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ORIGINAL RESEARCH

Promoting Students' Sense of Coherence in Medical Education Using Transformative Learning Activities

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Objective: Transformative learning theory offers medical educators a particularly relevant insight into student learning. Transformative learning involves critically reflecting on assumptions and actions using empirical research methods and participating in a continuing discourse to validate the best reflective judgement and act according to new insights. The purpose of this paper is to investigate medical students' experiences with transformative learning activities and empirically and theoretically explain how these activities contribute to their understanding of the interplay between theoretical knowledge and professional practice, thereby creating a sense of coherence in medical education.

Methods: This paper analyzes the data from interviews with 40 medical students derived from a qualitative longitudinal research project in Norway from 2012 through 2018.

Results: Students characterize linking theoretical knowledge with professional practice, experiencing authentic placement situations with real patients, and discussing and critically reflecting on cases and professional practice with experienced doctors as learning activities that transformed their understanding of professional practice. These transformative learning activities influenced students' perceptions of educational content and demands as being comprehensible, manageable, and meaningful, which are the core components of "sensing coherence" in professional education. Moreover, experiencing a lack of knowledge in either case-based learning on campus or when meeting patients in clinical placements motivates students to pursue further theoretical studies.

Conclusion: Medical education includes rich opportunities to use transformative learning activities both on campus and at clinical placement sites, but it is not given that these types of learning activities are present in the teaching offered at all the various learning sites; thus, enhanced awareness of why and how to promote transformative learning is required among medical educators.

Keywords: transformative learning, sense of coherence, critical reflection, educational quality, placement learning, on-campus learning, professional program, medical program

Introduction

A major challenge for medical students is the application of theoretical knowledge to medical practice with actual patients,[1] that is, students may experience a lack of coherence between knowledge and skills acquired in medical education and the competence demands of professional practice.[2] To better understand how medical education can be improved to accommodate this challenge, it is important to obtain knowledge about the connection between teaching and student learning outcomes.[3] Moreover, student evaluations can provide valuable information about the quality of the teaching and learning activities offered.[4,5] This paper reports on a longitudinal qualitative study that examined medical students' evaluations of various learning

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opportunities offered on campus and at clinical placement sites in the medical program at the University of Tromsø – The Arctic University of Norway (UiT). During this six-year program, a gradual escalation of placement learning took place. Antonovsky's[6,7] concept of coherence and transformative learning theory[8–12] provide the theoretical framework for examining and discussing medical students' statements regarding their learning experience in UiT's medical program. Critical reflection and problem solving, which are central features of transformative learning, and other related concepts are used widely in health education literature and have been proposed as methods for professional knowledge acquisition.[13–17] However, few studies have used a longitudinal design that investigates students' evaluations of transformative learning activities offered throughout the medical program. This paper aims to identify learning activities that promote transformative learning and reveal how these learning activities can lead to students' integration of theory and practice, thereby creating a sense of coherence in their medical education.

Theoretical Framework

Sense of Coherence

The theoretical knowledge content of a professional program, such as medicine, is chosen because various theories can illuminate challenges in professional practice and form the basis for action in specific situations.[18] Moreover, scientific theoretical knowledge taught in a professional program provides a reliable basis for critically reflecting on and further developing professional practice.[19,20] However, medical students do not always grasp the relevance of some aspects of the theoretical knowledge they are taught, such as chemistry and biochemistry, unless these concepts bear an explicit relation to medical education. In addition, students may experience difficulties in applying theoretical and practical knowledge to treat patients. Furthermore, students may have different preconceptions about what comprises good professional practice, and variations may exist in scholars' opinions and evidence that point in different directions regarding what comprises the best means of treating specific medical conditions. In other words, medical education is complex and contains conflicting situations that the students may interpret as a lack of coherence between theory and practice.

Antonovsky,[6,7] a professor of medical sociology concerned with the relationship between health, stress, and coping, claims that facilitating a "sense of coherence" is important for supporting human health and well-being. He postulates that a sense of coherence may act as a health-promoting mastering mechanism to help human beings cope with complex, conflictual situations that can also be described as "creating order out of chaos." Antonovsky[6] describes the concept "sense of coherence" as a global orientation that consists of the three core components: comprehensibility, manageability, and meaningfulness. Comprehensibility refers to having confidence in "that the stimuli deriving from one's internal and external environments in the course of living are structured, predictable and explicable".[6] Manageability is about experiencing that "resources are available to one to meet the demands posed by these stimuli".[6] Meaningfulness is about perceiving the demands one encounter "are challenges, worthy of investment and engagement".[6]

Antonovsky[6] suggests expanding how his sense-of-coherence concept can be applied to include an individual's competence development. With this in mind, we argue that Antonovsky's emphasis on a sense of coherence—with its core components of comprehensibility, manageability and meaningfulness—is a relevant contribution that can illuminate our findings because it indicates important motivating factors of human behaviour.[6] In medical education, comprehensibility refers to the student's perception of educational content as understandable. Manageability is the student's confidence in his/her ability to develop skills or access the support and resources required to master educational and professional demands. Meaningfulness refers to the student's perception of educational content as relevant and useful for professional practice.

