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DERIVING LEARNING OUTCOMES FOR AN APPLIED HEALTH TECHNOLOGY COURSE FOR PHD STUDENTS

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Abstract

This study discusses the initial stage of development of a PhD course within the field of Applied Health Technology (AHT), in a multi-professional and transdisciplinary environment. The research aimed to align stakeholders' and PhD graduates' perspectives in order to create learning outcomes for a proposed AHT course. Semi-structured interviews were conducted with stakeholders and graduates of the programme, and the results were analysed using a qualitative content analysis method. The identified themes related to AHT perspectives, issues with working with AHT projects, programme goals, and course goals. These guided the creation of four strategically aligned learning outcomes for the proposed course.

Keywords: applied health technology, learning outcomes, PhD education, qualitative content analysis

Sammanfattning

Denna studie diskuterar den inledande fasen av utvecklingen av en doktorandkurs inom området för Tillämpad hälsoteknik (Applied Health Technology, AHT) i en tvärvetenskaplig miljö. Forskningen syftade till att samordna programansvarigas och före detta doktoranders perspektiv för att skapa lärandemål för en AHT-kurs. Semistrukturerade intervjuer genomfördes, och resultaten analyserades med hjälp av en kvalitativ innehållsanalys. De identifierade temana rörde AHT-perspektiv, problem med att arbeta med AHT-projekt, programmål och kursmål. Dessa vägledde skapandet av fyra strategiskt inriktade lärandemål för den nya kursen.

Nyckelord: Tillämpad hälsoteknik, lärandemål, doktorandutbildning, kvalitativ innehållsanalys

Methods

Setting

The study took place at the Department of Health in the Blekinge Institute of Technology (BTH) in Sweden, where interviews were performed from March to May of 2023. The Applied Health Technology (AHT) PhD programme at BTH aims at performing transdisciplinary research that involves both health and technology sciences, thus employing professionals from different areas.

Participants

This study collected data from two different groups of participants: stakeholders and graduated individuals from the AHT PhD programme. The stakeholder group comprised individuals who had an active role in the administration and decision-making in the AHT PhD programme at the time of the study. The graduated group included individuals who defended their PhD thesis in the AHT PhD programme before the time of the study. Recruitment used a purposive sampling approach (Polit & Beck, 2017). An email containing detailed relevant information about the study was sent to potential participants: three in the stakeholder group, all with positive replies, and seven in the graduated group, which resulted in four positive replies, two non-respondents and one negative reply.

Data Collection

Individual semi-structured interviews were conducted in person or through video conferences, according to participant preference and availability. In both cases, the interviews were carried out in reserved spaces without the presence of non-participants. An interview guide with open-ended questions was created separately for each group by the research team in accordance with the study objectives (see table 1). That allowed the capture of spontaneous and in-depth responses regarding the participants' experiences and opinions (Baumbusch, 2010). During the interviews, follow-up questions were asked for clarifications or in-depth explanations, based on the information provided by the participants. A pilot interview was carried out to ensure the validity of the proposed topic questions and to ensure consistency between the interviewers (the authors of the study). As changes were not deemed necessary, the pilot interview was added to the study.

The interviews lasted 15 to 45 minutes and were audio recorded and transcribed verbatim by the authors, with the removal of identifying information.

Table 1: Interview guides for the stakeholder and graduated groups

Stakeholder group	Graduated group
What does AHT mean to you?	What does AHT mean to you?
What do you envision the AHT PhD programme should achieve?	What have you gained from the courses you took that you think was helpful in your PhD?
What do you think the outcome of the course should be?	Did you face any difficulties regarding the technology/health sciences in your PhD?
What would you like the students to achieve with the new course, not related to the explicit content of the course?	What courses would you have liked to have been offered?
	Do you feel that you missed anything regarding your AHT studies?

Data analysis

The study employed the conventional content analysis method (Graneheim & Lundman, 2004), which comprises a systematic approach that is able to analyse manifest (descriptive) and latent (interpretative) contents regarding participants' experiences (Lindgren et al., 2020). The transcription of each interview was reviewed several times by the authors. The coding was done by both authors separately, and then compared for further abstraction. Two main themes were identified from the Graduates group: 'Applied Health Technology perspectives' and 'Working with Applied Health Technology projects'. Three main themes were identified from the Stakeholders group: 'Applied Health Technology perspectives', 'Programme Goals' and 'Course goals'.

