

Original Article

“Development work thesis” as a Tool for Continuing Professional Education

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The objective of the study was to describe the concept of a “development work thesis” (DWT) and explain, from an educator’s viewpoint, its use as a tool for continuing professional development in specialized studies in point-of-care testing (POCT). The data were collected from three focus group interviews conducted in degree programmes involving Biomedical Laboratory Sciences in the Finnish University of Applied Sciences in January 2010. The data were examined using inductive content analysis. The application of development work theses in specialized studies of point-of-care testing was divided into four categories: 1) Connection with the world of work; 2) Implementation of DWT recommendations; 3) Challenges associated with development work; and 4) Suggestions for future specialized studies. In conclusion from educators’ points of view, development work theses offer a functional tool for use in the continuing professional development of biomedical laboratory scientists. The main challenges in education linked to specialized studies will be agreeing with common guidelines and defining policy, and ensuring competence in methodology.

Key words: *biomedical laboratory scientist, continuing professional development, education, point-of-care testing*

Introduction

The Universities of Applied Sciences (UAS) in Finland educate biomedical laboratory scientists (bachelor’s level, 3.5 years). Their role of such scientists’ in Finnish health care is wide-ranging. They collect samples, guide and conduct laboratory investigations for patients and health care staff and are responsible for reliability and quality assurance during these investigations. In addition, they participate in the development of laboratory activities and the supervision of students. After obtaining a degree they can complete their education via specialized studies. Biomedical laboratory scientists

with diploma-level education can also apply to undertake specialized studies at UAS. Specialization deepens, expands and develops the skills and knowledge required at diploma or degree level. Finland is a sparsely populated country and there are great distances between the universities of applied sciences. As a result, five UASs planned and implemented these specialized studies collaboratively. Each UAS was responsible for specific courses (professional studies). The one UAS took charge of point-of-care testing (POCT) in patient care, the one for methods of point-of-care testing, the one for quality management of POCT, and the two UASs for quality management of POCT (Figure 1). Specific courses consisted of the utilization of POCT in various patient testing settings including primary care, hospitals and self

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testing. Technology in POCT, quality, organization and management of POCT service were topic of those courses in all fields of laboratory medicine for example in clinical chemistry (e.g. glucose) and clinical microbiology (e.g. *Streptococcus A*). This training was provided in the form of e-learning courses, where students studied via computer networks in their own localities. The lectures and discussions were mainly conducted over the Internet. Such educational activities are usually

carried out in the evenings and on weekends, but in this case activities took place online so timing was flexible. Each UAS was responsible for supervise its own UAS students' development work thesis (DWT). As a DWT students established validation and implementation for some POC devices and tests, orientation guides for POCT, surveys of blood glucose measurements in wards, evaluation of oral therapy in self monitoring. Most of these DWTs were assignments of their employers.

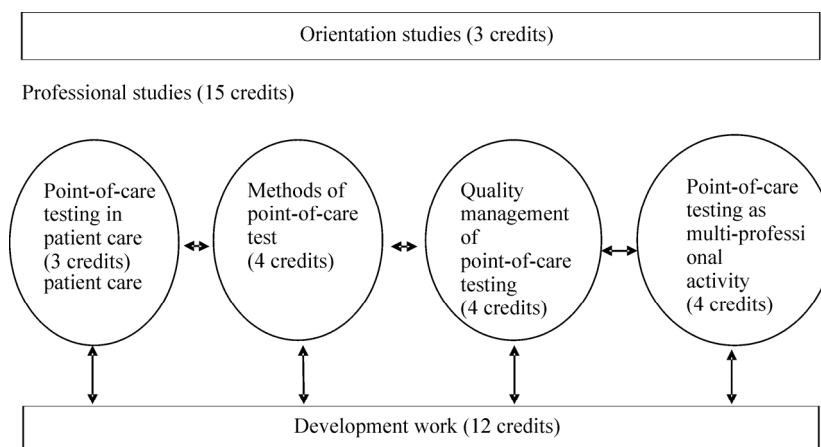


Figure 1. The structure of specialized studies in point-of-care testing

In recent years, technology has changed the way that education is delivered, and the Internet is central to the communication of information. Internet technology gives students an opportunity to learn anywhere and at anytime. It enables interaction with both the teacher and other students [1-2]. No differences have been observed in students' learning when comparing traditional teaching methods (face-to-face) and e-learning methods [3-4]. At the same time, Internet-based learning has been associated with a significant positive effect in improvement in the delivery of education to biomedical laboratory scientists [5-7] and other health professionals [8].

