

# **The Undergraduate Degree Project – Preparing Dental Students for Professional Work and Postgraduate Studies?**

## **Abstract**

**Objectives:** The undergraduate degree project is a requisite part of higher education in Sweden, designed to prepare students for professional work and postgraduate studies. This article examines the extent to which the degree project in Swedish dental education helps students achieve these purposes. The focus was on the students' choice of topics and research methods as well as their ability to reflect on the implications of their results for dental practice.

**Methods:** Degree projects from three of the four Swedish dental schools were analysed using content analysis.

**Results:** The students' topics concerned clinical dentistry, biomedicine, educational issues and public oral health. Quantitative research methods were used more often than qualitative ones. Some of the degree projects were based on literature reviews. Students demonstrated shortcomings in their reflections on the implications of their results for dental practice. The level of reflection was particularly low in one of the schools; this may be because the students in this school were not expected to reflect on the results.

**Conclusions:** The degree project gives the students an opportunity to develop their knowledge on a topic relevant to dentistry, to be trained in conducting research and to reflect on scientific knowledge in relation to dentistry. However, this study shows the need of assessment criteria that urge the students to reflect on the link between science and clinical work and motivate them to learn to reflect so they become critical thinkers. It is also suggested that dental students should learn more about qualitative research methods.

## **Introduction**

The goal of higher education is to prepare students for professional practice and postgraduate studies. This means that higher educational programmes should equip students with the theoretical knowledge and skills that are essential for future work, foster their interest in research and develop their scientific skills. This holds true also for dental education.

This study concerns the degree project in Swedish undergraduate dental education and its function in relation to the purposes of higher education. One approach to foster students' interest in research is to introduce a degree project that implies that students conduct a research project and write a short thesis. In Sweden and in some other European countries, a research project is nowadays an integral part of the dental undergraduate programme. In other programmes, as for example in North America, it is voluntary for students to do research during undergraduate education (1).

The introduction of a research project into the undergraduate dental education is motivated as a consequence of that future dentists need to understand the results of research and how they can be applied to dental practice (2, 3). According to Swedish government bills, the undergraduate degree project should be an opportunity for students to show professional and scientific maturity (4). Furthermore, the project is assessed and part of a national evaluation of students' fulfillment of the educational goals (5). On graduation dental students shall have knowledge about the scientific base of dental practice and be aware of current research, the importance of scientific research and established practice in dentistry. They shall also be able to critically and independently examine, evaluate and use information and to scientifically discuss new facts and issues within the dental discipline, according to the Swedish Higher Education Ordinance (6). The degree project is an opportunity for dental students to develop and demonstrate this knowledge and these abilities.

The degree project is related to the students' future professional work as it provides students with the opportunity to gain deeper knowledge within a topic and to develop theories and work practices relevant to the profession in question (7, 8). Moreover, the degree project functions as a preparation for postgraduate studies as it implies that students are conducting a research project (8), which gives them an opportunity to develop research skills (9, 10).

In health professional education programmes, the degree project can be seen as a process that connects professional work and research as not only researchers but also practitioners need to understand research and the research process. The degree project also functions as a link between the two spheres as it can be an opportunity for students to develop and demonstrate the ability to reflect (11, 12). To learn to reflect on professional practice is of significance for dental and other health profession students; it prepares them to solve complex and ambiguous problems that they will encounter in future work (13, 14). In the professional sphere, reflection on practice is also emphasised as an essential skill for professional development. Professionals have to be reflective practitioners, as Schön (15) pointed out. Additionally, an understanding of research and the ability to reflect and make critical analyses are central skills in clinical practice in the application of evidence-based practice (10). Evidence-based practice means that health professionals, such as dentists and physicians, should use the best available scientific knowledge in their care of patients. Before they can use research findings, they have to critically reflect and appraise the reliability and applicability of the findings (16).

However, it is not obvious that the degree project helps students to achieve the purposes of higher education. A study of nursing students' degree projects showed that their topics and research problems were strongly connected to their working field, but the students displayed shortcomings in the use of theories to develop the knowledge of the profession (8).