Ethical considerations

This study was conducted in accordance with the Declaration of Helsinki (General Assembly of the World Medical Association, 2014). No personal data were gathered from the participants. The Head of the Department of Health at BTH was briefed and approval for the implementation of the study was obtained. The participants were briefed about the study context and goals, namely that their participation in the study was voluntary, they had the right to withdraw from the study at any time, and they were guaranteed confidentiality. Written consent was gathered in in-person interviews, and verbal consent from video-conference interviews. All data were anonymised. If one of the authors had a direct work relation with a participant, the interview was conducted by the other author in order to avoid bias.

Results

The main themes identified in the interviews with the Graduates and Stakeholders are further detailed and interpreted in this section. Based on knowledge gathered from these, learning outcomes for the PhD course in AHT were derived.

Applied health technology perspectives of graduates and stakeholders of the PhD programme

The first step of the analysis was to understand the perceptions of the two groups about the area of study. The categories identified by the Stakeholders are arranged in the stacked Venn diagram shown in figure 1. All the stakeholders approached the context as a starting point, e.g. changes in society and healthcare, digitalization, and the necessity to improve access to care. The problem emerges from the context into need-based questions. Then, technical solutions can be proposed based on stable technologies, with artificial intelligence being mentioned in all interviews. The development of a solution takes into consideration principles of Health Technology Assessment, i.e. the analysis of a health technology as to its value, effectiveness, costs and broad impact (*European Commission, 2023*), and co-creation with user involvement. Lastly, to enable this framework, the collaboration of different professionals in different areas is needed. These themes are identified in the following quote by Stakeholder 1: *“It’s not the development of new technology, that’s within product development, or computer science, or other things. It’s neither new medical, or caring working methods, could be in some way, but it comes to using technology in the work, so it’s more in the area of Health Technology Assessment in a broader perspective. To see what happens when you start using new technology in the health field, the health area. So, it should be about the implementation of this, it should be about how it affects the care workers, the working situation, could be also about how it affects the population or individuals’ health. It brings together different areas or different theories of research or science.”*

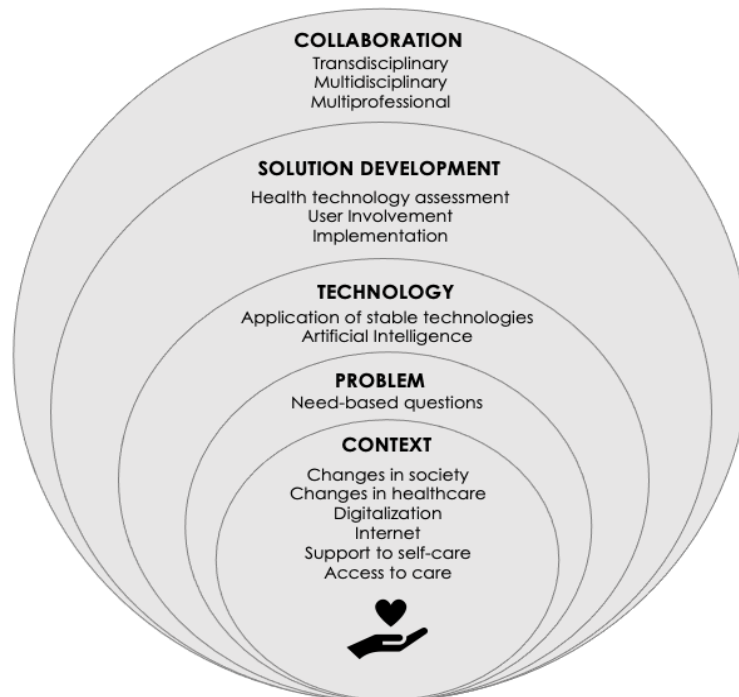


Figure 1: Representation of the area of AHT according to the stakeholders of the PhD programme

The graduates highlighted categories regarding multidisciplinary, application and Health Technology Assessment. Although the perspectives were somewhat aligned, the identified categories differ numerically and in terms of the depth. This is an important issue as it shows a conceptual gap that should be addressed by the proposed course.

Working with applied health technology projects

The second step of the analysis was to gain insights into the issues related to the work in the area, so the graduates described their experiences with working with AHT projects during their PhD studies. As a positive aspect, the graduates highlighted the mutual knowledge transfer that occurs as a consequence of the collaboration with professionals of other areas, providing enhanced perspectives of the new area as well as of their own field. Graduates also expressed the importance of interactions between areas in order to create a holistic view of how to solve problems in the project.

