

ORIGINAL RESEARCH

Implementing a Swedish regionalized medical program supported by digital technologies: possibilities and challenges from a management perspective

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A B S T R A C T

Introduction: In 2011, Umeå University in Sweden was facing its first attempt to transform the existing medical program into a regionalized medical program (RMP), supported by the use of digital technologies. The Swedish RMP means that students are distributed in geographically separated groups while doing their five clinical clerkship semesters. To provide medical students with ways of undertaking their theoretical studies when geographically distributed, digital technologies are used for educational and administrative purposes. In this article, the Swedish RMP will be described and related to previous international research on educating medical students in rural settings. The aim of this article was, from a management perspective, to understand if and how contradictions arise during the implementation process of the Swedish RMP, supported by digital technologies. Based on this analysis, a further aim was to discuss, from a management perspective, the possibilities and challenges for improvement of this medical educational practice, as well as to provide implications for other similar changes in medical programs internationally.

Method: To identify possible contradictions during the implementation process, ethnographically inspired observations were made during management work meetings, before and during the first regionalized semester. In addition, in-depth follow-up interviews were held in May and June 2011 with six management executives of the Swedish RMP, concerning their expectations and



experiences of the implementation process. The qualitative and activity theory (AT)-inspired analysis resulted in the emergence of two main themes and seven sub-themes.

Results: The analysis suggests that a number of contradictions arose during the implementation process of the Swedish RMP. For instance, a contradiction constituted as a conflict between the university management and some teachers concerning how digital technologies and technology enhanced learning (TEL) could and should be used when educating medical students. In addition, due to the use of digital technologies the implementation process helped to reveal existing problems and tensions in educational practice, not previously visible to management. These included contradictions such as a lack of alignment in how course goals, teaching practices, and examinations should be carried out. Further, obsolete course content and overlap between courses and subjects were identified, leading to an overhaul of all semesters, not only those regionalized.

Conclusion: This study showed how contradictions in educational practice arose when the Swedish RMP, supported by digital technologies, was implemented. These contradictions involve both possibilities and challenges for management to improve how and with what quality the Swedish RMP is conducted. A challenge for management is to find the most effective way to enhance up-take and use of the more interactive and innovative TEL-solutions. However, a possibility is that the regionalization process and implemented improvements may also influence non-regionalized semesters, with the potential to eventually increase the quality of the entire program.

Key words: activity theory, contradictions, digital technologies, ICT, implementation, management, medical program, regionalized medical program, rural clinical school, technology enhanced learning.

Introduction

For the first time in Sweden, in January 2011 Umeå University commenced a regionalized medical program (RMP) located in rural settings. In RMPs, instead of collected or dispersed localization, medical students are geographically distributed in groups to rural hospitals during their clinical clerkship semesters¹. To provide these medical students the means to continue their theoretical studies while on RMP, digital technologies and conditions for technology enhanced learning (TEL) were implemented. According to previous research, this can be a complex and unpredictable process that include possibilities as well as challenges for program organization². For instance, the implementation of digital technologies and TEL has been proposed as a catalyst for improvement 'which mediates and shapes the *design* of learning activities' (p488)³. At the same time, Blin and Munro³ suggested that even if management's ambitions for TEL are to fundamentally change educational culture and teaching practices, this may only result in the up-take of new

technological teaching tools, while the educational culture remains unchanged.

The change from face-to-face to a TEL-influenced educational mode has further been argued by researchers to cause and reveal contradictions in program organization⁴. According to activity theory (AT), these contradictions can constitute conflicts, problems, or accumulating tensions disturbing the current educational practices^{5,6}. Examples of these include communication and collaboration issues among people in the organization⁷, contradictory motives concerning how new digital technologies and TEL should be integrated into the teaching practice, or insufficient e-competence among teachers⁴.

