

ISSA Proceedings 2006 - The Quality Of Argumentation In Masters Theses



1. *Introduction*

Thesis writing is an inherent and important part of university studies that guarantees academic qualifications and the quality of scientific knowledge building. Thesis writing gives students an experience of doing real scientific research. It also has an impact on university teaching and learning methods.

The purpose of the study was to survey the quality of theses. The quality was assessed with respect to the scalability of grades and the structure and standard of the argumentation of the theses. The role of argumentation and argumentation skills are important in thesis writing, both for building scientific knowledge and presenting relevant conclusions. Behind the study lies the fact that the Faculty of Behavioural Sciences introduced a new thesis assessment form in the autumn of 2004.

This is why this project surveys masters theses assessed using this new form. The project is also related to the Bologna Declaration which forms the basis for assessing the standard of university education and theses. The Faculty of Behavioural Sciences of University of Helsinki wanted to evaluate students masters theses and research the scalability of good and excellent grades. The purpose of the project was to evaluate the credibility of the grading system. Teachers and professors wanted to know whether the theses were evaluated according to the same criteria in five chosen departments or whether there were there differences between criteria. Finnish universities have joined in the European Bologna Process (the Bologna Declaration 2003) in August 2005. The Bologna Process requires that the quality of university education and degrees must be assessed and developed both nationally and internationally. Finnish university studies consist of a two-tier structure. All students first take a bachelors degree but they all have the right to continue their studies to a master's degree.

The declaration is considered to be a call to assess also the quality of theses.

Finnish university pedagogy focuses on counseling and education students so that they become fully qualified experts and researchers in their own disciplinary. This same kind of counseling and education must be present in all the different teaching and learning methods (e.g. lectures, seminars, group works). Teaching methods have to be consistent and in line with learning evaluation methods. Teachers can not teach issues and evaluate students learning differently (Ramsden 2003). For example, students' personal epistemological development and students' skills in justifying their points of view and using argumentation for knowledge building have to be visible in the teaching and learning methods. The principle of university teaching should be a student-focused approach because the quality of students' learning and learning results are used as the criteria for the evaluation of successful teaching. A student-focused approach also sees students as different learners and as individual people each with their own learning skills, values, beliefs and experiences (Trigwell & Prosser 2004).

Besides the Bologna-process the Faculty of Behavioural Sciences of the University of Helsinki wanted to evaluate students' masters theses and research the scalability of good and excellent grades. The purpose of the project was to evaluate the credibility of the grading system. Teachers and professors wanted to know whether the theses were evaluated by the same criteria in five selected departments or whether there were differences between criteria and whether teachers evaluated good and excellent theses somehow vaguely in any way and by unfair means. In this research, the writing and evaluation of master theses are explored within the context of Finnish higher education. The case study consists of the theses from the Faculty of Behavioural Sciences of the University of Helsinki. In Finland, a thesis is required of all university students completing their master degrees. The nature of the thesis varies across study fields to some extent, but there is a general norm that students have to show a good command of the research phenomenon, mastery of research methods and the capability to produce academic writing.

Students participating in a one-year seminar in which they make research plans and get their own work started. The teaching and practice of argumentation are not compulsory studies in the seminar and the teaching of argumentative writing is very unusual. These issues also have an impact to data analysis. Finally, in the end of this paper I will point to suggestions for development for teaching argumentation and university pedagogy which are based on the results of the study.

2. Components of thesis writing and personal development of the student into an expert

In writing a Master's thesis, students demonstrate that they can think and reason scientifically and that they can perform independent research. The evaluation of the level of the thesis is also important to the scientific community as it can evaluate knowledge building, the sophistication of the student and the community's own teaching methods, and strategy based on the level of scientific thought and argumentation presented in the thesis, as well as the coherency and relevance of the reasoning presented in the conclusions. The role of argumentation and argumentation skills is important in thesis writing, both for building scientific knowledge and presenting relevant conclusions. Argumentation reinforces and contributes to the message being received since a clearly written and expressed explanation is more easily understood than an opinion expressed using long and difficult sentences. The conclusions should be submitted for consideration or criticism from multiple standpoints. To evaluate the reasoning ability in scientific knowledge building the researcher has to explain clearly how he or she has drawn the conclusions and what kind of arguments have been used to prove or disprove the issue.

