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Comparing connection to theory in Bachelor's theses: Old research university versus new regional university college

Juha M. Alatalo*

Department of Biological and Environmental Sciences, College of Arts and Sciences, Qatar University, P.O. Box 2713, Doha, Qatar
*Email: jalatalo@qu.edu.qa

ABSTRACT
Quality of higher education is often assumed to be linked to the size of the faculty. Therefore, this study tested the hypothesis whether Bachelor's theses in ecology at a large, old research university would have more connection to theory than those at a small, young university college. The results revealed no significant difference between the universities. One potential explanation for these results is that theory is more likely to depend on the individual supervisor who may demand a clear connection to theory in Bachelor's theses. However, in the group of theses categorized as without a clear connection to theory, there were significant differences between the two universities regarding whether students were testing/developing a method or performing a case study. At the large, well-equipped research university, Bachelor's theses were significantly more likely to be based on developing/testing methods, while those at the university college more often comprised inexpensive case studies. Further studies including more universities of contrasting sizes, across countries and disciplines, are required to test the general validity of the findings.

Keywords: ecology education, size of faculty, student theses, supervising, university merger, university size

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INTRODUCTION

The importance of having a connection between research and undergraduate education is often emphasized in Sweden, and the proportion of teaching staff with a PhD and the number of teaching faculty with research included in their duties are considered to be important factors for enabling the connection between research and undergraduate education.[1] In Sweden, student independent projects (theses) formed the core of Swedish quality assurance of Bachelor's and Master's programs during 2011–2014.[2] Taking this perspective into account, it could be argued that large research universities can be predicted to provide higher quality education for students than university colleges, which by tradition have a limited number of research resources in terms of research-active faculty, postdoctoral research, PhD students, and funding. Assuming that traditional research universities commonly have a larger number of active researchers among faculty members and more funding for research, this could facilitate opportunities for students to meet a larger number of researchers who are up-to-date with the latest developments in research, and this in turn could help the students to receive a better quality education. University size is often considered as a measure of quality, with large universities being assumed to be of higher quality than small universities or university colleges. Merging universities has therefore been proposed to solve a number of problems associated with higher education.[3] In fact, university mergers have often been found to have positive effects by upgrading existing and developing new education programs,[4] creating stronger academic programs, and enhancing student choice[5] and the academic portfolio.[6] Although mergers do not always bring the expected administrative gains,[6] a study on 30 mergers in the UK has found that they are successful overall in the majority of cases.[7] This has resulted in putting pressure on many countries worldwide to merge universities and/or university colleges to create fewer, larger units.[8–14] For example, in Sweden, in 2012–2014, the government cut funding to universities, but promised extra funding if they voluntarily merged with other university colleges or larger universities to create greater units. However, there is not always a clear connection between size and quality, e.g., earlier studies comparing research output between small and large university departments have found no relationship between the size of the department and research productivity in scientific publishing.[15,16] Furthermore, in the USA, there are excellent small colleges such as Amherst, Dartmouth, Middlebury, and Williams,[17] which are among the most highly sought-after higher education institutes in the country. It has also been reported that the meaning of quality in education has different answers depending on educational ideology.[18] The socio-economic background of the student may also be of importance. Similar to other countries,[19] students in Sweden who have parents with advanced educational qualifications (having completed at least three years of tertiary education) are over-represented in higher education, and students whose parents have no advanced educational qualifications are under-represented.[20] Socio-economic background also influences their choice of studies: students whose parents have advanced educational qualifications are more likely to choose longer programs and high status institutions, whereas students whose parents have no advanced educational qualifications are more likely to choose shorter programs and lower status institutions.[19,20] Students' academic backgrounds have also been shown to be a predictor of their performance[21] and the likelihood of them continuing their studies to obtain a Master's degree[20]. However, this is not always the case. A study at the State University of Campinas in Brazil (a high status research university) has found that students from a disadvantaged environment, in socio-economic and educational terms, performed relatively better than those with a higher socio-economic and educational background.[22] The health and well-being of students has also been shown to be associated with their academic performance,[23] and health is often associated with socio-economic background.[24]