According to AT, contradictions should, however, not only be understood as problems or conflicts, but also as tensions that drive innovation and development in educational practice^{6,8}. By identifying, revealing and resolving any contradictions that occur, improvements can be made to educational practice⁸. Murphy and Rodriguez-Manzanares



claim that 'a specific focus on contradictions provides an opportunity to explain and understand how teaching practices can change when ICTs are introduced' (p453)⁴. With this backdrop, the aim of this article was to understand, from a management perspective, if and how contradictions arise during the implementation process of the Swedish RMP supported by digital technologies. Based on analysis, a further aim was to discuss, from a management perspective, possibilities and challenges for future improvements of the Swedish RMP, as well as to provide implications for use in similar medical programs internationally.

The following research questions were posed:

- How does the management understand and experience the implementation process of digital technologies and conditions for TEL in the Swedish RMP?
- Which possibilities and challenges can be uncovered and further discussed due to the future improvement of the Swedish RMP as well as other similar medical programs internationally?

Contextualization of medical education in rural settings

The international research concerning RMPs presents a number of key aspects that are characteristic of educating medical students in rural settings. One aspect is the aim of the education. As expressed by Maley et al⁹, the initial cause has often been the emerging lack of workforce in rural settings, although in recent years the need to learn rural medicine appears to have increased¹⁰, and educating students in rural settings is said to provide both increased patient time and diverse patient cases for such learning¹¹. In addition, with the adoption of RMPs rural hospitals have an improved potential to recruit physicians^{12,13}.

Another aspect concerns the concept 'rural', which has been used frequently in previous research. In several countries 'rural' is understood as a lack of technical and human resources¹⁴. However, as expressed in previous research¹⁵, the difference in definition of rural settings between Europe

and, for example, Australia, Canada, and the USA can be somewhat problematic and difficult to reconcile due to differing conditions among countries and continents¹⁵. For instance, the distance between academic hospitals and the rural hospitals involved in a RMP can differ from 2200 km in Australia¹⁰ to 380 km in Sweden. In addition, one rural hospital in Australia is located in a town of 5000 citizens, while the smallest rural hospital involved in the Swedish RMP is located in a town with 60 000 citizens.

Previous research also connects the concept of 'rural' to aspects of time spent by medical students in rural settings, ranging from one day only¹⁶ to one year¹. The attachments can constitute a short informal visit to rural hospitals, or mean that medical programs move the entire educational practice to rural settings. Depending on the time spent in rural settings, digital technologies and TEL are used to enable students' theoretical studies. However, the way digital technologies and TEL are used and to what extent varies considerably among medical programs^{10,17-19}. For instance, some programs use digital technologies and TEL to enable medical students' access to study materials¹⁹, while others conduct cases, simulations, and seminars online¹⁰.

Implementing a RMP is said to be a comprehensive process²⁰. One key aspect highlighted in the research is the recruitment of academic competence and local leaders who can drive development and improvements in teaching and learning environments in all study locations²¹.

Description of the Swedish RMP and use of new digital technologies

The Swedish RMP at Umeå University commenced in January 2011. In the Swedish RMP, the medical students' rural attachment includes the entire clinical clerkship semesters, that is, two-and-a-half years (with the exception of the 10th semester when students conduct their degree project). Thirty students per semester are located in three rural hospitals (located in Östersund, Sundsvall and Sunderbyn) and 70 are located at the Umeå University academic hospital. The clinical clerkship semesters have been



introduced one-by-one regionally, with a period of two-and-a-half years before the program is fully developed (in autumn 2013). When fully implemented, the program will include approximately 50 students at each rural hospital, distributed across the five clinical semesters.

The rural hospitals are located in smaller cities in northern Sweden some 250-380 km from the university hospital, and serve a population of from 100 000 to 245 000 citizens. There are approximately 100-140 teachers each semester and a large number of subjects and minor modules where teachers educate only in their specific area of expertise. To organize and administer the teaching, 10 PhD-awarded physicians (two for each semester) and one administrator were recruited in each rural setting.