Argumentation involves building knowledge because argumentation obliges students to present their understanding explicitly, reflect upon it and eventually revise it. It may also involve a posteriori reconstruction of new arguments and the active search for knowledge in the decision-making and problem-solving processes to produce convincing arguments and make reliable decisions. Knowledge building should take place during argumentation. Good argumentation validates the relevance of knowledge. If the student does not use ambiguous language, then he or she can produce more acceptable and relevant knowledge. It must be noticed that the theses do not describe the processes of thinking and learning that result from the research which has been done. In addition, teachers cannot describe the chain of reasoning which students have produced during thesis writing. The formal procedures of scientific theses and norms within each discipline determine the specific styles of doing research and writing which conceal the processes of thinking and learning.

Epistemological perspectives of thesis writing

The development of an individual into an expert can be seen in the styles of argumentation, personal experiences and perspectives of personal

epistemologies.

When considering thesis writing, one has to take into account that students' personal experiences and expectations of university studies vary greatly. The wider disciplinary context, the departmental ethos (Sheppard & Gilbert 1991, p. 235) has an impact on students study orientations and experiences because the aims and practices of teaching and learning vary between the cultures of different disciplines (Becher & Kogan 1992). In addition, the nature of the writing conventions and norms of different departments has an impact on the structure of theses. Bazerman (1981) has said that different departments have their own writing norms which determine the structure of argumentation. For example, these norms can be the nature of knowledge, traditions for relating new knowledge to existing literature, the extent to which language is understandable to the outsider, the nature of the terminology, the concepts and the style of the writing in relation to how new knowledge claims are made.

Scholars have studied the epistemological development of college students - what kind of epistemological beliefs students have. Theories of epistemological development differ in detail, but they present a common pattern of development that progresses from simple, right-wrong thinking, through an exploration of multiple perspectives, to an understanding of knowledge and knowing that uses complex, contextual and relativistic thinking. The main point of this development is a dramatic change in students' epistemology. As students are exposed to the complexities of various disciplines, theories and methods, they start to understand new standpoints in relation to knowledge. This change means that students experience a dramatic shift from viewing knowledge as a collection of facts, towards an epistemology in which they see knowledge as contextual, relativistic and ever-evolving. The term 'epistemic' relates to knowledge more generally and conditions for acquiring it. From a psychological and educational standpoint, it is important to refer to personal epistemology or epistemic cognition. Personal epistemology or epistemic cognition refers to students' capacity to develop conceptions of knowledge and knowing and utilize them in developing their understanding of the world. Models of epistemological development emphasize that various cognitive mechanisms related to individuals own belief revision, e.g. awareness of differences between one's own beliefs or knowledge, are important to produce developmental change. In addition, the individual has to be interested in evaluating their beliefs or knowledge and must not be afraid to doubt their thinking (Pintrich 2002).

There is a small but consistent bodies of research of the increases in intellectual

and cognitive capabilities (Perry 1970) and changes in view of knowledge (Kitchener, King, Wood & Davison 1989) through the college years. Several researchers have shown that students of different disciplinary domains do not have similar epistemological beliefs. For example social science students more often than technology students believe that knowledge is a collection of simple isolated facts (Schommer 1993). Students with majors in engineering and science are more likely than students with majors in soft (social science and humanities) fields to believe that knowledge is certain and unchanging (Paulson & Wells 1998).

For example, results of one research have indicated that students' epistemologies vary across knowledge domains. The interview research shows evidence of two major epistemological shifts as students moved from simple to complex epistemologies. The shift from singular truth to multiple perspectives appears to happen more naturally in humanities and social sciences. Students of sciences (mathematics, engineering) understand science as evolving, but also see this evolution to be more than just multiple opinions. They recognize that they have discovered new facts and that these facts fit into theories based upon the contextual setting being analyzed, discussed or applied. In addition, they see the evolving and changing nature of science combined with the fact that scientific method and knowledge still exist within a changing theoretical and contextual framework (Palmer & Marra 2004, p. 320).