The degree project in dental education will give the students a better basis for postgraduate studies (12), but the study of the nursing students' degree projects indicates shortcomings in the students' methodological training as the majority had carried out a literature review (8). Similarly, Gustavsson (17) pointed out that there is a risk that students will learn only about few research methods through the degree project. There are, however, contradicting views on the function of the degree project for the development of students' ability to reflect. A Turkish study on dental students' perception of the importance of undergraduate research project showed that they thought the project has improved their critical thinking skills and learnt them about the connection between research and clinical practice (12). In contrast, the nursing students displayed shortcomings in their critical reflections on the results of their projects, such as the influence of different contextual factors on the results of the studied phenomenon (8).

The importance of a discipline's local educational context as well as the cultural and historical contexts on what students will learn from conducting research in undergraduate education has been stressed. Students' topic choices can be influenced by current research in a discipline (7) or by research carried out in a local educational context. The dominance of particular research methods used in degree projects within a certain discipline can be explained by the culture in which the degree projects are produced and which determines different epistemological approaches within each discipline; these approaches determine what kinds of questions are appropriate to ask, what is considered knowledge and what is considered an appropriate method(s) for acquiring it (18, 19). Another explanation can be the methodological knowledge of the supervisors (20). In a Finnish study, it was shown that quantitative methods dominate in dental students' degree projects (21). One can assume a predominance of quantitative methods in undergraduate degree projects in Sweden and other countries as well. A positivistic view, which for example assumes that there is an objective,

real world and stresses experimentally based and hypothesis-driven investigations, predominates in dental education and in dental practice, which means that a qualitative research approach is less common (22).

Additionally, the educational context plays a role through the criteria used in the assessment of students' degree projects. The assessment may focus on the written report primarily as an academic text and thus as a preparation for postgraduate studies (23).

However, as the degree project is an opportunity for students to demonstrate professional maturity, for example how research can be applied to dental practice, the assessment criteria should also emphasise the connection between science and clinical practice.

There is a need for knowledge about the role of the undergraduate degree project in dental education. Dental programmes are based on that students learn in seminars, lectures, study groups, skills laboratories and in the clinical setting. An undergraduate degree project worth at least 30 higher-education credits is integrated in the Swedish dental education as a consequence of the Bologna Declaration and a higher-education reform in Sweden 2007. The degree project is undertaken independently by the students and supervised by tutors. The aim of this study is to investigate how the degree project helps students achieve the purpose of higher education by focusing on students' choice of topic and research method and their reflections on the implications of their results for clinical practice. The results of this study will be discussed in relation to contextual factors.

## **Material and methods**

### **Material**

This study is part of a larger project on the degree project in Swedish dental education. There are four dental schools in Sweden. The empirical material consists entirely of undergraduate degree projects that were completed in the spring term 2012 in three of the four schools. Thus,

these projects were the first completed after the higher education reform in 2007. The total number of degree projects was 74. The degree projects are public documents and therefore accessible to everyone. Due to ethical concerns, neither the names of the students nor the dental schools in which the degree projects were produced are revealed. The dental schools are referred to by the capital letters X, Y and Z.

### **Context**

The three dental schools have similar views on the purpose of the degree project, and they apply almost the same criteria in the assessment of the projects. A previous study on handbooks and assessment criteria demonstrated that the students were expected to conduct a research project of a topic relevant to dentistry. The students were free to choose a topic. They were expected to demonstrate scientific skills, such as the ability to formulate a research problem, make a review of relevant previous studies, use research method and express critical reflections in the written report (24). The assessment criteria differed in one respect that is of relevance in this study: the students in the dental schools Y and Z, but not in the dental school X, were required to discuss the contribution of **their results to dentistry** (24).

### **Data analysis**

The degree projects were analysed by content analysis. The aim of this method is first to establish relevant categories from the texts and then to use the categories to analyse how often each one occurs in the texts (25, 26). Following the steps of this method, the first part of the analysis comprised a classification of the degree projects' content. The classification consisted of (1) the chosen topics, (2) the research methods and (3) the students' reflections on the implications of the results of their degree projects to dentistry.