Consistent with previous research, an important aspect of the Swedish RMP and its enhanced collaboration with rural hospitals is the possibility of offering students different kinds of learning experiences by locating their clinical clerkship in different local hospitals¹. During their two-and-a-half years of clinical clerkship, regionalized students have the opportunity to become familiar with a local rural setting and its specific conditions for conducting effective and quality health care. The learning experience of these students can be said to be varied and enriched by learning from local physicians who broad and rich experience of rural health care. Students also have time to become acquainted with the economic, organizational and staff-related issues typical in rural hospitals. Furthermore, student–patient and student–teacher time is often increased, and the patient cases are more diverse than those in urban clerkships. In addition, the RMP is considered to offer a way to reduce the shortage of physicians in rural areas of northern Sweden.

From the beginning, management decided that students distributed in academic and rural hospitals during their RMP clinical clerkship semesters should conduct their theoretical education in a collaborative mode. The purpose of this was to utilize the teacher resources available from all campuses and to take advantage of the variety of knowledge and practices existing in different hospitals. By doing so, students would

have the opportunity to be educated by both physicians with rich rural experience and university hospital physicians with daily experience of more specialized cases. In addition, and in line with previous research, by using digital technologies management ensured that students had easy access to course materials, information, and connections to teachers and other students^{10,18,19}. To build a solid ground for collaborative teaching and learning among different campuses, the following digital technologies were implemented:

1. A *Tandberg video-conference system* was used to send all lectures to students simultaneously, regardless of campus. The lectures are conducted by physicians both from the university hospital and the three rural hospitals in northern Sweden. The so-called two-way lecturing is a means for students to learn both rural and university hospital practices in which common and specific patient treatments can be demonstrated.
2. *Adobe®Connect™* and *GoToMeeting™* were implemented in order to encourage interactive teaching and learning among students and teachers at the four campuses, that is, through seminars, case presentations or discussions. From a management perspective the video-conference system would also enable the distributed teacher team to conduct work meetings without traveling between campuses.
3. A *course management system (CMS)* (Moodle; <https://moodle.org/>) was developed in cooperation with two educational technologists (each hired on a half-time basis) from the Department of Education, Umeå University, Sweden. In the Swedish RMP, the CMS is used as a daily teaching tool by the teachers. The CMS gives students access to pre-recorded streamed lectures, course information, guidelines, assignments, grades, and also contains social tools including forums and chat-rooms. The CMS was modeled to provide the same structure for each semester in order to facilitate usability for students and teachers. To enhance flexibility in the students' learning, all semesters are accessible in the CMS at all times. Therefore, students can repeat course



content from previous semesters, as well as preview course content for upcoming semesters.

Method

The empirical data in this article derives from ethnographically inspired observations and follow-up, in-depth interviews²² with the management executives of the medical program. The observations were performed from September 2010 to May 2011 (before and during the first regionalized semester) during executives' work meetings and comprised approximately 50 hours distributed over 3 full days (of 6 hours each) and 16 two-hour meetings. The number of study subjects varied from seven to 15. Field notes included quotations and descriptions of executives' discussions concerning what could be understood as problems, tensions or conflicts. All field notes and reflections were confirmed by two other observers (educational technologists from the Department of Education) before they were analysed. Field notes were also used as a foundation for creating the interview guide.

In May and June 2011, six in-depth interviews were conducted with these executives: the dean of the medical faculty, the chairman of the medical program, the executive of the first regionalized semester, two regionalization coordinators, and the executive secretary of the medical faculty. Except for the secretary, all executives had roles as teachers in the Swedish RMP. The interviews were conducted during the day, mostly in executives' offices. At the beginning of each interview, the researcher explained the aim of the study and participants were informed about anonymity and the possibility of ending their participation in the study. The interviews were guided by a semi-structured interview guide that including four main themes; however, this guided conversation was open to new directions and follow-up questions. The interviews lasted from one to one-and-a-half hours each (8 hours in total). All interviews were recorded and then transcribed in their entirety by the author.