On the basis of previous work on connection to theory in the ecological literature,[25] this study tested the hypothesis whether Bachelor's theses produced in the oldest research university in Sweden would show a higher connection to theory than theses produced in a small, young university college with a smaller number of staff actively involved in research. The reason for examining this issue is that theses (student independent projects) provided most of the material for the quality assurance on Swedish undergraduate programs conducted by the Swedish Higher Education Authority during 2011–2014.[2] Connection to theory was included in that quality assurance work. Thus, although Bachelor's theses can be assumed to have less focus on theory than Master's or PhD theses, they can be expected to have theory connection. One major difference is the time allocated for independent work; thus, Bachelor's theses cannot be expected to have the same level of depth as Master's or PhD theses, but are likely to have some evidence of theory connection. A search was made on the Uppsala University

Library database to review the abstracts of peer-reviewed journal articles related to this topic; however, the search received zero hits and there were no studies available on the connection to theory in student theses at universities and/or university colleges. Thus, to the best of the author's knowledge, the present study is the first to compare the connection to theory in student theses produced within biology degree programs with an ecological/evolutionary focus at large and small universities. The universities chosen for the comparison were Uppsala University, the oldest and one of the largest universities in Sweden (founded in 1477, with about 6,800 staff), and Gotland University, one of the smallest and youngest university colleges (founded in 1998, with about 220 staff; merged with Uppsala University in 2013). Therefore, this study tested the specific hypothesis whether Bachelor's theses in biology (with focus on ecology/evolution) at Uppsala University would have a significantly higher connection to theory than Bachelor's theses in ecology at Gotland University.

METHODS

This study used the method described in previous work on connection to theory in the ecological literature,[25] but did not include literature reviews. This is because review studies are not accepted as Bachelor's theses at Gotland University, which require independent work by students (in terms of experiments or studying living organisms). Based on the study by Scheiner,[25] much care was taken when categorizing a dissertation as "having a clear connection to theory". However, if there was no mention of any theory, or hypotheses testing a theory, in the introduction to a dissertation, it was included in a group categorized as "without a clear connection to theory". To get comparable theses from Uppsala University, "Degree project C" was chosen, which included independent work similar to the theses at Gotland University. The theses from Uppsala University were downloaded from the website of the Biology Education Centre (IBG), the organization responsible for undergraduate education in biology, biotechnology, bioinformatics, and environmental biology within the Biology Department at Uppsala University.[26] All theses were obtained from the Director of Studies in Biology at Gotland University. A total of 97 theses were checked, of which 54 were from Uppsala University (2009–2014) and 43 from Gotland University (2003–2014; including theses in the ecology program at Gotland University after the merger with Uppsala University in 2013).

First, the studies were divided into two major groups: 1) without a clear connection to theory in the introduction and 2) with a clear connection to theory in the introduction. Then, they were grouped into method studies or case studies (theses without a clear connection to theory), and theory-motivated or testing theory studies (theses with a clear connection to theory).[25] The Mann–Whitney *U* test was used to compare the differences between the universities, using SPSS version 21 for Macintosh.[27]