Recent developments in technology and the automation and centralization of laboratory activities have increased the use of POCT in health care situations [9-10]. POCT is defined as a laboratory measurement performed outside the traditional laboratory environment, usually at the bedside and by a non-laboratory-based professional. The most commonly used point-of-care test is that for blood glucose levels. Typically, nurses perform POC-tests. The role of the laboratory in the organization of POCT varies between hospitals and health centres. Clinical units have not, unfortunately, been able to prepare themselves for the increased use of POCT though proper training [11]. However, the im-

portance of training in the use of devices has been noted [12]. Thus, there is a need to co-ordinate POCT in health care situations. The co-ordination role could be undertaken by biomedical laboratory scientists since they have extensive knowledge of the subject.

Specialized study courses' in point-of-care testing were arranged for the first time in the academic year 2008-2009. These studies, for which 30 credits are available, comprise orientation studies, professional studies in point-of-care testing and a development work thesis (DWT), accounting for 12 of the credits (Figure 1). One credit is associated with 27 hours of work. The DWT is an important part of the specialized studies, carried out in collaboration with UASs and partners in the workplace. The purpose of development work is to deepen and broaden students' continuing professional learning and prepare them for a role in development projects [13]. Development work is an important part of continuing professional studies, consolidating the student's professional skills. During development work, students apply special field theory and methods of work to learn and practice skills, in order to develop and demonstrate their ability to apply knowledge and skills. This allows them to undertake specialist POCT tasks. It has been recommended by educators that the develop-

ment work projects undertaken by students be reported as articles in professional journals. The studies take one year while the learners work as biomedical laboratory scientists.

The purpose of this study was to describe, from an educator's viewpoint, the development work thesis (DWT) as a tool for continuing professional development within specialized studies in point-of-care testing (POCT). This study should support the development of specialized studies in POCT as well as other specialized studies at UASs. Continuing professional education (CPE) allows individuals to undertake lifelong learning in order to enhance skills and knowledge, leading to improved performance in the workplace [14]. Little research has been published relating to the CPE of biomedical laboratory scientists. A research- and development-oriented approach is essential in CPE because it offers employees the opportunity to develop both themselves and their workplace [13]. This study reveals aspects of DWTs that should be considered when incorporating such projects into CPE.

Materials and Methods

Focus groups and participants

A total of nine educators attended three focus groups; two to five individuals attended each session. There were two educators from Helsinki Metropolia University of Applied Sciences, one from North Karelia University of Applied Sciences, two from Oulu University of Applied Sciences, two from Savonia University of Applied Sciences, and two from Tampere University of Applied Sciences.

We chose a focus-group format, since group discussion and dynamics increase the ability to access multiple perspectives and can lead to a broader and richer description of the topic than a series of individual interviews [15]. Focus group interviews have been used in studies of decision-making, communication, ways of thinking and actions of health care professionals [16-17].

The educators at UAS are eager to develop specialized study education, so there was full participation in the discussions. Two of the discussions took place in private rooms during the educators' annual conference in Helsinki and one at Tampere UAS in January 2010.

Interviews and study questions

The interview themes were based on the assessment criteria used in the UAS national thesis competition. This competition is an annual event, aimed at improving the quality of theses and supporting the culture of thesis writing in the UASs. The interview themes were: (1) connections to professional practice; (2) methods and results of development work; and (3) reporting. The interviews consisted of an interviewer asking the educators about these themes, asking predefined questions where appropriate. All interviews were audio-taped, and lasted between 27 and 90 minutes.

The questions addressed in the study were:

- (1) What kind of connections are there between development work and professional practice?
- (2) What types of methods and results were seen in development work?
- (3) What kind of reporting of development work was there?"

When collecting data, informed consent [18] was obtained. The educators were informed about the purpose of the study and that it was voluntary and anonymous in nature. Ethical approval from the organization was not needed.