Observational and interview data were analysed according to Hjerm and Lindgren's levels of coding and analysing²³. This included a systematic but open analysis process with possibilities for developing codes and themes from the data. The coding entailed naming different categories. In this work, the executives' words and perspectives on what could be understood as tensions, problems, and conflicts in the implementation process were used. The next level involved moving from categories to a structure of main themes and sub-themes. This process involved reading, interpreting, and re-reading, which resulted in two main themes and seven sub-themes (Table 1).

Ethics approval

The study was approved by the Regional Ethical Review Board, Umeå University, Sweden (# 2010-304-31Ö).

Results

This section presents an activity theory-inspired (AT) analysis of the observation and interview data. The two main themes from the analysis constitute the structure of the section, including the seven sub-themes. In order to fulfill the ethical agreement, the executives have been anonymised and randomly numbered 1 to 6.

Contradictions

In both observations and interviews there were a number of contradictions constituted as problems, conflicts or tensions which arose during the implementation process. Contradictions seemed to arise at various levels in the Swedish RMP, including personal and cultural levels but also at the level of the course material itself. In this main theme, contradictions are divided into four sub-themes: (i) the use of new digital teaching tools, (ii) deeply rooted routines, (iii) competence and agency, (iv) the revelation of problems already in existence.



Table 1: Main themes and sub-themes generated from observation and interview data

Main themes	Sub-themes
Contradictions	<ul style="list-style-type: none"> • Use of new digital teaching tools • Deeply rooted routines • Competence and agency • The revelation of problems already in existence
Perspectives on revealed contradictions	<ul style="list-style-type: none"> • Self-evaluation and tools to control • Time and effort • Contradictions as a catalyst for change

The use of new digital teaching tools: This sub-theme includes conflicts related to conflicting motives for using digital technologies and TEL in the RMP. As expressed by the executives, for quite some time the program had been characterized by a large number of lectures as the basis of teaching and learning. By implementing the RMP and having access to new digital technologies, the executives wished to largely replace lectures with pre-recorded, streamed lectures in order to facilitate greater interactive teaching initiatives. This could further enable teaching and learning with students from different campuses, with the possibility of discussing both common and specific, situated learning experiences gained throughout their clinical clerkship.

When the material is recorded and uploaded to the CMS there is no need for a cathedral lecture [a teacher lecturing in front of a large group of students] and such material can be used [for] at least two or three semesters. The time released should be used for students. What we would like to do is to start up student group work on the CMS, communication with students and perhaps more group teaching. (Participant 4)

[Digital technologies] are still used mostly for one-way communication [eg lectures]. We have very little evidence [in the RMP] of two-way communication back and forth with assignments or such. (Participant 6)

Everyone is so stuck in lectures. The program really needs support to get further in the use [of TEL]. (Participant 3)

While the executives were seeking innovation, they recognized that the teachers were focused on the teaching procedures they had always used. In the digital learning environment this meant using live send-and-streamed lectures without exploring the development of more interactive activities. This could be rooted in a double-bind between traditional teaching, which is considered convenient but less functional in an RMP, and the innovative interactive solution which is more challenging but important when utilizing the rich experiences gained in both academic and rural hospitals.

Deeply rooted routines: This conflict emerged between executives' and teachers' motives for using digital technologies to change the teaching practice. This conflict could be deeply rooted in strong and long established norms and values concerning how teaching 'should' be conducted when educating medical students. For instance, in meetings executives expressed the view that the strong culture of lectures had historically and in a powerful way directed teaching practice. This was rooted in teachers' perceptions of teaching when seeing lectures to be the pedagogical mediating tool to ensure that all students acquired the knowledge required by the curricula. For example, this was expressed as:

We do have a strong culture of lectures. This is hard to get past. (Participant 4)



Some think that their cathedral lectures are totally crucial for students to learn what is needed to pass the course.
(Participant 5)