In the second part of the analysis, the established categories were used to analyse the frequency of the categories and to make comparisons between the three dental schools. The degree projects were analysed on an individual level in the classification procedure and on a group level in the comparative analysis between the dental schools.

## **Results**

### **Topics of the degree projects**

The classification of the topics showed that the students wrote about a wide range of topics. The analysis resulted in four categories. The most common topics were those categorised as *clinical topics*, which concern the diagnosis and treatment of dental and oral problems and diseases. These projects mostly dealt with patients' experiences of treatments or their oral health, the accomplishment or outcomes of specific treatments, the accuracy of diagnostic methods or the effects of preventive dentistry on patients' oral health. Degree projects within this category also were concerned with the compliance of dental staff with national hygiene routines and dentists' and general practitioners' knowledge of oral diseases. A couple of projects dealt with the interaction between the dentist and the patient.

The second most common category concerned *the biomedical field* such as immunology, cell biology, chemistry, genetic, histology, physiology, dental biomaterials and pathology. In these degree projects, the students investigated research problems related to the preclinical aspects of treatment of dental, oral and general health related problems and diseases.

The students' degree projects also dealt with *educational topics* and *public oral health related topics*, but to a lesser extent. The ones that focused on educational topics were concerned with issues relevant not only for the undergraduate education of dental students, dental hygiene students and medical students but also for continuous education of Swedish

dentists and foreign dentists in Sweden. The public oral health related topics dealt with the oral health in a population. Four of the six degree projects in this category were about public oral health in other countries. The frequency of topic categories is shown in Table 1.

Table 1 here

The distribution of topics within each of the three dental schools generally followed the pattern of topic distribution among all the degree projects but with some exceptions (Table 2). Most of the degree projects in school X were biomedical and not about clinical dentistry as in the other two schools. This school also differed from the other two in that none of the students wrote about public oral health. In school Y, biomedicine-related topics were as common as education-related ones, and in school Z, public health related topics were more common than education-related ones.

Table 2 here

## **Research methods**

The analysis of the research methods showed that they mainly used quantitative methods (Table 3). In the degree projects, 18 (24%) acquired empirical data from questionnaires, 24 (32%) focused on clinical examinations, 15 (20%) applied laboratory studies, 9 (12%) used charts and 1 (1.01%) of the degree projects contained quantitative interviews. A combination of these data collection methods was used in 9 (12%) degree projects. Literature reviews, which are studies that do not include empirical data, accounted for 7 (9.5%) of the degree projects. Laboratory studies, in which laboratory methods have been used but not statistical methods, accounted for 7 (9%). The number of degree projects of other types was 4 (5.4%). One of these four was a case report with a description of dental treatment in China. This degree project did not include any analysis but only a description of the dental care in the

visited clinics. In the other 3 (4%) degree projects, quantitative and qualitative methods were combined: in one of these projects, questionnaires were used in combination with observations of how the dental staff treated patients and of analysis of case books; in another, questionnaires were used in combination with observations and interviews with dental workers; and in the third, questionnaires were used in combination with one interview.

Interviews can be analysed both in a quantitative and a qualitative way. As mentioned above in the section about quantitative methods, interviews were used in one degree project to collect empirical data. The student that had carried out this project wrote in the report that the interviews were analysed qualitatively, but this is incorrect. The interview data was analysed and shown in a quantitative way. The data was not analysed qualitatively with the aim to, for example, establish analytical categories that should be used to describe and explain social phenomena (27).

Table 3 here

Quantitative methods were the most commonly used research methods by students in all the schools, while the number of students that used laboratory methods and wrote review articles differed slightly between the schools. A combination of research methods was only used by students in dental school Z (Table 4).

Table 4 here

### **Students' reflections on the results**

Four categories emerged in the analysis of the students' reflections on the implications of their results for dental practice: (1) *merely descriptive*, (2) *further research is needed*, (3) *implications for dental practice* and (4) *implications for education*. Seventeen projects were categorised as *merely descriptive*, 26 as *further research is needed*, and 29 as *reflective on*

*implications for dental practice or education.* Thus, the majority of the students did not reflect on the clinical use of their research results. The frequency of the categories in the dental schools is shown in Table 5. In all three dental schools, students who wrote about a clinical topic reflected more often on the usefulness of the results for dentistry than students who wrote about a biomedical topic. Students who wrote about a biomedical topic more often merely described their results or concluded that more research was needed in comparison to students who wrote about a clinical topic.