Analysis

The audio-tapes were transcribed and the data were analysed using inductive content analysis, which is a qualitative approach [18-19]. Qualitative research investigates phenomena, typically in an in-depth and holistic fashion, through the collection of rich narrative materials using a flexible research design. The analysis of qualitative data is an active and interactive process [19]. Qualitative data are analysed in five stages: familiarization, identifying a thematic framework, indexing, charting and mapping, and interpretation [20]. Content analysis is the process of organizing and integrating narrative, qualitative information according to emerging themes and concepts; classically, a procedure for analysing written or verbal communications in a systematic and objective fashion, typically with the goal of finding quantitatively measuring variables [18]. Inductive content analysis includes open coding, creating categories and abstraction [21]. The unit of analysis selected was, in this case, a theme (the three described in the previous section). Then the qualitative data were organized by open coding, creating categories and abstractions. The written material was re-read, and notes made in the margins describing various aspects of the content. Headings were created based on these notes. Based on the content

(similarities of meaning), headings were classified into subcategories and then into further categories (Figure 2). Names were allocated to these categories according to their content. One researcher coded the transcripts, whilst another researcher read the transcripts and checked the categories against the original data. All researchers discussed the categorization and a consensus was reached.

Results

Four main categories were generated from focus group interview data: 1) Connection with the world of work; 2) Implementation for DWT practice; 3) Challenges associated with development work and 4) Suggestions for future specialized studies. The main groups of categories and subcategories are illustrated in Table 1.

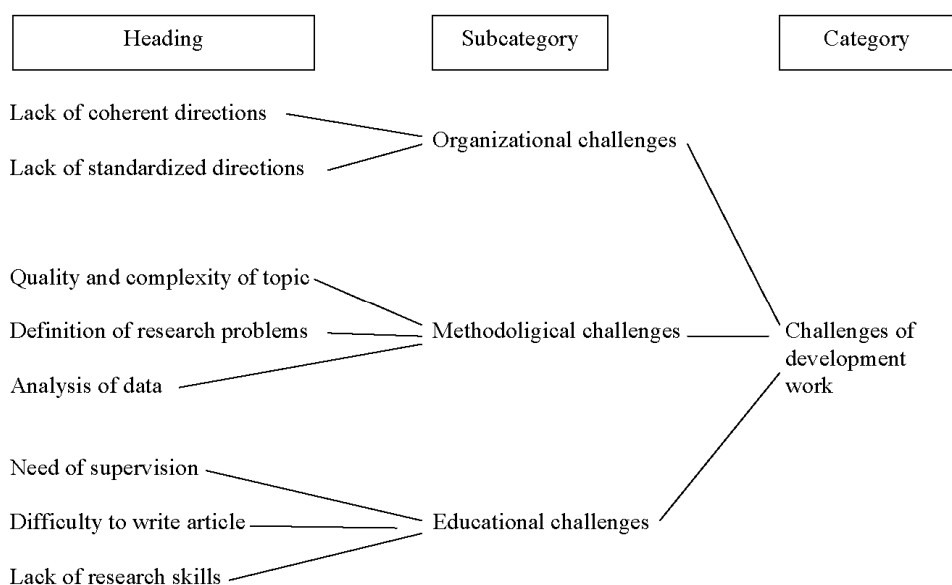


Figure 2. An example of the abstraction process

Table 1. Categories and subcategories emerging from the data

Categories	Subcategories
Connection with the world of work	Foundation of development work within workplace Relevance to work community Part of workplace development
Implementation of development work thesis recommendations	Reporting development work Development work procedure
Challenges of development work	Organizational challenges Methodological challenges Educational challenges Actual areas of work
Suggestions for future specialized studies	Educational needs Organizational needs Reporting needs

Connection with the world of work

DWT projects were intimately linked with the world of work, so their foundations were rooted there, and they engendered communication within the workplace. The subjects of DWTs were relevant to the work community and were a part of workplace development as a whole. Some of the DWT projects were commissioned but a few DWT topics originated from the students. Many topics were both conventional and non-innovative:

... XXX has shown that their motives (the world of work) to participate in this task were that it (the development work thesis) fulfilled the current requirements of the world of work in one way or another... (Educator 7)

In general, DWTs cover such topics as the validation of POC devices, POC inquiries and writing work procedures.