In this sub-theme the motive to decrease lectures and enhance more interactive TEL-solutions was in conflict with teachers possibilities to act in accordance with the curriculum. This also seemed to be the root of executives' problems in implementing more interactive digital technologies and changing current practice. This was expressed by one executive as:

It is very traditional; you have probably come across that. So if someone had officially said that we must change the entire pedagogy, then people [teachers] would have probably just said 'no'. (Participant 5)

Competence and agency: This sub-theme includes conflicts related to the willingness of teachers to develop their current educational practice and the technical and pedagogical competencies required for such a process. One executive, for instance, put forth competence and use of digital technology itself as an obstacle to teachers' development of TEL. Teachers have strong motives to teach and educate but also strong motives to avoid adoption of new teaching activities that require the use of teaching tools beyond their current digital literacy. Some teachers were suspicious of the use of digital technologies in their teaching, even for cathedral and streamed lectures. This was expressed as:

People [teachers] are not as creative with new methods that have to do with computers. (Participant 1)

The program really needs support to get further in the use [of TEL] (Participant 3)

Here was an explicit need for both technical and pedagogical external support to reform the curriculum and re-think the way digital technologies could be used in educational practice to enhance students' learning.

The revelation of problems already in existence: This sub-theme covers old problems that had not been visible in the program but were uncovered when the CMS was developed and implemented in the RMP. When developing the Swedish RMP, teachers were instructed to upload streamed lectures, assignments and course information to Moodle to create a shared teaching and learning space. This shared space resulted in improved overview and insight for management concerning day today work and teaching practice, that is, course structure, materials, and teachers' actions. This also appeared to reveal problems existing in teaching practice that had not been visible to management before the implementation process, and entailed, for instance, conflicts between how teaching was described in the curriculum and how it was actually interpreted and conducted. This resulted in different and subjective resolutions by the teachers and a lack of stringency throughout the entire program. One executive said:

Well, it has been proven that, when starting to go through our course documents, schedules and curriculums, we do have a plethora of different names for different learning activities, where basically equivalent pedagogical designs can have different names in different courses. (Participant 6)

Other problems discovered include obsolete course content and overlap between subjects and courses, expressed as:

It becomes so distinct when uploading to an open site, accessible for both students and teachers. Actually, these things have always been there but were not so distinct. So when we are uploading the lectures to the platform, then people [eg teachers] are discovering that: well, we do lecture about the same things but a bit differently. We have seen that some people [eg teachers] have about the same lecture for three semesters. (Participant 3)

This kind of transparency further demonstrated the lack of alignment among goals, teaching, and examinations in courses and subjects:



One has been forced to think through what one is doing. How do we think, what is our task, what is the knowledge that we need the students to learn and what is an appropriate way to get there? (Participant 4)

Perspectives on the implementation and revealed contradictions

In both observational and interview data most of the revelations of conflicts and problems in the Swedish RMP were understood by management as spin-off effects of the implementation process. However, there were differences in perspectives concerning how executives understood and wished to tackle these conflicts and problems in program organization. This second main theme can be divided into three sub-themes: (i) self-evaluation and tools to control; (ii) time and effort; and (iii) conflicts as a catalyst for change.

Self-evaluation and tools to control: Some executives understood the new insights into teaching practices through the use of digital technologies and TEL as a tool to control, but also and more importantly, to discuss problems arising in teachers' activities, content, and course structure. In the long run, this was understood as creating possibilities for self-evaluation and future improvement of the educational practice:

No one has noticed what has been happening within the closed room [eg lecture halls]. One becomes checked in a slightly different way. It is really good. (Participant 1)

We have better control of what is taught. We can see what is in the teaching material. I mean, before we had been wondering what they were saying during lectures, we had no clue. (Participant 5)

From now teachers can watch each other's lectures, which results in a kind of peer-review, like: 'What? Is he saying that?' (Participant 5)