Making the educational content understandable, manageable, and meaningful for students is also highlighted in research on teaching and learning as important aspects of teaching quality.[21–23] Ramsden[23] emphasizes that some of the important properties of good teaching are the lecturers' ability to explain the material clearly, engage with students at their level of understanding, and make clear what has to be understood, at what level, and why. Bandura's[24] concept of self-efficacy—believing that one will succeed in undertaking a task—elaborates on Antonovsky's point about the importance of manageability. According to Bandura,[24] self-efficacy in a specific domain affects the thought processes, endurance, motivation, and emotions related to tasks in the same or similar domain, hence influencing the individual's effort and the results of their

actions. Bandura[24] also emphasizes the mastery of experiences and feedback from a significant other as influential sources for developing self-efficacy in a specific domain. Moreover, previous research has shown that self-efficacy in a specific domain is an influential, motivational driving force for the individual to continue with further engagement in that same domain.[24] The importance of meaningfulness, the third core component in Antonovsky's sense-of-coherence concept, is also highlighted in the expectancy-value theory,[25,26] which emphasizes the importance of believing that the learning content is important and useful or interesting, as well as calculating whether striving to learn the content is worth the effort and challenges it entails.[26] Students' self-efficacy combined with the expected value of a task is crucial to their effort, endurance, and performance.[26]

Based on Antonovsky's[6,7] theory, we argue that experiencing a sense of coherence in medical education does not require an absence of conflicting situations and a lack of tension among various perspectives. Instead, creating coherence in medical education means that students must experience and perceive educational content as comprehensible and meaningful for professional practice and that demands in education and professional practice must be viewed as manageable. However, how the tensions that students experience (ie, diverging perspectives or a lack of understanding and perceived practical competence) are addressed and processed is important. There are many theories that explain how students learn and how to enhance student learning, and each has its own merits.[3] We argue that transformative learning theory contributes with a particularly interesting theoretical framework for understanding and addressing the tensions that students experience. Transformative learning theory shows how experienced tensions and lack of understanding and ability to perform can be a source of learning and how this can facilitate students' professional competence development in professional education. Moreover, the theory of transformative learning offers a theoretical foundation for learning activities that integrates theory and practice and facilitates students' perceptions of coherence in medical education.

Transformative Learning

Transformative learning is an analytic metatheory that provides educators with a theoretical lens through which to view student learning.[27] Facilitating transformative learning in medical education gives students a broad perspective and an expanded understanding of patients' conditions and professional conduct, thereby promoting a change in attitude and professional practice.[28] Illeris[29] emphasizes that when transformative learning takes place

> we have to do with the processes that pave the way for what truly can measure up to the buzzword of competence development when changes in mind and behaviour are followed by more concrete changes in understanding and acting.

Transformative learning theory is founded on both humanist and constructivist assumptions; that is, humans are seen as free and autonomous beings that have potential for growth, development, and self-actualization, and experience is seen as socially constructed, and learning is seen as a process of creating meaning from experience.[30] The concept of transformative learning was first created by Mezirow in 1978, and transformative learning theory has evolved over time and has been adapted to address criticism.[11,30,31] Transformative learning differs from learning that only involves the acquisition of new knowledge and skill or elaboration of existing knowledge.[30,32] However, learning that begins as the acquisition of new knowledge can become transformative if the learner's perspective, assumptions, or expectations undergoes a fundamental shift.[30] Mezirow[10] defines "transformative learning" as:

> Learning that transforms problematic frames of reference —sets of fixed assumptions and expectations (habits of mind, meaning perspectives, mindsets)—to make them more inclusive, discriminating, open, reflective and emotionally able to change.