RESULTS AND DISCUSSION

Bachelor's theses with a clear connection to ecological theory

At Gotland University, 60% of the Bachelor's theses had a clear connection to theory (i.e., either theory-motivated or testing theory), whereas at Uppsala University, the corresponding estimate was 54% (Figure 1, Table 1). However, this difference between the universities was not statistically significant ($p > 0.25$), and thus no support was found for the hypothesis whether Bachelor's theses in ecology at a research university with a much larger number of faculty and more number of research resources would have a higher connection to theory than those at a small university college with a limited number of faculty and research resources. Furthermore, there was no significant difference between the two universities with regard to theory-motivated studies ($p > 0.25$) or testing theory studies ($p > 0.5$; Figure 1, Table 1). The results indicated that, there was no connection between the size of the university department (and the number of staff actively involved in research) and an explicit connection to theory in Bachelor's theses, as found previously for research productivity in terms of scientific publications.[15,16] The results also indicated that the students' socio-economic background, albeit not taken into account in this study, may not have influenced their ability to connect to theory. Uppsala University is an "elite university" in Sweden, qualifying among the top 100 universities in worldwide rankings. Gotland University, on the other hand, was among the lowest ranked universities in Sweden. These universities recruit students from different categories, with Uppsala University having stricter admission rules and recruiting students with higher qualifications than Gotland University. Thus, it was somewhat surprising that this did not influence the theory connection in Bachelor's theses. However, to study the potential impact of students' socio-economic background, relevant questions/methods

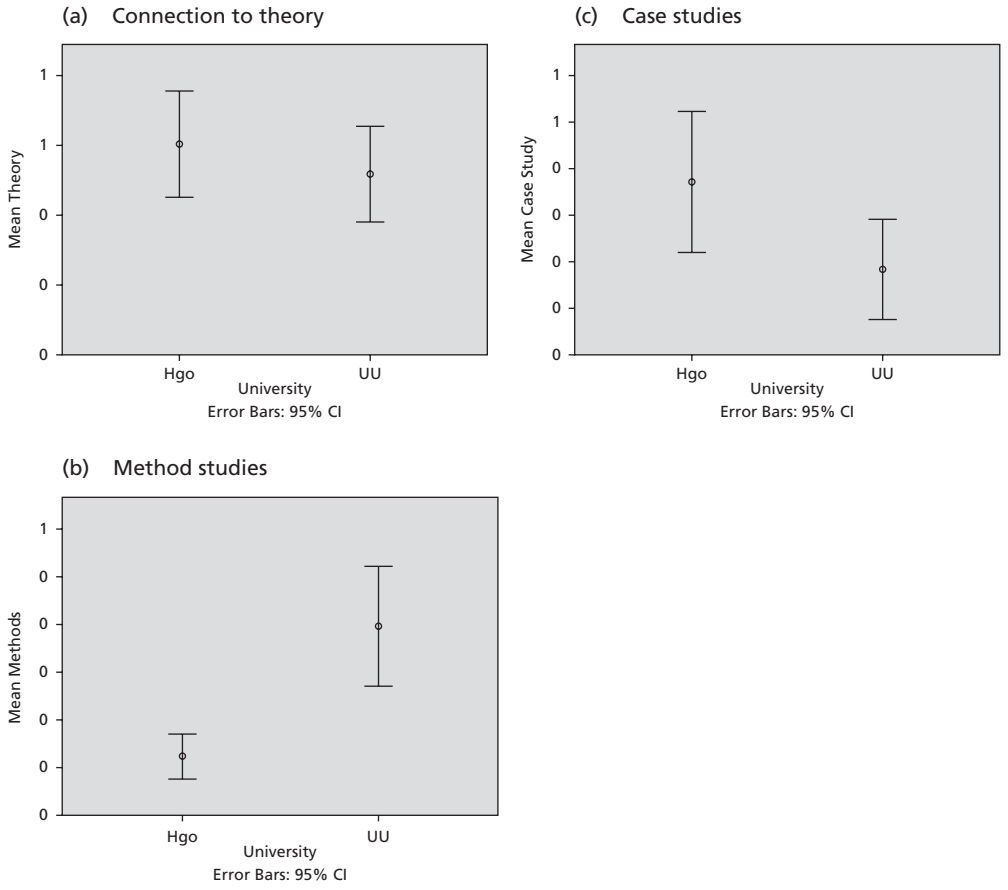

Figure 1. Connection to theory in Bachelor's theses in the ecology program produced at Gotland University (Hgo) and in the biology program (with focus on ecology/evolution) produced at Uppsala University (UU): a) connection to theory, b) method studies (without a clear connection to theory), and c) case studies (without a clear connection to theory). Values are represented as means and 95% CI ($n = 54$ (UU) and $n = 43$ (Hgo)).