Time and effort: This sub-theme illustrates a conflict between executives' motives or willingness to push the

implementation process through, and their motives to avoid increased workload. For instance, two of the executives understood the implementation process and subsequent attention to the problems and conflicts it revealed as necessary, but also experienced the effort involved as a disturbance to the rest of their daily work in medical program organization. In addition, executives pointed out that the great effort and attention to the implementation process and conflicts thereof had partly resulted in 'weariness' within the system. For example, this was expressed as:

It [the regionalization] has entirely shocked the decision organization, so within three years no one has managed to get involved to a higher extent with anything else but the regionalization. Staff is starting to get pretty tired, to be honest. There are a limited number of initiatives one can do, so to speak, and one starts to notice [a] certain weariness in the system. (Participant 6)

One should know, obviously, that the regionalization work-wise has burdened the organization a lot. (Participant 4)

Contradictions as a catalyst for change: This sub-theme covers the perspective that the problems and conflicts revealed were catalysts for change. Most of the executives experienced the implementation process and the revelations of problems through the use of digital technology as a means to become aware of and solve both new and deeply rooted problems in educational practice. This included not only problems in course content and teaching in practice, but also the development of more interactive learning activities within and among campuses. For example, such opinions were expressed by two executives as:

Hopefully, the regionalization process has started pushing pedagogical development. (Participant 2)

Because of the regionalization we have begun to tackle this [revealed problems and conflicts]. So regionalization has meant everything for the development of the program. (Participant 3)



Without having done this, [implementing] the RMP, my view is that we would have failed on the HSV evaluation [Swedish national education monitoring]. (Participant 3)

The implementation process and the revelation of problems were further expressed by all executives to have influenced both regionalized and non-regionalized semesters in a positive way. One executive formulated this in terms of:

This has also exposed some problems that already existed in the program, so a process like this is useful for the entire program. (Participant 4)

This has also forced us to start working with the first semester which is not regionalized, to get them into the CMS, technologies and the thinking around this. (Participant 5)

Discussion

In the Swedish RMP, the long rural placement and the large distributed teaching team are well suited to the use of digital technologies and TEL as flexible tools to conduct collaborative theoretical teaching and learning. The distributed teaching team can share the teaching, while students are offered rich opportunities to learn from teachers and students with both common and specific experiences from both academic and rural settings. To implement digital technologies and TEL in a medical program with a strong educational culture, however, is not an easy task. As this study has shown, a number of conflicts and problems can arise in educational practice. These may be problematic and time-consuming for management, creating 'weariness' in program organization, but they may also be catalysts for change and improvement in educational practices.

Some of these understandings and experiences of management will be discussed. Following this, implications for the way Swedish RMP management could improve educational practices and scaffold the implementation process will also be discussed.

Interpretation of the main findings

The first research question in this study focused on the way management understands and experiences the implementation process of digital technologies and conditions for TEL in the Swedish RMP. As has been shown, management believed that the implementation process of the RMP and digital technologies revealed both cultural and structural problems, as well as conflicts that had not previously been visible. These were understood to be a 'spin-off' effect of the implementation, triggered by the new digital teaching tools and influencing the entire program, not only the regionalized semesters.

For example, in managements' experience of implementing the CMS, as has been the case in many other medical programs internationally, the Swedish RMP is characterized by massive program content and a complex educational structure, which is complicated for management to oversee and gain insight into. However, in the present study, management experienced the development and use of the CMS to create a more open and transparent teaching and learning space which was easier to oversee and gain insight into. This increased transparency revealed existing problems and tensions in educational practices, including obsolete and overlapping course content among courses and subjects. Further, a lack of alignment was observed between course goals, teaching practices and the attainment of examinations.