Table 5 here

Below are examples of parts of merely descriptive discussions and conclusions. In one report, the following was written:

Our findings suggest that there is no relation between intense chewing and delayed onset muscle soreness in the masseter muscles. Intense chewing evoked moderate levels of fatigue and discomfort, hypoalgesia to mechanical stimulation, and reduced vibrotactile sensitivity. (School X)

In another degree project about *miswak* and tooth brushing, the following was written:

The conclusion of this study was that colouring of the organic substance in enamel with Lawson is possible. After the Lawson colouring, it is possible to see differences between fresh enamel and enamel with lower degree of mineralisation in optical microscope. (School Y)

In a degree project on postoperative complications of mandibular fractures, the following was written:

The results of this study showed that the most common dysfunctions due to conservative treatment are clicking and crepitation in the temporomandibular joint. (School Z)

The discussions and conclusions that contained reflections on the research results either related to dentistry or to dental education. In one of the degree projects in which the students reflected on the effects of the results for dentistry, the following was stated:

This study shows that more than two thirds of the fissure sealants were not completely retained. According to other studies, a fissure sealant has to be completely retained to give good protection. Consequently, all defect fissure sealants, where this preventive treatment still is indicated, should be completed/modified until the sealants have complete retention. (School X)

In a degree project on the oral health status of African children, the following was written:

The conclusion of this study was that the dental caries prevalence was high and probably due to the poor oral hygiene and high intake of sweet drinks. To improve the oral health in these areas, more preventive measures need to be carried out in order to increase the knowledge in oral health, and more dental personnel are required to meet the extensive needs. (School Y)

In a degree project on the effects of a conventional toothbrush and two specially designed ones, labeled SB and CC, the following conclusions were made:

A reduction of bleeding on probing was statistically obtained with the use of a specially designed toothbrush. The clinical relevance, in particular for care-dependent elderly patients, indicates that if there are difficulties in maintaining

adequate oral hygiene, SB or CC can be seen as a better alternative to a conventional toothbrush. Which brush type, CC or SB, being recommended is, however, strongly due to the individual acceptance and experience of each specific brush. (School Z)

In one degree project on research relevant to dental education, the reflection on the implications of the research results was as follows:

The following conclusions can be drawn based on the study's results: that an overview that reflects the oral health at the clinic for the dental care of adults (in the dental school) has been created that could be used as an overview of patients' oral health when you want to distribute patients (to students) in a better way, and when you want to evaluate and analyse patients oral health over time. (School Z)

## **Discussion**

This study examined how the degree project in Swedish dental education helps students achieve the two purposes of higher education: To prepare the students for future professional work and for postgraduate studies. The study shows that the degree project plays a role: The project is part of the preparation for a professional career as it gives students the opportunity to investigate topics relevant to dentistry. The topics and research problems in all the degree projects were related to dentistry in some way. However, the strength of the connection to the practical aspects of dentistry varied among the topics. For example, some of them were directly related to clinical practice by focusing on the treatment of patients or compliance by dental staff with national hygiene routines. Other topics were rather indirectly related to

clinical practice as they were biomedical studies of pre-clinical research problems, studies of public dental health or studies of education related questions.

The significant number of degree projects on clinical topics is in line with the core of professional practice: “to classify a problem, to reason about it, and to take action on it”, that is “to diagnose, to infer, and to treat” (28). It is, however, worth noting that only a few degree projects dealt with the communication between the dentist and the patient. The interaction between professional and client or patient is another central part of professional practice; the importance of this interaction is held for the outcome of dental treatment (29). Dental students are taught about this interaction both in theoretical studies and during the treatment of patients. Perhaps students believe that they have enough knowledge about this topic, do not find it interesting or concentrate more on learning technical skills. Furthermore, none of the degree projects dealt with dentists’ relations with other dental professionals, which is also a central part of a dentist’s daily practice.