3. Methodology

The method of analysis deployed was that of qualitative argumentation analysis. I produced my own table for this evaluation because in addition to the argumentation analysis I had to take into account the structure of thesis, departmental cultures and the norms and conventions of scientific thesis writing.

A scale was created for the argumentation analysis that contained criteria (excellent, good, and weak) for evaluating the scientific argumentation. A scale is showed next.

Excellent: (relevant, acceptable, logical and truthful chain of inferences, multiple structure of argumentation, a little superficial description of things, an attempt to build knowledge independently and use relevant evidences, taking into account audiences), evaluate evidence critically from many perspectives (pros and cons), assessing the reliability of the processes of forming beliefs and making choices.

Good: (some multiple structure in the argumentation, relevant, acceptable, logical and truthful chain of inferences), mostly short (simple) structure of argumentation.

Weak: short (simple) structure of argumentation, a lot of description, repetition of knowledge.

Parts of analysis of scientific argumentation (the form of arguments and conclusions) include: Acceptable and relevant grounds, warrants, a claim, counter-arguments (chain of argumentation is relevant and logically coherent).

Principles of argumentative writing (Andriessen & Chanquoy, 1999) and reasoning strategies (presumptive and practical reasoning, if-then reasoning).

Classifications of argumentative scheme (forms of argument) (Walton 1996) and fallacies which can be occurred in the scientific writing (Richardson 2006). Especially the forms of argument from expert opinion (e.g. refer to references), argument from analogy, argument from verbal classification and argument from correlation to cause are important.

I have used Toulmin's (1958) classical model in the analysis as the starting point to evaluate the structure of argumentation. The model has been a successful tool to describe a reasonable structure and clear chain of argument in ill-structured problems. The model does not provide information concerning the processes of problem-solving or decision-making (Voss 2005). I shortened and moulded it a little to apply it to analyzing natural text in which I noticed institutional language. There are also other models of argumentation which notice more the narrative and rhetorical properties of argument. For example narrative structure of argumentation can be useful as concept development and argumentative writing (Andrews 2005). Next is presented the structure of short and multiple argumentation that I created on the ground of the data analysis. The following is of short (simple) argumentation structure:

claim -> a ground
(a warrant) (implied warrant)
or a ground -> a claim
(a warrant) (implied warrant)

Other texts (description, explaining)

no further argument development

Multiple structure of argumentation (acceptable, relevant and coherent chain of reasoning and argumentation from abstract to discussion with the student demonstrating evidence of depth of reasoning) is the following:

Explanation of issue + a (presumptive) ground (at least 3 pieces) -> if-then reasoning, accept, relevant explanation including elements of argumentation -> a claim + an counter-argument + a ground

Warrants (implied warrant)

further argument development and chain of argumentation

I did not use strict (rigorous) and formal argumentation analysis because I wanted to see what kind of chains of reasoning and argumentation were in the theses. The principles of pragma-dialectical reconstruction (van Eemeren & Grootendorst 2004) helped to evaluate the implicit parts of argumentation in the different texts. I used the ideal models with theories of argumentation as the starting point of the method but I let the students' styles of writing and chain of reasoning direct the analysis. The classical reasoning procedures, e.g. deduction, are formalistic to describe human natural argumentation. Deduction understands arguments as simple linear structures, moving from one premise to the next. It is necessary not to miss nonlinear arguments, such as metaphor, narration (Hampe 2003). But these nonlinear arguments have to form some kind of logical connection and reasonable structure between different parts of argumentation (e.g. grounds, claims and implied warrants).