Two main issues were identified regarding the practical work with AHT projects. The category 'Challenge to connect health and technology' reveals the difficulty in integrating the different perspectives in the project. The graduates reported difficulty in understanding the problem from the other perspective, difficulty with the terminology, and lack of knowledge or interest in the other area. Most of the graduates stated that when these issues arose, they were mitigated by the supervisors' advice. This is expressed in the quote by Graduate 4: *"Somehow, the research needs to integrate both the technical perspective but also the health perspective. Then the question is: what kind of framework should you choose?"*. The category 'Communication problems with professionals of other areas' emerged from issues raised by the lack of effective communication between different areas, which hindered the shared understanding. The PhD projects varied in the level of interaction with actors from other areas. In projects without fruitful communication, the graduates expressed a lack of interest for the other area or the feeling of being lost.

Views about the applied health technology PhD programme goals

The third step of the analysis was to understand the stakeholders' views about the programme in AHT, where four categories emerged. Firstly, 'Create a platform for transdisciplinary research' was identified in all the interviews; this category expresses the vision of performing research that is inherently dedicated to address problems of the health area by employing various technologies. 'Cover the gap between technological researchers and the needs of health professionals' is a category that elaborates on the importance of establishing shared understanding and a common ground for developing effective solutions for the problems in the health area. This category emerged from the stakeholders when commenting on past experiences and highlighted the value of facilitating discussions and communication between professionals of different areas and of giving feedback. This is identified in a quote by Stakeholder 1: *"We saw a gap between the technological researchers developing things and the health professionals wanting to have tools, and they were not satisfied with what came out from the technological research, and the technological research did not understand what the health sector meant"*. The category 'Perform collaborative research' describes the importance of identifying and considering different perspectives in developing solutions. Finally, 'Principles of health technology assessment' highlights the importance of considering the consequences of the solutions developed by the research in a broader perspective, instead of a list of functional requirements. The implementation

of a new solution in healthcare affects society on multiple levels, and it can have varied economic, societal or health-associated consequences.

Views about a PhD course in applied health technology

The fourth step of the analysis was to gather the stakeholders' suggestions of what they consider important for the development of the proposed course, from which four categories emerged. The category 'Create a common base' was brought up by all stakeholders; this concerns being able to discuss with peers and collaborate in an effective way. For this to happen, the PhD students need knowledge about terminologies and the fundamentals of different disciplines. The collaboration aspect is highlighted in the category 'Integration of different perspectives', hence the integration of different theories in science and the merging of disciplines. The category 'Be aware of the areas of research in AHT' emerged from the fact that the projects within AHT tend to invite new ways to engage in inquiry, without any firm boundaries between disciplines. There is a need to think laterally, creatively, and imaginatively about solutions to problems. Therefore, it would be necessary to deliver health and technology concepts, common terms, and the major areas that are being addressed in recent research. This is quoted by Stakeholder 2: "*It's about Gerontechnology, it's about aging technology, it's about using artificial intelligence...*". Finally, 'Stimulate holistic thinking about the projects', is an important part of transdisciplinary research; this concerns critical thinking and consideration of the interconnections in the broader context of the project.

Learning outcomes for the applied health technology course for PhD students

Deriving relevant learning outcomes for the proposed course took into consideration the qualitative analysis of the interviews, which identified the issues faced by the graduates, the stakeholders' strategic views for the programme, and suggestions for the course. Four learning outcomes (LO) were crafted using the relational and extended abstract levels from the Structure of the Observed Learning Outcomes (SOLO) taxonomy (Biggs & Collis, 2014). These are shown in figure 2.