would need to be included in the study design from the outset. One potential reason for these results is that the connection to theory depends on the individual supervisor who may demand a clear connection to theory in Bachelor's theses. To verify this, it becomes necessary to interview all the supervisors. The results could also be affected by the way the published theses were categorized on the basis of whether they had a "clear connection to theory". However, based on previous work on connection to theory in the ecological literature,[25] much care was taken to include in that category all studies that mentioned any theory in the introduction. Furthermore, as the author was the only person grouping the theses from both universities with respect to their connection to theory, any potential bias

Table 1. Connection to theory in Bachelor's theses in the ecology programme at Gotland University (Hgo) and the biology programme (with focus on ecology) at Uppsala University (UU).

University	Methods (%)	Case study (%)	No theory (%)	Theory-motivated (%)	Testing theory (%)	Theory (%)
Hgo						
Mean	02	37	40	33	28	60
N	43	43	43	43	43	43
Std. Deviation	0.152	0.489	0.495	0.474	0.454	0.495
UU						
Mean	30	19	48	26	26	52
N	54	54	54	54	54	54
Std. Deviation	0.461	0.392	0.504	0.442	0.442	0.504
Total						
Mean	18	27	44	29	27	56
N	97	97	97	97	97	97
Std. Deviation	0.382	0.445	0.499	0.455	0.445	0.499

in subjective grouping can be expected to be similar for the two universities. Some theses were collected after the merger (1 July 2013); however, there was no change in faculty or curriculum with respect to the ongoing ecology program at Campus Gotland (the new name for Gotland University after the merger). Thus, it is unlikely that the merger had any major impact on the theses produced in autumn 2013 or spring 2014. However, the ecology program at Campus Gotland ceased to accept new first-year students for autumn 2013, as part of phasing out of the program.

Bachelor's theses with no connection to theory: Methods and case studies

In the group of theses with no clear connection to theory, there were significant differences between the two universities regarding whether the theses involved testing/developing a method or performing a case study in the field. Bachelor's theses at Uppsala University comprised a significantly ($p = 0.0001$) higher proportion of method studies, while theses at Gotland University were significantly ($p = 0.040$) more likely to comprise field-based case studies (Figure 1, Table 1). These results reflect the different focus on the Bachelor's programs at the two universities: Uppsala University concentrates more on molecular biology and Gotland University more on "green ecology". These differences in focus seem to have a clear impact on the choice of Bachelor's dissertation. This raises the question of whether traditional research universities and smaller regional universities are starting to diverge on students' qualifications when they graduate. Universities often market the uniqueness of their undergraduate programs when trying to attract students; however, in the past, the core curriculum for a particular mainstream course (e.g., ecology) has only differed slightly between universities. On the other hand, the results from the present study indicated that there might be a difference evolving in the choice of students' final theses. This calls for future studies that compare theses from larger numbers of traditional research universities and regional universities. Furthermore, at Uppsala University, the majority of Bachelor's theses in biology are literature review studies that do not involve any field or laboratory work; thus, the majority of students do not get any experience of conducting an individual research project that involves experiments or collection of data on living organisms. While the students are exposed to minor research activities during their studies, this experience cannot be compared to conducting a more focused project that is evaluated as a "final dissertation". The reason for not demanding individual theses that involve experiments or collection of data on living organism is to streamline the education and make it more "efficient". It can be difficult to find faculty to supervise practical dissertation projects when involving large numbers of students, while literature studies require less supervision than field or laboratory work. As the dissertation is normally an important document, this may have implications for evaluating the skills developed within Bachelor's programs in ecology.

