertation-writing-tips/dissertation-conclusions-recommendations>). Therefore the authors of this study have used their experience to report their opinion about recommendations writing style. The recommendations should give clear impression about the robust of the thesis or dissertation and must be logic, applicable, understandable and particle, and based on the output of the research analysis and discussion, and must be echo and follow for conclusions. Difficulties in writing appropriate recommendations have made some researchers to propose special system such as proactive recommendation system to extract recommendations from research papers that did not success to document the right recommendations (Melguizo et al., 2009).

In Iraq the Ministry of Higher Education and Scientific Research has published guidelines for thesis or dissertation writing and every postgraduate student must follow these guidelines. These guidelines are originally adapted from many international generous guidelines used worldwide (UNESCO, 1962; UNESCO, 1983; American National Standards Institute, 1971; Tuckman, 1978; Basthomi, 2006; Johnson and Scott, 2009; Antic, 2009; Davidson and Delbridge, 2011). However most professors in biology fields who supervised those students announced that most students did not commit with these guidelines, and every University, College or Department followed other guidelines often far from the Ministry instructions. As previously stated that the context of most studied chapters in the thesis or dissertation was written in a way that incompatible with standard requirements for scientific writing indicating that the postgraduate students have no experience about how to write thesis or dissertation properly. The results of those studies have offered motivation to study the context of other chapters in the thesis or dissertations because those results suggest the presence of defect in writing style in other chapters. One of those chapters is the recommendations chapter which has not been studied yet. Therefore this study was conducted to demonstrate the situation of recommendation context writing style in the thesis or dissertation in biology fields.

## MATERIALS AND METHODS

### Thesis/Dissertation

The recommendations chapter was carefully and deeply read and analyzed in 124 theses and dissertations (for both PhD and master degree) in biology fields including medicine, dentistry, veterinary medicine, pharmacy, agriculture and biology. This project was carried out on theses or dissertation published from 2007 to 2012 in the Iraqi Centre for Cancer and Medical Genetics Research. These theses and dissertations were accomplished under the supervision of professors from different specialties in biology fields. Studying the recommendation was done after reading and analysis of results and discussion in order to find out the relation between what is written in recommendations and what is documented in the findings and discussion. Standard international guidelines for scientific writing (UNESCO, 1962; UNESCO, 1983; American National Standards Institute, 1971; Tuckman, 1978; Basthomi, 2006; Johnson and Scott, 2009; Antic, 2009; Davidson and Delbridge, 2011) were used for standardization, matching and comparison.

### Students' interview

The interview was conducted on 114 postgraduate students (Both Master and Doctor of Philosophy) from many Universities and from different biology fields as mentioned above. The interview was documented only with students who showed their agreement to carry out that task. The students were asked to answer two questions:-

- 1- Have you read any articles or guidelines about how to write recommendations context in your thesis or dissertation?
- 2- Put tick on the proper answer (s) of the followings. (You can tick more than one question).
  - If I have the authority I can say it is not necessary to write recommendations at the end of thesis.

- I wrote the recommendations because the University rules need that.
- I wrote the recommendations because the previous students did it.
- I wrote the recommendations text by following the style of the previously graduated students.
- I might write the recommendations because they are so important for future studies.

## RESULTS

### Theses/Dissertations

The results showed that almost all postgraduate students wrote their recommendation in a way that cannot match the standard and acceptable style. The analysis of recommendations in all thesis or dissertation revealed that all students wrote the recommendations in separated points or statements; started from three statements and ends with 11 statements 6/124 (4.8%) with three statements; 17/124 (13.7%), with four statements; 26/124 (20.9%), with five statements, 28/124 (22.5%) with six statements; 16/124 (12.9%), with seven statements; 12/124 (9.7%), with eight statements; 9/124 (7.2%), with nine statements; 6/124 (4.8%), with 10 statements and 4/124 (302%), with 11 statements.

Only eight students (6.4%) wrote the recommendations according to the scientific style in a way that the recommendations were extracted from their findings. However the writing style was not completely right; the statements were written broadly but not as titles for future research work. Whereas 63/124 have recommendations written broadly and generalized but with few recommendation statements emerged from the results of students. In 18/124 the recommendations were common and written as they were advices derived in some way from the results of the students. The remaining 35/124 thesis or dissertation possessed recommendations written in style that the students imagined their-self as director or minister that can give advices or orders to be implemented immediately. The recommendations in the last group were so broad, generalized and did not elicited from the findings of the students and some of them were not related to the research subject but they were common advices that said to the authority or to the governments.

Only few students in the first and second group 13/124 (10.5%) were able to write very few correct statement texts among their recommendations in their recommendation chapter while the majority of their statement content was incorrect. The students wrote recommendation statements as advices to their self, to other researchers or to the authority but not as understandable and acceptable title for future research project. Some students 8/124 (6.5%) mixed between recommendations and conclusions that some statement in the recommendations tended to be conclusions instead of recommendation. On other hand 3/124 (2.4%) students repeated some of their findings in the recommendations but with few linguistic expression modifications.