The differences in the students’ topics between the three dental schools can be explained by the influence of the research projects that are being conducted in these schools. Lecturers who are doing research may integrate their research into the education and thus make the students aware of current research on a local level. The influence of current research may also play a role in determining the interests and knowledge of the supervisors. Another explanation can be the dental schools’ local curricula. The Swedish dental education is governed partly by national learning objectives and partly by local curricula. Local autonomy means that the dental schools differ when it comes to theoretical and practical elements. Furthermore, work on the final degree projects starts halfway through the education. The subjects that the students have previously studied and their acquired knowledge can influence their topic choice.

This study shows that the degree project is part of the preparation for postgraduate studies, but the results of the study raise questions about the extent to which it does so. Quantitative research methods were more common than qualitative ones in the investigated degree projects; this is in line with previous research on the degree project in dental education (21). Even in degree projects where qualitative interviews should preferably be used to investigate patients' experiences of treatment and their oral health, students have used quantitative methods. This outcome should be compared with the fact that qualitative interviews are more common than questionnaires in dissertations and degree projects within social work. An explanation of the dominance of qualitative interviews in social work is that social workers talk with their clients because of scepticism about the quantification of clients' problems, and therefore, undergraduate and postgraduate students favour qualitative interviews (20). However, dentists also ask patients questions in order to ascertain their problems. The lack of use of qualitative research methods in dental research means that knowledge about patients' problems, needs and experiences of dental care may be neglected.

The dominance of quantitative methods in dental education and dentistry (22) may be due to that teachers have not the competence to supervise students in why, when and how qualitative research methods should be used. This study indicates the importance of teaching students about the different scientific and philosophical positions behind different research methods, as a research method should be chosen from ontological and epistemological grounds (30). The degree project can thus be seen as a preparation for postgraduate studies to a certain degree as the students seem to have been trained in doing research using the most common methods in dental research. A negative consequence may be that students merely reproduce the most common research methods and do not think beyond the boundaries.

The degree project can function as a link between professional work and research and, hence, helps students achieve the purposes of higher education as it can develop students' ability to reflect (11). It is a skill that connects the clinical and research spheres, especially through evidence-based medicine (10). However, this study indicated shortcomings in the degree project as an exercise that trains students to reflect on the implications of their projects for dentistry. Most of the students did not express such reflections. An explanation can be that students do not have enough clinical experience to be able to see the possible consequences of their results. The reason why the level of reflection was particular low among students who wrote about a biomedical topic is probably because these degree projects investigated research problems that did not directly concerned clinical practice. The students in this study discussed the usefulness of the results for dental education more often than for clinical practice. Maybe this is because students are more familiar with the educational context. To improve students' ability to reflect, other exercises should be used in addition to the degree project. For example, previous studies describe clinical journals and interviews (13) and the critical incident method (31) as useful exercises to develop the ability of dental students to reflect on dental problems and on their own clinical experiences.

The differences between the dental schools regarding students' reflections can be attributed to the differences in the criteria used in the assessment of the degree projects. In dental school X, in which the students reflected to a lower degree compared to the other two schools, the students were not expected to reflect on the implications of their results for dentistry.

One limitation of this study is that it only concerned dental students' written degree projects. Interviews with students could contribute more knowledge about the rationale for their choices of topics and research methods. Interviews can also be fruitful in examining what the students believe they have learnt from the project. Supervisors and other dental

educators should also be interviewed to examine their views on the degree project. Another limitation is that the focus of this study was only on the students' choices of topics, their research methods and their reflections on the results in relation to dentistry. For example, examinations of the theoretical perspectives in the degree projects, the students' reflections on the theoretical framework and the research methods they have used can be valuable in gaining knowledge about the function of the degree project (8).

### **Conclusion**

Hopefully, the outcome of this study will be useful for educators in the field of dentistry in Sweden and other countries with the aim of utilising the opportunities of the degree project in preparing dental students for professional careers and careers as researchers . The results of this study show the need of assessment criteria that urge the students to reflect on the link between science and clinical work and motivate them to learn to reflect so they become critical thinkers. It is also suggested that dental students should learn more about qualitative research methods.

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