Potential impact of merging universities on future Bachelor's theses

Due to the merger of the two universities in 2013, Gotland University has closed its Bachelor's program in ecology. On the other hand, the results indicated that the merger of the two universities will most likely not cause any significant difference in the connection to theory in Bachelor's theses for future students; however, it may indirectly cause a decline in the number of field-based case studies and the number of theses that involve independent research (in terms of experiments or studying living organisms). Uppsala University has launched a new Bachelor's program in environmental science at Campus Gotland. In the future, it would be interesting to see whether theses without an apparent connection to theory in this program have a similar focus as those in the previous ecology program (mostly field-based case studies), or whether they adopt the same focus as theses in the ecology/evolution program (mostly method studies) at Uppsala University. This would give an indication of how the larger Uppsala University has influenced the work of Gotland University after the merger in 2013.

Questions for the future

While improving the quality of education is a commonly stated goal in university mergers, education usually receives little attention, with vague goals for implementation and administration receiving much more attention.[28] The results in the present study raise several questions regarding the kind of education we are developing for the future, and how the present trend of merging universities and/or university colleges in many countries may have an impact on education. Are the findings general in

terms of differences between traditional research universities and smaller university colleges? More studies are clearly needed to investigate this issue, as this study cannot provide definitive answers. The results also raise the question of what are the driving forces behind the differences observed: is it the increasing focus on using molecular tools in ecological research that causes some of the differences, is it the indirect effect of funding agencies mainly funding research universities, or is it dependent on the individual supervisor? External funding patterns could help explain the difference between field-based case studies and laboratory-based method studies present in the two universities, as the vast majority of external funding often goes to a small number of research universities.[29] It could be expected that more research funding translates into a greater connection to theory in undergraduate theses, as high-quality research proposals often make connections to the latest developments in theory. However, this does not always seem to be the case: the distribution of research funding may have an indirect impact, as active faculty researchers at university colleges with less number of resources typically have to conduct inexpensive research, which may in turn reflect the choice of topic for Bachelor's theses (i.e., field-based case studies). Another issue of concern is whether we want graduating students to have a proven record of conducting independent research (in terms of experiments and/or studying living organisms), or whether literature review studies can be seen as a sufficient proof of skills acquired during Bachelor's studies in biology or other science subjects.

CONCLUSIONS

The present analysis of whether Bachelor's theses in ecology produced in a large, old research university would have higher connections to theory than theses produced in a small, young university college revealed no differences between the two universities. Therefore, the hypothesis whether the quality of higher education (measured as connection to theory in Bachelor's theses) is linked to the size of the faculty or department does not hold true. One potential explanation is that theory is more likely to depend on the individual supervisor who may demand a clear connection to theory in theses. In the group of theses categorized as "having no clear connection to theory", there were significant differences observed between the two universities regarding whether the theses focused on testing/developing a method or performing a field-based case study. The Bachelor's theses from the large research university were significantly more likely to focus on developing/testing methods, while those from the university college were significantly more likely to focus on field-based case studies. However, further studies including more universities of contrasting sizes, across countries and disciplines, are obviously needed to test the general validity of the findings.

Conflicts of interest

The author declares that there is no conflict of interest.