### Students' Interview

The answer of the first questions revealed that unfortunately all the 114 students had not read any article or guidelines about

how to write the context of recommendations in the MSc or PhD thesis. The second question showed that 32 (28%) of students thought that recommendations chapter is not necessary to be involved in the thesis or dissertation. Most students 108 (95%) wrote recommendations because the rules of the University obliged them to do that. All the 114 (100%) students confessed that they wrote the recommendations because the previous graduated students did that. Again 112 students (98%) imitated the previous graduated students in their recommendations writing style. However 33 (29%) felt that writing the recommendation is important for doing further research projects in the future.

## DISCUSSION

The results of this study reveal the frustrating situation of the postgraduate students in the field of biological sciences in writing recommendations at the end of their theses or dissertations. Very few students were able to mention few recommendation statements that correctly emerged from their findings and considered to be topics for future research projects; however non of them was found to write all recommendations in right style but just wrote few statements among all recommendations in the chapter of recommendation. Almost all students tend to form recommendations that are generics, too broad, not directly related the findings by the students and like commands or orders to people. The recommendations were vaguely linked to the results in their thesis or dissertations. The interview with students revealed frustrating impression on their knowledge of how to write the recommendations content. All the 114 students without exception confessed that they neither read any articles about that and they had no idea about the style of recommendations writing nor read the guidelines or instructions published by the University. Moreover most students announced that they will not write any recommendation if they are given the authority to write thesis or dissertation as they felt that recommendations were not necessary. They used to inherit writing style from previously graduated students regardless if this style is correct or not. No one even has tried to ask about the way to write recommendations. Few students believed that recommendations may possess important role in suggesting research topics to be performed in the future; however they did not apply that in their thesis or dissertation indicating that they just think theoretically. Some students thought that the recommendations represent another version for conclusions as some of them wrote conclusions instead of recommendations with few modifications in sentences words. The problem seems greater when some of the students supervisors had no enough idea about recommendations writing, and this can be concluded when any body reads theses or dissertations of graduated students which they were peer reviewed and scientifically evaluated.

It appeared that most students believed that the recommendations must be like commands or orders given to others to be done or as advices submitted to the government or to the higher authority to be performed. This is clearly shown by the presence of the verb "must" which can be easily detected predominantly in the recommendations statements to express the students' tendency for ordering people. The students thought that the recommendations arte just general advices to others regardless if the they are researchers or not, the recommendations were just the students idea which was built up

during the research project performing and they must convey these recommendations to others in order to find solutions or to necessarily apply them for the benefit of a society. The students used their findings just a base for their broad recommendations even there are no direct relations between the findings and recommendations. Although the recommendations were not totally wrong but they are not specific or sufficiently relevant. It seems that because the postgraduate student went deeply with the research aspects and remained months or years thinking deeply within the circle of the research idea, the students believed that he/she possesses the handle of the science and becomes on the top of the science mountain, that gives him/her the authority to give advices or instructions to others even they are too far from the research findings that the student obtained.

The students firstly must not recommend something that has not been discussed in the discussion chapter, and secondly the students must bear in mind that the recommendations are not conclusions; they are completely different as the recommendations represent further steps but not the resultant of the performed research project. However the students can modulate the recommendations statement according to whom they written; for academic, policy makers, practitioners, or for training and education who directly concerned with the recommendations of the student. However at the Universities, the students must write for academics and researchers as they could use the recommendations as a basis for future studies to put further knowledge to specific field. In addition the student can recommend similar research work to be conducted but in another places if the geographical factor may influence the results.

The readers or researchers keen to read more rich recommendations that emerged precisely from the thesis or dissertation results. The recommendations can represent further research that is required to eventually developing best solution to the studied problem. However in very few cases the recommendations are useless if the student feels that results of the performed research project gave full solution to the hypothesized problem but this case is rarely found. Any research project must give new ideas and open new doors for further scopes to make the wheel of progression or development going on. Therefore the recommendations must contain clear, practical, logical, specific, relevant and attainable suggestions for other students or researchers to be worked out in future; the recommendations may suggest new methodologies or to extend the scope of methodologies, new instruments, new technologies, new access or widening the studied sample.

The results in this study cannot be discussed with other thesis obtained by postgraduate students in Iraq or in other countries because it seems that there are very few articles about how to write recommendations in thesis except the guidelines or instructions published by universities about thesis writing style (McMillan, 1988; Khalili, 1998; Chinneck, 1999; Peat et al., 2002; Baron, 2015; Wolfe, 2006). However Melguizo and colleagues (Melguizo et al., 2009) tried to suggest new system for recommendations to speed up and improve their quality. That was done because of the importance of the recommendations to open new scopes in any fields. This study concluded that the postgraduate students in biology field have no experience in recommendations chapter writing and they write this chapter by following the previous graduated students

even the writing was incorrect. The study recommends establishing a syllabus for scientific writing style for students before starting writing their thesis or dissertation. This syllabus can be conducted by experts who have a good experience in scientific writing process.

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