

Digital diet planning task in a Food and health subject curriculum in teacher education

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Abstract

This practitioners' inquiry focuses on students' and teacher educator's experiences and reflections in implementing a digital diet planning task (DPT) as a learning/teaching method in an academic primary and secondary school teacher education at Oslo Metropolitan University (OsloMet). DPT involved students individually registering of all foods and beverages they ate during a 24-hour period, computing nutrients and energy consumptions by using a digital program and evaluated their diets by comparing these with the Norwegian Health Directorate's nutrients and diet recommendations. They also reflected on what food they could remove or substitute in order to consume a healthier diet.

The data was collected by a questionnaire administered to 23 students, interviews of eight students, and teacher educator's observation notes. The findings indicate that the task made the students more aware of healthy food choices based on scientific knowledge and regarded DPT as relevant to their future teacher careers. Most students responded positively to DPT as a teaching/learning method and meant that DPT supported their learning of the subjects' content knowledge but only little new digital skills. The results indicate that several students had propositional content knowledge, teachers' knowledge and professional knowledge.

KEYWORDS: FOOD AND HEALTH SUBJECT CURRICULUM (FH1), TEACHER EDUCATION (TE), DIGITAL DIET PLANNING TASK (DPT), PRACTITIONERS' RESEARCH, STUDENTS' LEARNING.

Introduction

In Norway, the political expectations for teacher educators' and teachers' professional competence are high (The Norwegian Ministry of Education and Research, 2018). The teacher educators are stakeholders in teacher education (TE) (Selmer, Bernstein, & Bolyard, 2016). They contribute to the education quality in many ways not only because they may model exemplary teaching (Lindstøl, 2017), but also because their understanding of knowledge influence how they prioritise and organise the contents in teaching. Teachers' knowledge is discussed in research literature and several concepts are used in describing teachers' knowledge base. Shulman (1986) uses "subject matter content knowledge" referring to disciplinary content knowledge, and "pedagogical content knowledge" when referring to "distinctive bodies of knowledge for teaching" representing "blending of contents and pedagogy into an understanding how particular topics..." can be taught, as categories in teachers' knowledge base. Winch (2014) writes about professional knowledge and uses the concepts "knowing that"-knowledge in describing the theory behind a professional practice and "knowing how to"-knowledge in describing how to use theory in the professional work. Furthermore,

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the expectations of research-based teaching requires a double role wherein teacher educators not only teach but also are active members in researcher communities (Munthe & Rogne, 2015).

TE in Norway should be research- and experience based, while simultaneous innovative and professionally oriented (Regulations on the plan for primary school teacher education, years 5-10, 2016). Policymakers expect that teacher education institutions develop effective evidence-based practices (EBP). However, EBP has been discussed widely. Several definitions has been suggested without any consensus (Biesta, 2013; Cordingley, 2008; Kvernbekk, 2016). However, research perspective on learning activities can strengthen students' abilities in learning how to teach (Korthagen, Loughran & Russel, 2006). Accomplishing evidence based teaching practices requires including practical and theoretical perspectives on teaching, and using newer constructivist learning theories (Canepescu, 2009), which emphasize student centred learning methods.

Several researchers have documented that although student-centered learning can be understood in different ways, it generally has positive influence on students learning. Bonwell & Eison (1991) write about strategies for promoting active learning. They remarked that active learning in the context of higher education demands that students are involved directly in higher-order thinking tasks such as analysis, synthesis and evaluation. Student-centered learning can be seen as learning in which students are encouraged to control their own learning processes to reach desired learning outcomes (Schleizer, 2011). Hattie (2012) summarised his findings in this area by highlighting students' capability in self-regulation, self-monitoring, self-evaluation, self-assessment and self-teaching. He emphasised the importance of teachers' considering themselves as evaluators of how their teaching affects students' learning. Findings in our previous study about inquiry-based learning in student-led lessons in the context of course food and health 1 (FHI) in TE (Müller & Sjøberg, 2017) show that student-led lessons can be an effective method for developing student-centered learning. Teaching/learning method refers here to how the content is taught and learned.