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REFERENCES

[1] Forsberg E. Formeringen av forskningsanknytning genom examensarbete. *Nord. J. Stud. Educ. Policy*. 2007;2006:2.
[2] HSV. *The Swedish National Agency for Higher Education's quality evaluation system 2011–2014*. 22 (Swedish National Agency for Higher Education). [https://www.uka.se/download/18.575a959a141925e81-d113e8/1403093617434/1103R-quality-evaluation-system-2011-2014.pdf].
[3] Harman K, Meek VL. Introduction to special issue: 'Merger revisited: international perspectives on mergers in higher education'. *High. Educ.* 2002;44:1–4.
[4] Gamage DT. Recent reforms in Australian higher education with particular reference to institutional amalgamations. *High. Educ.* 1992;24:77–92.
[5] Harman G, Harman K. Institutional mergers in higher education: Lessons from international experience. *Tert. Educ. Manag.* 2003;9:29–44.
[6] Wan Y, Peterson MW. A case study of a merger in Chinese higher education: The motives, processes, and outcomes. *Int. J. Educ. Dev.* 2007;27:683–696.
[7] Rowley G. Strategic alliances: United we stand: A strategic analysis of mergers in higher education. *Public Money Manag.* 1997;17:7–12.
[8] Harman K. Merging divergent campus cultures into coherent educational communities: Challenges for higher education leaders. *High. Educ.* 2002;44:91–114.
[9] Kyvik S. The merger of non-university colleges in Norway. *High. Educ.* 2002;44:53–72.
[10] Mok K. Globalization and educational restructuring: University merging and changing governance in China. *High. Educ.* 2005;50:57–88.

[11] Mao Y, Du Y, Liu J. The effects of university mergers in China since 1990s: From the perspective of knowledge production. *Int. J. Educ. Manag.* 2009;23:19–33.
[12] Drowley MJ, Lewis D, Brooks S. Merger in higher education: Learning from experiences. *High. Educ. Q.* 2013;67:201–214.
[13] Kyvik S, Stensaker B. Factors affecting the decision to merge: The case of strategic mergers in Norwegian higher education. *Tert. Educ. Manag.* 2013;19:323–337.
[14] Välimaa J, Aittola H, Ursin J. University mergers in Finland: Mediating global competition. *New Dir. High. Educ.* 2014;2014:41–53.
[15] Cherfas J. University restructuring based on false premise?: Recent studies contest the British government's argument that big science departments are better than small ones. *Sci. N.Y.* 1990;247:278–278.
[16] Kyvik S. Are big university departments better than small ones? *High. Educ.* 1995;30:295–304.
[17] Best Colleges | College Rankings | US News Education – US News. *US News & World Report*. [http://www.usnews.com/best-colleges].
[18] Ohlsson Ö. Educational Innovation in Economics and Business II. In: Tempelaar DT, Wiedersheim-Paul F, Gunnarsson E, eds. Springer Netherlands; 1998:259–272. [http://link.springer.com/chapter/10.1007/978-94-011-5268-6_16].
[19] Jerrim J. *Family background and access to high 'status' universities*. The Sutton Trust; 2013.
[20] Amf A. *Higher education in Sweden – 2014*. Universitetskanslersämbetet; 2014.
[21] Borde SF. Predictors of student academic performance in the introductory marketing course. *J. Educ. Bus.* 1998;73:302–306.
[22] Pedrosa RH, Dachs JNW, Maia RP, Andrade CY, Carvalho BS. *Educational and socioeconomic background of undergraduates and academic performance: consequences for affirmative action programs at a Brazilian research university*. IMHE; 2006. [http://antares.comvest.unicamp.br/paais/artig02.pdf]
[23] El Ansari W, Stock C. Is the health and wellbeing of university students associated with their academic performance? Cross sectional findings from the United Kingdom. *Int. J. Environ. Res. Public. Health.* 2010;7:509–527.
[24] Adler NE, Ostrove JM. Socioeconomic status and health: What we know and what we don't. *Ann. N.Y. Acad. Sci.* 1999;896:3–15.
[25] Scheiner SM. The ecological literature, an idea-free distribution. *Ecol. Lett.* 2013;16:1421–1423.
[26] Biology Education Centre (IBG). Uppsala University [http://www.ibg.uu.se].
[27] IBM Corp. *IBM SPSS Statistics for Windows*. IBM; 2010.
[28] Ursin J, Aittola H, Henderson C, Välimaa J. Is education getting lost in university mergers? *Tert. Educ. Manag.* 2010;16:327–340.
[29] Shibayama S. Distribution of academic research funds: a case of Japanese national research grant. *Scientometrics*. 2011;88:43–60.