One related to the validation of a Clinitek Status device... (Educator 1)

More or less all of them concerned the familiarization programme and its instructions. (Educator 8)

The research showed that DWTs brought about communication within the workplace and that their results were used to develop and to challenge the work being carried out there. However, not all the results of DWT projects were used. The educators found that students' views of the development required within POCT were well informed. There was cooperation within the workplace, with workplace representatives contributing to the DWTs.

...evidently such matters came up and these can be developed and have already been developed in the workplace (Educator 4)

The sales representatives of point-of-care testing equipment took part in our development work. (Educator 2)

Implementation of DWT recommendations

How DWTs were implemented in the workplace depended on how students worked on them and how they presented the final report. The final report was either in the form of a paper and or a traditional thesis. Some educators accepted a traditional thesis as the correct way of presenting the report whilst others considered that writing an article was a good learning experience as this method improves critical and analytical thinking.

So if you ask me, this article is quite good and it teaches critical and analytical thinking... (Educator 4)

A DWT was carried out by both individuals and in pairs with peer support and peer supervision. The students developed a good team spirit; they received feedback and peer support, as well as support from educators and collaborative partners in the workplace.

... they were all eager and team spirit was good. They inspired each other all the time. (Educator 5)

Challenges of development work

Four types of challenge arose whilst undertaking a DWT: along with the challenge of carrying out the DWT, there were methodological, organizational and educational challenges. Most of the challenges were related to carrying out the DWT. When it came to writing the article, the students needed supervision and workshops were arranged to help them develop their writing skills. When constructing and writing the article, they needed supervision, which the educators found laborious and time-consuming. Students considered writing to be demanding because they were inexperienced. They also thought that there was not enough time allowed for the DWT. All these issues were compounded by the students' lack of research skills and the fact that they were not used to reading scientific articles. They also did not have a sufficiently strong theoretical background.

Formulating questions is as such quite a skill, and to be quite honest, the students need lot of help and supervision... (Educator 1)

As far as writing is concerned, it was challenging, perhaps the biggest challenge

was to produce clear enough writing... (Educator 2)

Yeah, it was hard work in the autumn to reform the whole point-of-care testing system, and it was of course not possible with only one development work project. (Educator 9)

The methodological challenges were associated with the quality and complexity of the topic, the definition of research problems and the analysis of the data. The challenges to the quality of the DWT included the lack of data, problems with methodological quality, and unreliable results. The students were given different guidelines by different educators.

... in my opinion our students needed to study research methods. (Educator 9)

... students' knowledge ended when it came to statistical analysis... (Educator 7)

The *organizational challenges* were related to a lack of coherent and standardized directions on how a DWT should be produced. There was vagueness about aspects of the DWT.

For example, there were different guidelines to reporting. Some students only did the articles ... and our students did whole reports and also an article, but not all students wrote an article. (Educator 8)

The educators were challenged by how difficult it was to supervise the writing of articles and not knowing of the content of discussions concerning DWT topics at the beginning of the project.

At that stage we did not know anything about what is happening in xxxx (name of town), like what discussions there are and what they are like, what kind of topics our students suggest and all that. (Educator 9)

Suggestions for future specialized studies

The educators who were interviewed suggested that subjects for future specialized studies should be related to actual areas of work as well as dealing with educational and organizational needs. Where subjects were

related to actual work requirements, it was suggested that there should be continuity and relevance of the topics, and there should be discussion about the results in the workplace. The topics should be based on work that had been researched for previous DWTs. Discussions about DWTs and their continuation in the workplace would be useful. Educators recommended that the results and their conclusions should be made more widely known in the workplace.

It would be fine if the next group of students, students in specialized studies of point-of-care testing, could continue development of the work that the first students have started ... (Educator 3)

Suggestions relating to the educational element of DWTs included examining prerequisites, exploiting networks, studying methods, developing guidelines for writing articles, alternative ways of reporting and encouraging communication. It was suggested that the prerequisites that students should have were knowledge of DWT methods, basic understanding of point-of-care testing, approaches to research, and an emphasis on critical and analytical thinking. Students used networks, both social and computer, to develop and discuss their articles and indeed their whole DWTs. The challenges presented by methods of studying were identified as finding alternative ways to study, compulsory methodological studies, more active study methods, existing study materials and consultation. The development of guidelines for writing articles consisted of supervision of DWTs and writing an article early in the research process. Alternative methods of reporting included different formats and ways of reporting in written form.