Digital skills are part of teachers' knowledge base and professional knowledge. Tømte, Kårstein & Olesen (2013) studied how teacher students develop professional digital knowledge and skills in creating pedagogical practices by using information- and communication technology during their education. Concerning digital competencies, they observed a gap between the political expectations and practices in TE. Gudmundsdottir, Loftsgård & Ottestad (2014) pointed out that students are expected to keep pace with the developments in societies' digital technology because digital competence provides opportunities for developing new and varied teaching/learning methods.

The TE subject FH in Norway and the equivalent international subject Home Economics are scarcely studied field in which little is known about how students develop subjects' content knowledge, pedagogical content knowledge and professional knowledge.

Aim

The aim of this study is to analyse and describe students' and teacher educators' experiences and reflections in implementing the digital diet planning task (DPT) as teaching/learning method in the course Food and Health 1, in primary and secondary school teacher education at Oslo Metropolitan University (OsloMet) in Norway.

Context of the study

The context of the study is the course FH1 (30 ECTS) at Oslo Metropolitan University (OsloMet). In 2006 the subject Food and Health (FH) replaced Home Economics in the Norwegian national curriculums in primary and secondary school education (The Norwegian Directorate for Education and training, 2006). National guidelines (National Council for Teacher Education (NCTE), 2016) complement the regulations and are mandatory basis for designing local course plans. The guidelines express the expectation for the students' learning to teach the basic skills including digital skills, as part of their future professional competencies, and the expected learning outcomes for students' learning in various subjects.

Learning outcomes are commonly understood as the learning results that students are expected to achieve at the end of their studies (Ross, 2000). However, different definitions of learning outcomes have been suggested (Prøitz, 2010) in order to emphasise a more process-oriented understanding. In

this study, the following learning outcomes were chosen as the most relevant for students' working with the DPT.

The student:

- has knowledge of foodstuffs and food processing, and knowledge about general education on healthy food.
- is capable of using digital tools in teaching.
- is capable of critically assessing dietary information and teaching materials according to the existing research.
- is capable of using subject specific concepts and terminology and of finding, applying and assessing research-based knowledge of relevance to the subject FH.

Digital diet planning task

DPT is one of the work requirements for the course FH1 and DPT is one of the compulsory assignments that must be approved by the teacher educator before the student gets access to the final exam. The students used the DPT in assessing the nutritional quality of their own one-day diet compared to the Norwegian Health Directorate's recommendations for nutrients and diet (2011). The learning goals for the DPT were developed according to the learning outcomes mentioned previously. The goals specify the subjects' content knowledge and pedagogical content knowledge in DPT. They were used as a starting point for assessing students work with DPT. The learning goals for DPT are:

The student:

- is able to evaluate information about foods and processed foods, register diets, calculate the nutritional content in food and understand how different nutrients promote health in the population.
- can replace some foods in her/his own diet for achieving healthier diet.
- can use digital tools for learning in subject FH
- is able to consider and use the DPT as learning/teaching method
- can critically assess and/or compare diet information and the results of their diet registrations with the existing recommendations for nutrients and health promoting diets.

The students documented their work with DPT in a written report delivered individually in to a digital learning platform for feedback and approval from the teacher educator. To register their one-day diet, the students used the digital diet planning calculation program "Kostholdsplanleggeren", developed by nutritional experts at the Norwegian Directorate of Health and The Norwegian Food Safety Authority (n.d.). The diet calculation planner is an educational diet calculation program designed to display, compare and calculate nutritional content in various foods, meals, small and large menus. It is a free data program, a suitable teaching/learning method in the subject FH in primary- and secondary schools, teacher education, in nutrition and health science courses in higher education, private enterprises, and also useful for individuals.

Working with DPT, the students calculated the energy (kcal/kJ) in foods they ate and estimated their total energy consumption in terms of the chosen physical activity level (PAL). Furthermore, they calculated the amounts of protein, fat, carbohydrates, dietary fibre, vitamins, trace elements and minerals. It was also necessary to calculate the energy percent originated from proteins, fats and carbohydrates. Fat quality in terms of fatty acid composition was also evaluated. Each of the nutrients, included vitamins and minerals, was evaluated separately. The registered amounts of nutrients in the student's diet were compared with the official nutritional recommendations (Norwegian Directorate of health, 2011) and the results were evaluated.