Argumentation however by no means always takes place in an institutionalized context with fixed procedures. For example, the phenomena of education, psychology and speech sciences are very complex and students of these fields have to solve ill-structured problems. As an analyzer I must be able to make judgments about the quality of each structural component and to assess the degree to which the composition of ideas coheres in support of the claim. It should be taken into account that argument units take their places within larger contexts of interaction, thoughts, emotions, frames of argumentation and feelings which could also be seen in the chain of written dialogue (Hampe 2003). In addition to argumentation analysis, the theses were evaluated according to the thesis evaluation form.

Argumentative writing

When I analyzed the theses I thought about the structure of argumentative writing. I did not expect the students to know how to write in an argumentative style unless they had studied it by themselves. In addition, Finnish university pedagogy does call little attention to argumentation. There is not a systematic style of teaching of argumentation in the seminar. According to Courier, Andriessen and Chanquoy (1999), argumentative writing contains four processes: reasoning, argumentation, linearization and linguistic coding. When a student is composing an argumentation, she or he must carefully order the presentation of information in the text (elaboration). This information must or can be linked by logical coherent relationships, for example logical chaining for causality (by a connective such as if-then), coordination of arguments with the same orientation (e.g. and) and opposition of orientation (e.g. but). At the same time students have to write to an addressee or audience and remember their communicative goal: to make the addressee accept the proposed standpoint. The difficulties of argumentative writing relate to the linearization process which is a major problem in text production (like connecting pro and counter-argument together in a sequence).

I have used the term coherence in the analysis of thesis writing in this research because it represents the purpose of thesis writing. Organizing text is important in writing because it relates ideas and things to each other in a hierarchical structure as a basis for a coherent text. In addition, it is important for sentence formulations to have logical relationships and a chronological order. These are characteristics of coherent and relevant argumentation.

Johnson (2000, p. 343) has determined the criteria of evaluation of argument. He arranges the order of criteria into acceptability, relevance, truth and sufficiency. It seems as acceptability is relatively easy to determine and to apply, it should come first. He also recommends that it is reasonable to first check to see whether the premises are individually acceptable (they are reasonable and also the audience can accept them).

Research problems

The research questions are: a) do the theses contain argumentation and argumentation chains? b) what kinds of argumentation occur? c) how coherent are the chain of reasoning that the students present in the defence of their theses? d) what does a comparison between the grades of thesis as good or poor reveal?

Data

Masters theses prepared in five departments of one faculty of the University of Helsinki during the period September 2004 - May 2005 were selected for the study. The goal of the research was to compare theses graded excellent with those graded good. Altogether 50 theses were awarded either an excellent or good grade; of these, 34% (17 theses) were excellent and 66% (33 theses) were good. The theses graded excellent were made up of 6% (3 theses) that had been awarded the grade *laudatur* and 28% (14 theses) that were graded as *eximia cum laude approbatur*. The theses graded as good were 20% (10 theses) *magna cum laude approbatur*, 36% (18 theses) *cum laude approbatur* and 10% (5 theses) *non sine laude approbatur*. The theses were selected at random by lottery.

4. Results

According to the results, the argumentation found in these theses varies. There are only a few long and logical argumentation chains. The argumentation level varies from department to department. Usually, the argumentation is somewhat weak, which can be seen in the structures, chains of reasoning, and content of the language used. At various points in the theses, simple or short, independent argument structures can be seen. For example, the short chains of argumentation are scattered throughout the different parts of the thesis.

The lengths of excellent and good theses varied with the departments. The shortest theses, in both grade categories, were those prepared in the field of psychology (25-55 numbers of pages) and the longest in the field of pedagogy (76-115 numbers of pages). One reason for the quantity of shorter pages in the field of psychology may be the writing conventions because they write a lot of articles. Students are prepared for writing an article. Their theses were more reminiscent of articles than of the normal form of theses but they included the structural elements of theses.