... it occurred to me that students could present a poster or give a lecture at a conference or something else comparable. Then the results and their importance would be disseminated... (Educator 6)

Suggestions for improving organization included an agreement of common guidelines, a common definition of policy, and allowing different forms of reporting.

I wish that in future specialized studies, at least the development work could be standardized between these universities of applied sciences by means of a set of guiding principles... (Educator 9)

Discussion

The educators who were interviewed identified that the DWT in specialized studies in POCT are connected to the world of work, implementation of DWT recommendations, the challenges of development work and suggestions for future development of DWTs. According to the current curriculum, the DWT is based on actual work, which was one of the main objectives of DWTs [13]. However, the DWT could be more innovative, and although it encouraged some communication within the workplace, there could be a greater practical adoption of the recommendations resulting from DWTs. This could be achieved by bringing the results of DWTs to the workplace e.g. by presenting the results in laboratories and hospital wards. Working in groups provides support for students [22] as evidenced in this study.

There were only a few problems with the way in which DWTs were implemented. Biomedical laboratory scientists needed a great deal of supervision when undertaking their DWTs. They seemed to need more training in both research methods along with relevant guidelines. Some students were educated only to diploma-level, which meant they had little research knowledge.

There were some challenges identified that need to be overcome in the future, in particular issues with the methods used in research and the writing element of the DWT. Although recommended, not all students wrote an article; this was probably due in part to inexperience, most students having never written an article before. Educators also play an important role in motivating students to write and their considerable contribution to the writing process definitely helped. As paper-writing skills make up one of the sections included in the special competence system of the Association of Biomedical Laboratory Scientists in Finland, clinical laboratory scientists should be encouraged to write such articles.

Students need to be aware of the wide range of research methods available because a variety of these may be relevant to their DWT research. Training in research methods can be delivered in a variety of ways, including e-learning. It is also worth considering the use of workshops where students could receive supervision in the research methods they need for their DWT. Common guidelines should be agreed in joint meetings between everyone involved with the DWT.

DWTs address real work issues and can be of benefit to the workplace. The cooperation of educators and students with mentors in the workplace is fundamental in

carrying out DWTs in the future. Cooperation between educators and partners in the workplace can be a productive exercise. The benefits of flexible cooperation within the world of work cannot be overemphasized when applied to professional development.

Continuing professional learning is important for all health professionals, and its importance for biomedical scientists has also been highlighted [23]. According to the study presented here, DWTs are an essential part of specialized studies. E-learning is an excellent way to continue lifelong learning. Biomedical scientists have a positive attitude towards continuing education [24] and they are comfortable using e-learning [25]. Finnish biomedical laboratory scientists have limited opportunities for formal continuing professional development. Specialized studies coupled with DWTs are an essential opportunity for them, particularly as the future of biomedical laboratory science education at university level is unclear at the moment.

Focus groups require a certain number of participants to function properly and to help those participants examine their views more thoroughly than in one-to-one interviews [26-27]. The relatively small number of participants may weaken the credibility of the findings. In the study presented here, the small number of participants in the group was not found to be problematic, as the interpersonal communication skills of those involved were good. The educators were happy to express their views and they were all active in focus group discussions. They were eager to develop DWTs within POCT-specialized studies. The atmosphere in the groups was quite friendly. Furthermore, the small number of participants meant that everyone had a good opportunity to recount their individual experiences.

The focus group interviews made it possible to gain an insight into the experiences of educators when they tried to implement guidelines, and helped us to identify what they considered the most important factors in implementation. The interviewer was experienced in leading groups, and this helped in conducting focus group interviews. All the participants expressed their opinions openly and honestly; five of them were also co-authors of this article. They did not, however, participate in the analysis of the data but they designed the study together with the other researchers and approved the manuscript.

Content analysis provided a relevant implement to describe, from an educator's viewpoint, DWT as a tool for continuing professional development within specialized studies in POCT. This analysis method organized clearly narrative information to emerging themes. The results have their unique value, as they highlighted DWT

as a tool for continuing professional development from an educator's viewpoint.

In conclusion, the development work thesis offered a functional tool for the continuing professional development of biomedical laboratory scientists as far as educators were concerned. This study has provided ideas for the further development of specialized studies, especially regarding organization and development of work methodology.

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