The students reported how they assessed the under- or over-consumed nutrients to discover how they could improve the nutritional quality of their diets. If the calculated figures in the diet deviated from the nutritional recommendations, the students were to suggest what kind of other foods should be substituted to obtain a healthier diet. In performing this task, the students utilised the nutritional textbook, used individual tables or graphics from the digital program and enclosed these in their final report. Thus, by working with the DPT, the student learned to construct knowledge about their own diets, compare and evaluate their diet against the official recommendations for nutrition and diet.

Methods

This empirical study is a practitioners' inquiry focusing on teacher educator's and her students' experiences and reflections in implementing the digital diet-planning task (DPT) as a learning/teaching method. It is research- and development work (Cochran-Smith & Lytle, 2009; Cordingely, 2008; Munby, Russell & Martin, 2001) aiming to develop our own teaching practice at the TE course FH1 at OsloMet. However, the results can also be useful in other similar contexts.

The data consist information from three sources: A questionnaire from 23 students, interviews of 8 students and teacher educator's observation notes. The printed questionnaire (Dalland, 2000) with open-ended, evaluative questions based on our earlier teaching experiences was developed to gain an overall picture of 23 of our 32 students' experiences with DPT. The students answered questions anonymously at the university after finished the task. The main questions mapped how the students experienced the importance and relevance of the task and in what extend DPT helped them attain the learning goals. We read the students' answers to the questionnaire several times, and summarized them. To gain a deeper understanding of the students' experiences and reflections on the task, an interview guide was constructed for piloting the semi-structured face- to face interviews (Brinkmann & Kvale, 2015). The teacher educator's field notes (Angrosino, 2007) consisted of their systematic observations and reflections on the students' work with DPT and their evaluations of the students' reports. We analyzed data manually by adapting the content analysis method (Hsieh & Shannon, 2005). However, interviews produced only minor data in this study. We present the results of the data analysis in the following sections, findings and discussion, after the ethical aspects of the study.

Ethical considerations

Our research followed the recognised ethical standards drawn up by the Norwegian National Committee for Research Ethics in the Social Sciences and the Humanities (2016) to protect the individual students' confidentiality. We informed the students about the study in advance, and asked for a voluntary participation. Students could withdraw their participation at any time and the students' identities were kept entirely anonymous.

Findings and discussion

This study show that DPT has several benefits for the students' learning and the teacher educators' teaching. The teacher educator developed and implemented DPT for meeting the requirements for research- and experience- based, professionally oriented teacher education where students' active learning is prioritised. The students should learn how to calculate the nutrients effectively, compare and analyse their food and beverage consumption with official recommendations, and evaluate their daily diets with the existing research-based knowledge about nutrients and diet which means that the DPT has potential in contributing to the development of higher-order thinking skills.

Students' experiences, reflections and considerations

The summary of the students' answers to the questionnaire indicated that students had experienced benefits from the diet planning program as a teaching/learning method. In the questionnaire, many interesting, positive answers and few negative ones were found. The DPT gave students the opportunity to learn and apply research-based nutritional knowledge and understand what constitutes a health promoting diet (The Norwegian directorate for health, 2011).

The national guidelines for TE (NCTE, 2016) and national curriculum for primary- and secondary school (Education Directorate, 2006), require that teacher students and pupils learn knowledge about nutrition and can use it in choosing their foods. The following quote from the questionnaire illustrates subject matter content knowledge the student has gained (Shulman, 1986) about nutrition "I attained more knowledge about nutrients and their importance to the body". Another student seemed to have learned professional knowled when combining the "knowing that" and "knowing how" knowledge about nutrition: "[...] good to get to know the diet calculation programme and to apply theory in practice".

The overall purpose of TE in different countries is to teach students how to teach school subjects (Donche & Van Petegem, 2011). However, the results of our analysis indicated that several students used subject matter content knowledge about healthy diet in different contexts, and produced new

contextualised practical knowledge which refers to their learning of professional knowledge. One student expressed it in this way: “[...] a lot of knowledge relevant to the Food and health profession”.