The results in terms of the theses show that there is no causal link between the length of the thesis and the grade awarded. But mostly in the long theses (e.g. over 100 numbers of pages) there is also a lot of description and students tend to describe a phenomenon and try to explain it rather than present criticism or arguments from multiple perspectives. A thesis of 50 to 60 pages, for example, was quite adequate for presenting scientific research of a good standard from the abstract through to discussion section. The chains of conclusion progressed in a coherent manner. Furthermore, the said number of pages was also sufficient for

taking into account the reader's view reporting the result in an analytical manner and producing new information. The longest theses, spanning some 120 to 130 pages, were in places overly descriptive and repetitive. The shortest theses were awarded the grade of cl, and they contained 27 to 30 pages. The writers of these theses had mechanically cited the theoretical basis, methods and results, and the discussion section was brief. The shortest theses contained basic research. They were coherent and produced results, but their reliability, discussion and analysis of results were too briefly assessed. This is why they were of a poor scientific standard.

Scientific thinking, argumentation and expertise

Scientific thinking varied, with respect to both its structure and content, in the theses prepared in different departments. Scientific thinking was most abundant in excellent theses containing a coherent, in-depth analysis of a phenomenon in one's own field of science. Scientific thinking was assessed on the basis of the standard of argumentation. Scientific argumentation in excellent theses was evidenced by more coherent chains of argumentation and conclusion, more precise sentence syntax and by more logical treatment from abstract to discussion. Almost all theses contained an argumentation structure (short or multiple) that varied with quantity. However, not all excellent theses contained excellent argumentation, because certain theses indicated very few grounds for claims and used very few logical linking words.

The accuracy of conclusions varied. The theses awarded an excellent grade also displayed scientific argumentation structures, but less often any coherent argumentation chains. Both the excellent and good theses contained examples of a simple or short argumentation structure, i.e. (justification or) warrant using the word "because" and drawing conclusions using the words "if" and "then". The standard of scientific thinking, argumentation or interruptions in logical chains of thought was only referred to in a few thesis assessment forms. Only a few professors mentioned chain of reasoning problems. One or two professors wrote about the weak argumentations in the thesis grading forms. As a conclusion, we can say that the theses contained a little argumentation of a reasonable or good standard.

It seems that in almost all the good theses, scientific thinking (and argumentation) was interrupted right after the theory section or literature review. In all these theses, the language and method for reporting factual content were reduced to the standard of everyday language in the methods and results

sections, but nevertheless stayed within the boundaries of standard language. The accuracy of conclusions varied, and conclusions were repeated on many occasions. The various concepts were, however, used in a systematic manner in all the theses surveyed but the structure and determinations of concepts were superficial.

There was a multiple structure of argumentation in good and excellent theses but more in the excellent theses. Students can be good writers but they cannot produce any new results, conclusions or theoretical idea. For example, students can argue sophisticatedly but they do not construct knowledge to create any new ideas or theoretical knowledge. For this reason some students have got a good grade for their theses, but not an excellent grade.

Scientific and critical thinking is most clearly evidenced in excellent theses and in some good theses. However, the consistency of thinking is interrupted in good theses, shown as a failure to use concepts in a systematic fashion, weak theoretical frames of reference, poor command of methodology or inadequate discussion. It is a case of poor scientific thinking to use practical reasoning for issues requiring consistent and objective language for scientific research, to use ambiguous terms, and to give instructions for action in the theoretical background section or results section without any reason. Further examples of poor scientific thinking are ambiguous source references, long sentences and presenting strong arguments without the justification of scientific research. A fragmented chain of reasoning throughout the thesis is another case of poor scientific thinking. Some examples of short and multiple structures of argumentation are presented below. The main points and the chain of argumentation have been italicised. The following is a pattern of short scientific structure of argumentation:

(1) ... "There has not been much research into the consonant combinations used by native English-speaking children. This research is not suitable for research into the Finnish language because of the differences of structure between the languages and because the consonant combinations of Finnish exceed syllabic boundary compared to the English language in which combinations are first part of the sentences or end in the syllable."... no further chain of argumentation (grade: good/m/department of speech sciences)

An example of argumentation with a short structure is the following:

(2) ... "Studying in the management of household affairs and housekeeping activities using wide and multidimensional theories is meaningful because housekeeping can be looked at on different levels, e.g. through an individual, family, neighborhood, society and from a more global perspective (Turkki 1999, 29, 34.)" ... no further chain of argumentation (grade: excellent/e/ home economics and craft sciences)

Multiple chains of argumentation and presumptive reasoning are as follows:

(3) (... development of idea ...)