Management understanding and experience of the implementation process mainly involved awareness of problems and tensions within and among teaching areas. There were also broader problems, such as the impact of personal motives and strong educational cultures, which provide continuing challenges for management. One challenge is teaching's strong set of norms and values which are in conflict with the implementation and use of more interactive and innovative TEL-solutions. Another significant challenge concerns what management understands as teachers' strong motives to teach in a professional manner but at the same time avoid engaging in new teaching activities and in teaching tools beyond their current digital literacy. One



problem here may be insufficient e-competence among teachers. Another may be the lack of a shared vision of teaching and learning among stakeholders, which constrains enhanced use of TEL in educational practice. Laurillard claims that when starting to use digital technologies, the questions of 'what should be learned' and 'what it takes to learn' (p. 526) must come first²⁴. Thus, after creating a shared vision of learning and what should be learned, the second question should be: 'How can digital technologies support this framework of didactical thinking?'

Implications

The second research question in this study focused on the possibilities and challenges that can be revealed and discussed further, and their implications for future improvement of the Swedish RMP, as well other similar medical programs internationally. This study has provided suggestions about how management could improve such a program, and also the qualities required to implement the Swedish RMP.

From an AT-perspective, it is important to discuss the roots of contradictions in order to discern which problems need to be tackled to facilitate development and improvement⁵. In the present study, it has been shown that the contradictions were grounded in both structurally and culturally related problems. These contradictions could and should be resolved if the implementation of TEL and an improvement to the Swedish RMP is to take place.

For instance, in the case of the Swedish RMP, there seem to be advantages in enabling collaborative learning among campuses in order to take full advantage of the different teaching and learning experiences gained in rural and academic hospital settings, by enhancing the up-take of more interactive and innovative TEL-solutions. Such visions, however, must be discussed among Swedish RMP stakeholders in order to motivate increased TEL usage in educational practice. From a long-term perspective this may mean that the curriculum design of the Swedish RMP needs to undergo significant change in order to align it with more digitalized teaching and learning practices. It will also be

important that management offers teachers pedagogical and technical support to overcome the double-bind of contradictory motives. In this way, enabling enhanced digital literacy for teachers will provide them with the confidence to refine and modernize their teaching and learning activities.

As has also been shown, the increased transparency gained by the use of CMS has uncovered examples of concrete problems in the Swedish RMP. Although some executives understood such problems as a lack of quality in the program, such examples could and should be understood as useful for justifying and initiating development and improvements in the program. As the present results suggest, and in line with previous research, refining and improving teaching areas may be achieved more quickly and easily than changing the overall medical educational culture³. Improvements such as removing and refining course content on the CMS could, for instance, provide space for additional and updated content in the program, which could lead to enhanced learning for students.

When using a CMS characterized by transparency, teachers appear to become more reflective about problems related to their own and their colleagues' teaching practices. One example is the peer-review activity that has emerged among teachers within the CMS. However, regarding this example, it will be important to encourage teachers to develop a model that fosters learning from one another, rather than an arena characterized by competition and protection of materials and teaching strategies. Further, such a peer-review model could be useful for rural physicians new to the theoretical teaching profession.

Finally, the revelation of contradictions is an on-going process^{5,6}, meaning that when one contradiction is solved, new ones will arise⁵. Currently, this appears to be underrepresented in research^{12,19} and therefore there is a specific need to investigate how contradictions provide new possibilities and challenges for improvement in RMPs both in Sweden and internationally. Longitudinal research at different levels of program organizations can be productive here.



Limitations

The focus of this study was management's understanding and experience of the implementation process. Future studies may usefully examine the insights of stakeholders such as teachers and administrators. When the implementation process is complete for all program semesters, future studies must examine important longitudinal aspects of change and development.

Conclusions

This study showed how contradictions in educational practice arose when the Swedish RMP, supported by digital technologies, was implemented. These contradictions involve both possibilities and challenges for management to improve how and with what quality the Swedish RMP is conducted. A challenge for management is to find the most effective way to enhance up-take and use of the more interactive and innovative TEL-solutions. However, a possibility is that the regionalization process and implemented improvements may also influence non-regionalized semesters, with the potential to eventually increase the quality of the entire program.

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