In Norway, it is expected that teaching is research and experience based on all levels of education (Munthe & Rogne, 2015). Knowledge about nutrition in the course FH1 is an example of research based knowledge. The DPT gives the students experiences of using nutritional knowledge in adjusting their own one-day diet, and how it can be taught and learned. The students need also experiences in how to make professional judgements, for example when choosing the contents and methods for teaching nutrition. Our students’ answers in the questionnaire indicated that they had experienced benefits with DPT as a content and method in their learning processes.

Our data show that the DPT contributed to research based TE (Munthe & Rogne, 2015) in several ways. The students gained knowledge about nutrients and diet from the official recommendations that are based on a large amount of international research. One student wrote that “[...] one gets a chance to compare with recommendations from the Health Directorate”. The students also orientated themselves with nutritional disciplinary vocabulary when discovering, applying and evaluating research based knowledge relevant to the school subject FH. Because the official recommendations are simplified into every-day language in order to be understood by many different target groups, the students considered the differences between scientific, professional concepts and informal language. The diet planning program updates regularly according to new research, and thus gives students access to the recent information. We suggest that this task can have a potential in making the students more aware of the healthiness of their own food choices based on scientific evidence which can give a good start when they teach nutrition to the pupils. Comments from two students underpin this: “I have become more conscious of my own diet” and “Nice task to see nutritional content in your own diet and to be aware of the changes that can be profitable”.

Several students were positive about using the DPT in their future professional life in primary-and secondary schools. Following examples from the interview data highlights this: “I think it was an educational experience which I can use in teaching my pupils as well”. The diet calculation program is probably suited for slightly older pupils, as another student stated that DPT could be used as a teaching material, content and method in teaching:

“Especially in secondary school [...] pupils can learn what they eat [...], nutritional content is important, [...] the teacher can give demonstrations with the digital diet planning program”. One student wrote that the food registering provided fewer opportunities for learning, while it was instructive to analyse the figures. This indicates that the student understood that the task involves some routine work, but also that for a teacher there was something more challenging to be considered. Furthermore, the students experienced how the teacher educators used the DPT as a teaching method in FH1. Model learning (Lindstøl, 2017) is usual in TE and refers to one of the strategies how students learn teaching and gain pedagogic content knowledge (Shulman, 1986).

This study give no clear impression of whether students recognise DPT as a student-active learning or not. However, one student meant, “I learnt little about the lack of nutrients in the diet [...] but more about nutrients and got involved in changes one should make in the diet and the consequences of not making changes”. This could possibly mean that this student considered this task as a form of active learning form because the student used the active verb phrase “get involved in” in describing DPT. One student commented that DPT was an active process: “I generally had little knowledge about this [nutrition], so it was very educational [...] one learns a lot about working with the task [...] and about a day’s diet”. Another student argued that the task “makes one take more conscious food choices”.

One student evaluated the advantages of DPT on her/his own measurement scale: “The benefits were an 8 out 10”. Another commented “No need to change anything for me” which indicates that the student was satisfied with the task, and she answered all the questions positively. This supports our consideration that positioning oneself positively in a learning process can possibly assist learning. Most students had no trouble in understanding the diet planning program *Kostholdsplanleggeren* which one student indicated: “A simple program that did much of the job. Only the interpretation we had to do ourselves”. Another student claimed in the interview that, “...our generation has high digital skills”. Thus, we believe that DPT had minimal influence on the most of our students’ learning of digital skills. However, two of 23 students thought that the DPT was difficult and complicated. Furthermore, one of these students wished that “we could have had a little more teaching in the

classroom first”. Another student did not see much importance in evaluating the final part in the task and commented “[...] the discussion (evaluating) of the task was least relevant”. Our opinion is that the evaluating at the end of the task is important because it concerns the whole task and fosters critical and reflective thinking. Some of the students show critical thinking concerning the data program by writing about its weaknesses such as: “[...] I learned little about the lack of nutrients in the diet” and “[...] all the foods were not registered in the diet planner calculation programme”. One student’s comment in the questionnaire show a clear negative attitude towards DPT. Because she was previously familiar with the program she did not achieve much new knowledge, nor did she see the pedagogical benefits of the task.