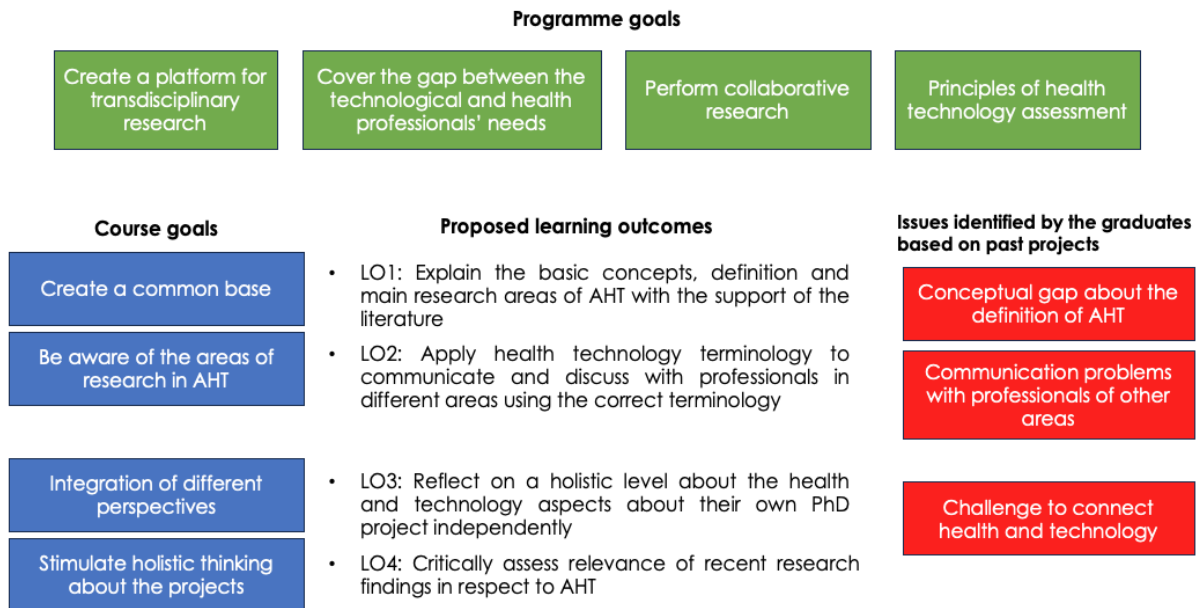


Figure 2: Proposed learning outcomes in the context of the identified programme goals, suggested course goals and issues faced by the graduates.

LO1 and LO2 cover the content regarding important concepts and different areas of AHT, addressing the issues related to communication with different actors and the understanding of AHT. LO3 and LO4 are more concerned with the integration between the health and technology areas. They address issues faced by the graduates in their PhD work and the stakeholders' views about transdisciplinary thinking in the projects. Hence, there is a clear difference in level, which could justify the separation of the course into a basic and an advanced course. The basic course would cover LO1 and LO2, aiming to create a common platform and constructing the basic knowledge that will allow the PhD students to have more productive interactions with actors from the other field. This course would be offered in the first year of the PhD studies. The advanced course would cover LO3 and LO4, with the objective of the integration of the areas, and would be more directed to the PhD students' specific projects. This course would be offered towards the end of the PhD studies.

Discussion

This work intended to describe the process of deriving LOs for a PhD course strategically aligned with the AHT programme. A qualitative content analysis was employed in order to obtain the latent and manifest views of the stakeholders and graduates of the programme and organize them into themes and categories. This process of analysing information facilitates the employment of the constructive alignment methodology, ensuring that the content and relevant views are harmonized to support the learning outcomes. Additionally, by incorporating the insights and experiences of the graduates, the course development process becomes more attuned to the students' needs and challenges, thereby enhancing the relevance and effectiveness of the proposed course.

The development of a multi-professional course in AHT is challenging because the students have different backgrounds and different needs and interests in terms of learning. Duncan et al. (2006) discuss

the development of multi-professional courses in terms of pan-professional curricula, which should focus on the content that is critically relevant to all the areas involved. These core concepts should be chosen by a multi-professional team, focusing on cross-field knowledge that is critical to create a common place where different professionals collaborate, rather remaining confined by their own professions. Another important aspect to be considered is the establishment of shared learning instead of shared teaching (Horsburgh et al., 2001). Shared teaching does not make use of educational strategies that enforce collaboration, being adopted often due to economic reasons. This practice delivers knowledge of different areas separately, which can reinforce stereotypes (Areskog, 1988). On the other hand, the shared learning approach is concerned with co-learning and with the knowledge, skills and attitudes that enable the students to understand and work in multi-professional settings (Horsburgh et al., 2001). These aspects are especially important in supporting the achievement of LO1 and LO2, which are more related to the students being able to fulfil the demands of their own discipline, gaining knowledge and acquiring awareness of other fields.

A student-centered approach could also be a useful tool in the proposed course. In this approach the students take responsibility for their own learning and actively process information with the help of their peers (Neumann, 2013; Palm et al., 2018). Supporting the students in identifying and critically assessing the transdisciplinary aspects in their own and their peers' projects gives the opportunity to transcend the boundaries of their disciplines and think holistically. These aspects are an especially important consideration in regard to supporting the achievement of LO3 and LO4, in which students should be able to go beyond their discipline.

This study comprised only seven participants, which could have affected the saturation of the content of the interviews, and this is a limitation of the presented work. However, all the stakeholders of the programme agreed to be interviewed. In addition to that, the graduated PhDs included individuals from both health and technology backgrounds; this was important in order to obtain the different perspectives and identify the issues faced in the transdisciplinary projects. Additionally, the groups were clearly delineated: stakeholders and graduates. This was a purposeful selection, which in the authors' opinions did not influence the results negatively. So arguably, the risk of selection bias was reduced.

Future work aims at the development of a course plan for the proposed course. The learning outcomes identified in this work must be discussed further with the stakeholders in a focus group to facilitate an exchange of views about the content for the course. This will be done in order to align the views of the programme and the course. In addition, syllabi of similar courses will be scanned and analysed for further information.

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