"Instrumental data, though, suggest that the difference between the flapped and the unflapped variants of the English /td/, at least, is not quite as radical as Barry's hypothesis would seem to imply.

First, the hypothesis implies that the flap variants involve no diversion of the tongue body whatsoever; this is inconsistent with the findings of Stone and Hamlet (1982), Fujimura (1987), and de Jong (1998) discussed above.

Second, Barry's hypothesis, if taken literally, implies that it is merely the case that the tip/blade is raised - that no effort is made to extend and raise the tongue sides in the same way as in stops. Byrd's (1994a) EPG records of two flaps - one in an unspecified context (fig. 7), the other in butter (see also Byrd 1995) - however, show contact along more or less the entire outer edge of the palate, beside the teeth. *Even though vowels like /a/ (at least) may have a slightly concave cross-sectional tongue profile* (see Stone and Vatikiotis-Bateson 1995), I find it hard to believe that such contact would occur if only the tip/blade were muscularly acted upon." ... chain of argumentation continues (grade: excellent/l/speech sciences)

There are different sections that give rise to problems in many theses. At first, it seems that the chain of reasoning is interrupted straight away after the abstract in that it is describing the goal and aim of the research. These things are not covered in the introduction. The introduction is written a quite poorly because it does not mention the purpose, theories, methods and results. The importance of the study is not argued in the introduction. Some students argue for the aim of the study implicitly. The second problematic part is the introduction and review of the literature. Reviews of the literature are written in a very broad way. Students do not focus on the aim and define the themes. In addition, they contain too much description and little or no conclusions and chains of inferences. The level of scientific argumentation is lacking. The third problem is methodology. The pros

and cons of methods are not used enough and the application of method is not always successful. The fourth problem is bias because students do not evaluate phenomenon of many perspectives. The fifth part is an assessment of the validity of knowledge, falsification, and a study of conflicting and contradictory accounts. The standard of argumentative writing can be specified using categorization such as expert vs. novice. The expert looks for conflicts, defects and contrasts whereas the novice does not analyze conflicts or evaluate counter-arguments. Both can have the same standard of reasoning, using conditional sentences and logical link words to describe the links between different matters and present an argumentative structure in their texts. Based on the assessment of the theses, there would appear to be no assessment of contradicting information, search for conflicts or falsification of own information in the good theses and some of the excellent ones. The accuracy of conclusions and more detailed analysis of information (evidence-based claims) were absent in almost all theses.

Comparability of the grading scale

There were no significant differences in the comparability of grading scales between different departments. The excellent and good theses were clearly distinguishable from each other. Figure 1 (see table) shows the strengths and weaknesses of the excellent and good theses written in different departments. The information is based on analysis and the grounds given by the instructors grading the theses.

The theses graded excellent had been graded in compliance with the grading scale. Excellent theses were clearly distinguished from those graded good by their theoretical and methodological basis, as well as by their argumentation and results. The theses graded excellent contained consistent scientific argumentation, they had a coherent structure, the conclusions were carefully drawn, and they clearly strove to present methodologically and/or theoretically new information or models. The good theses contained conceptual argumentation but there was a difference in implementation between the grades. There was a lack of functional totality in some theses graded good. Other defects included the subject being outside the scope of the intended field of science, failure to master the research method used, no logical link between the theoretical and empirical sections, a poorly established theoretical basis, ambiguous language or brief and superficial discussion. The reasons for awarding a good grade for theses where the chain of reasoning was not continuous were in most cases not stated. The comparability of the grading scale used for theses graded good with respect to

the grading criteria varied somewhat between different departments.