Teacher educators’ considerations

In addition to the responses from the student questionnaires and interviews, the teacher educator’s notes gave a lot of information and provided a fruitful base for critical reflections of our own professional practice. As a practitioners’ inquiry, this research provides in our opinion valuable contextualized information (Cochran-Smith & Lytle, 2009). Furthermore, this study can also be described as evidence informed practice (Cordingley, 2009) and experience-based learning in TE.

The DPT provides an example of how digital skills can be useful and improve efficiency in teaching/learning the subject. A task using diet registration over such a short term is not representative of the students’ diets. However, it can be an applicable method to raise the students’ awareness of their actual food consumption during a single day, learn more about health-promoting diets based on the official recommendations, and learn how to use this digital tool in teaching. Furthermore, the focus in DPT is on learning pedagogical content knowledge (the teaching method) and the main principles of diet evaluation (disciplinary content knowledge). Students learned from DPT how to evaluate diets in general, and how a student can evaluate her/his own one-day diets in particular. For students, this can be a motivating example of how new contextual knowledge can be constructed.

In many countries, the national learning outcomes are expected to guide teacher educators’ teaching (Walvoord, 2010). The learning outcomes are the statements of what the students should have learned at the end of the FH1 course, and the learning goals describe what the teacher educator expects the students will learn by working with the DPT. What a student should learn to be qualified as a FH teacher in Norway changed in 2006 when the subject Home Economics became Food and health. Globally, the nature of Home Economics as a field of knowledge is multiple and changing (Pendergast, McGregor & Turkki, 2012). For example, the subject has different names and goals, contents and frame factors in different countries. In Norway in the course FH1, one of the main focus in learning outcomes in TE is on the relation between food and health and knowledge in nutrition is important content. DPT was developed for creating a holistic view on nutritional knowledge. Continually asking critical questions about our teaching is important for developing our pedagogical practice.

During the observations the students, the teacher educator raised several questions concerning the learning goals in her notes:

- How did students’ learning goals relate with content and teaching /learning methods in DPT?
- What were the criteria for approving the students’ reports?
- What was the minimum of skills required?
- How does the DPT facilitate new views on learning and teaching as well as on knowledge and professional practice?

The teacher educator observed that the instruction of how the digital diet planning program work could have been better for some students with low digital skills. Our experience is that it is important for the teacher educator to demonstrate thoroughly how the digital diet program works. After completing this study, we reviewed the details in the written sheet about the functions in the digital diet program. It is essential that the teacher educators are available for questions during students’ work, so that they can clarify the task and better support students’ learning. Teachers should ensure that the students have understood what they are expected to learn, and try to communicate the learning goals in such a way that it is clear for students how to work towards achieving them. In our opinion, it is more important to set advanced goals than “do your best” goals because general formulations of learning targets can easily take attention away from achieving the learning outcomes

and competences. Therefore, clear goals for the task is crucial for students' success. According to the teacher educators' notes, most of the students approached learning outcomes satisfactorily. However, this task is not the only context in which the students learn about nutrition. The course literature, other teaching methods and further information sources and tasks are included in the subject curriculum. To be able to solve the DPT, the students have to understand nutrition in some degree and need knowledge about the official diet recommendations, along with possessing some digital skills. The timing of different learning activities is another major factor in teaching success DTP was given early in the semester. Only the energising nutrients were included in the teacher educators' teaching content before the task was finished, and students had to use textbooks to acquire more knowledge, specifically about vitamins and minerals. However, our view is that over time the students might have gradually become capable of discovering how to teach about nutrients, diets and health and official recommendations.

Zafra-Gómez, Román-Martinez & GomezMiranda (2015) observed that students learned more and obtained better results if they conducted research projects as a team and worked together on activities. This raises the question of whether the DPT should be a group task or an individual task. Even if it is an individual task, the students can collaborate when they have recorded and analysed the data. We argue that the DPT can be seen as a student-centered and active learning method because the students decide when, where, how and with whom they want to work with. Thus they were responsible for their own learning activities (Cochran-Smith & Lytle, 2009); (Hattie, 2012). Additionally, DPT involves a shift from teaching basic skills to teach applied skills (Trilling & Fadel, 2009). Active learning, student-centered, learner-centered and project-based learning are concepts used in describing learning in which students play an active role in their own learning, and teachers are activators for learning rather than instructors. According to the constructivist approach to learning, students need innovative learning experiences to integrate new knowledge with existing knowledge, critical thinking and pedagogical reflections (Canepescu, 2009). The learners' active participation in the task is thus seen as a prerequisite for learning. This study indicates that the DPT comprises a high degree of student engagement, which is in line with constructivist learnings view.

An interesting question is whether students' learning was successful or not, and why. The students displayed skills such as problem-solving, creativity, critical- and reflective thinking to different degrees when working with the DPT. It is important that the educational use of digital technology support students' learning processes. The digital diet-planning tool used in this study provides several possibilities for using digital technology in FH1. For example, charts can be useful in presentations of numbers since visualising a numerical data is easier to comprehend. Digital technology seems to be used in solving practical problems and involves creativity rather than investigatory activity. Gudmundsdottir et al. (2014) do not elaborate why future teachers are not prepared to use digital tools in teacher education. Their findings support the mismatch between political expectations for students' learning digital skills and teacher educators' teaching practises when it comes to digital competence. However, most of the students considered "Kostholdsplanleggeren" as a simple digital program that did not affect their digital skills particularly.

All students received written feedback of their task performance concerning its positive aspects, weaknesses, and measures for improvement. Such teacher feedback is most effective when it stimulates students' reflective thinking (Van der Schaaf, Baartman, Prins, Oosterbaan & Schaap, 2013). However, more research is needed about students' varied perceptions and beliefs about feedback, for example how they respond to teachers' comments (Higgins, Hartley & Skelton, 2002) and what the students do with such feedback (Bailey & Garner, 2010). We conducted the study after students had received feedback and revealed response to DPT. Most of our students stated that they were satisfied with the task, which may indicate that they also were satisfied with our feedback. However, the evaluation and follow-up of students' learning are often lacking in teacher educators' teaching (OECD, 2013). Maggs (2012) suggested that a single higher education institution could make considerable improvements to its feedback practices. Feedback can be brief, concise comments and include an overview that highlight both the positive and negative sides of the evaluated work (Ferguson, 2011). The teacher educator found shortcomings in some students' tasks, especially in case of missing calculation of some minerals and vitamins and unsatisfactory evaluating of the diet compared to the official nutrition recommendations. Several students did an inadequate assessment of their diet and thus had inadequate improvements, such as changing one food product for another. Because of these insufficiencies, some students had to deliver two times before the task was approved.

The DPT contributed to the students' development of knowledge, skills and competences and gave also new reflections for teacher educators. The students attained subjects' content- and pedagogical content knowledge, and professional knowledge. The DPT promoted students' progressing towards the learning outcomes for knowledge and skills and general competence in FH1. Furthermore, most of the students began to achieve some expertise about diet planning, applying and using official information and evaluating diets and took ownership of their learning processes throughout this task. Professional knowledge is constructed when students apply several forms of knowledge and transform it into the knowledge they can use later in their teaching in schools (Cochran-Smith & Lytle, 2009). Furthermore, Winch (2014) suggests that expertise demands that an individual is able to find her/his own way how to teach the subject. The DPT can be designed to suit several different target groups so that it can be relevant and interesting in primary and secondary schools in several countries. At primary level, the teacher, for instance, show comparisons of foods from the diet program, such as fat percentage of whole milk, light milk and skim milk. In the secondary school, the pupils can use the digital program on their own with guidance. The DPT has proven to be an appropriate teaching/learning method for the FH1 course in TE. The DPT can be used in several countries to increase and facilitate the understanding of the nutritional content of foods and the recommended intake of different nutrients. We argue that DPT is a learning activity that contributes intentions in the national curriculum for primary- and secondary teacher education.

Conclusion

Our findings indicate that most students responded positively to the DPT as a student-centered teaching/learning method. The students and teacher educator reported that the DPT provided a good overview of the nutritional- and energy contents of foods, and information about energy consumption, and it enabled an effective diet evaluation based on the official nutrition recommendations. This task also made the students more aware of healthy food choices based on research- and experience based knowledge. The students regarded the learning experience as relevant for their future teaching career at schools. The results indicate that several students had propositional content knowledge, teachers' knowledge and professional knowledge.

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