5. *Conclusion*

In this paper, the level of argumentation as an evidence of the quality of theses and as a reliable knowledge building process has to be taken into account seriously. The results show that there was some evidence of an excellent and coherent chain of argumentation in excellent and good theses. It is fascinating to see that the argumentation is a useful tool to evaluating the quality of theses. Furthermore, the evaluation led to new questions about the nature of the structure of argumentation in the theses e.g. what kind of reasoning strategies developed a better line of argumentation.

With respect to the coding of argumentation, I experienced some difficulty in determining the presence of warrants because students did not use a logical connector or word such as "because" or "then". It is possible that individuals never think of a warrant because the warrant is implied by the argument presented (Voss 2005). There could be institutional intuition that operates as a warrant. Individuals learn the rules of their own organizations that form the inference between grounds and claims (Freeman 2005). How can intuition be depicted and analyzed in a particular text? In addition, there were other problems in the theses in which did not contain an argumentation structure but the sentences were put together one after the another in consecutively without the logical connectors. These kinds of elements should be taken into account when developing a better analysis tool for theses.

These results are important in the development of university pedagogy where the student learning process and the level of the scientific theses must be considered. The quality of the theses is also used to evaluate the level and sophistication of the scientific reasoning used as well as the student's ability to perform scientific research. The results can be used to build a master's degree and to develop tests at the beginning and in the middle of a student's academic career to measure their academic expertise. These tests can also be used to influence teaching and study skills before writing a thesis. The results obtained are also important for increasing the teaching of scientific argumentation, which has been somewhat neglected in Finnish university instruction. Scientific argumentation classes will teach students how to construct arguments while also developing their ability to draw conclusions, build knowledge and think critically and creatively.

How do reasoning strategies affect argumentation? The quality of argumentation in the theses should be researched more from the perspectives of reasoning

strategies which are the basis for argumentation. Reasoning strategies might help in understanding the difficulties encountered in giving justifications or evaluating evidence critically. The choice of reasoning strategy is related to performance and the accuracy of research problem. It is also maintained that processing and task demands may influence strategy selection (Morris & Schunn 2005).

According to results of this research, there were little quantity of chains of argumentation in theses. The question of why there were few chains of argumentation needs more research of epistemological perspective (beliefs of knowledge structure and argumentation). Epistemological beliefs are also related to argument avoidance. Nussbaum and Bendixen (2005) found that students with less well-developed epistemological beliefs, specifically regarding the certainty or simplicity of knowledge, tend to avoid arguments. But more research is needed to understand the reasons for the relationships involved in this issue.

The suggestions for development are based on the results of the study. The suggestions are related to creating the theses. The following factors are emphasized. The scientific standard and applicability of the theses must be more accurately assessed. Attention must be paid to the subjects of theses, the theoretical frame of reference, sources, problems in the research, methods and knowledge building. The students' skills with regard to scientific thinking and argumentative writing must be developed. When looking at the reasons for theses receiving failed or poor grades, the trail often leads to insufficient planning and poor command of methodology. Unrealistic goals may have been set or the risks associated with the implementation may have been insufficiently assessed. The most typical defects may be the failure to carry out sufficient pre-studies and a poor command of logic related to the structure of the plan, the theoretical frame of reference and/or implementation.

Counseling must be seen as important and the number of counselors should be considered. In a world that is complex and constantly changing, teachers should to encourage students to develop and use a sophisticated, and nuanced understanding of the evolving nature of the knowledge we are teaching them. Students have to be encouraged to take risks, explore bold and possibly implausible ideas, and work at the edge of their competences. The independent reasoning, development of scientific thinking and problem-solving skills and self-esteem of the students must be enhanced at different stages of their studies so that they are capable of making more independent decisions and developing their thinking. The students should be more actively involved in the department's

research projects, or new research coalitions should be created. The students should be encouraged to join cross-scientific research projects.

Students and teachers should develop their awareness of argumentative writing and teachers should motivate students to critical thinking. More detailed conclusions should be drawn, and information should be assessed in a more versatile fashion (evidence-based claims). Teachers should evaluate their argumentation competence themselves. They should be conscious of the benefit of the argumentation as a cognitive and pedagogical tool to promote characteristics of scientific thinking and behavior.

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