Furthermore, Mezirow[10] underlines that "such transformed frames of reference are better than others because they are more likely to generate beliefs and opinions that will prove more true or justified to guide action." Moreover, transformative learning involves "reflecting critically on the source, nature, and consequences of relevant assumptions —our own and those of others",[11] and it may occur in both instrumental and communicative learning. Transformative learning in instrumental learning, which is often task oriented, uses empirical research methods to determine whether something is true, whereas transformative learning in communicative learning involves critical self-reflection and an understanding of others' arguments and experiences, arriving at strongly justified beliefs by participating in an informed continual discourse. Particularly in

relation to communicative learning, transformative learning is metacognitive reasoning that applies critical thinking that involves becoming aware of, considering, and revising one's attitudes, assumptions, and preconceptions in light of new experiences and newly acquired theoretical knowledge that challenge existing ways of understanding and acting.[11]

Transformative learning typically occurs after one experiences a disorienting dilemma,[11] which is an insufficiency between previous understanding and practical experience, other people's interpretations, or newly acquired theoretical knowledge. This experience of inadequacy in prior understanding and tensions between different perspectives implies that students become uncertain and feel the need to solve this disorienting dilemma. Both in medical education and medical practice, a disorienting dilemma is a situation in which previous assumptions and preconceptions about a patient or a medical condition are tested and found to be inadequate regarding a full understanding of the symptoms, the patient's needs, and/or how to best communicate with the patient about his or her condition and further treatment. Thus, experiencing inadequate understanding may provide medical students with a starting point and motivate them to study further, thereby providing an opportunity to transition into a transformed and deeper understanding of the relationships between theoretical knowledge and practical challenges, as well as of the demands of professional practice.

While Mezirow[8–11] emphasize critical reflection, dialogue, and experience as central to transformative learning, Taylor and Cranton[12] additionally address the role of empathy and desire to change. They argue that empathy provides the learner with the ability to better understand and identify with the perspectives of others and the motivation to listen to others. Furthermore, empathy lessens the likelihood of prejudgment; increases the opportunity for identifying shared understanding; and facilitates critical reflection through the emotive valence of assumptions.[12] In addition, they emphasize that for transformative learning to occur, the learner needs to be willing and able to engage in activities that have the potential to lead them to shifts in perspectives. One important question for the medical educator is therefore, how to facilitate transformative learning. In our study, we addressed this question by investigating medical students' experiences with learning opportunities at various learning sites, and elaborate on what, according to the students, characterizes learning activities that had a profound impact on their learning outcome and contributed to their understanding of the interplay between theoretical knowledge and professional practice and created a sense of coherence in their medical education.

Materials and Methods

The medical school in Tromsø was established in 1971 and is said to be at the forefront of medical education in Norway due to its principles of integration between medical theory and clinical practice. Thus, the interplay between theoretical knowledge on campus and practical cases or placement experiences has been the backbone of the medical program for many years. This paper highlights this process by focusing on students' perspectives on transformative learning activities and by asking what characterizes a learning process that seems to create a sense of coherence in medical education.

The current paper reports on a longitudinal qualitative study from 2012 through 2018 that complied with the Declaration of Helsinki and was approved by the Norwegian National Research Ethics Committees. Forty medical students were interviewed regarding their learning experiences at various learning sites. Each student was interviewed at the end of each academic year. The study was based on self-selection, and the sample was comprised of 16 male and 24 female students, accurately reflecting the gender breakdown of the entire medical student body. All students who volunteered took part in the study through the program for six years, and informed consent was obtained from the study participants prior to study commencement. This informed consent included permission to quote the participants. The interviews were conducted in accordance with the Personal Data Act and with the legal and ethical guidelines regulating research developed by the Norwegian National Research Ethics Committees. The interviews were conducted individually and lasted approximately 60 minutes.

As this study sought to understand the students' learning perspectives concerning their experiences in medical education, a semi-structured interview guide was chosen as the basic method for obtaining the presented qualitative data. We applied open-ended questions and designed the qualitative approach in order to get to know what, according to the students, seemed to be important about the theme under study. The interview guide also allowed the medical students to present their reflections and experiences, which is of great importance in qualitative

research.[33–36] For detailed information about the content of the interview guide, see Appendix.

In a qualitative approach, the researcher is the key instrument, and thus the researcher's role is demanding, especially when it comes to validity. Maxwell[37] points out that researcher bias and reactivity as two threats that can influence the validity of a study. In our case, follow-up questions were used for clarification and further in-depth understanding. At the end of each interview, the researcher presented the interviewee with a short summary of the session and her understanding of the main points to avoid misunderstandings that could influence the study's validity. According to Maxwell,[37] these strategies are important to strengthen validity in qualitative research. The same researcher conducted all the interviews to ensure consistency.

Each interview was recorded and transcribed verbatim. The transcribed text was read and reread to obtain an overall impression of the data. The themes concerning transformative learning, sense of coherence, and the impact of on-campus and placement learning were then identified and coded, balancing inductive and deductive coding, which can be referred to as an abductive research strategy,[38,39] which is the process of generating social scientific accounts from the interviewee's account of his/her experiences.[38] Abduction is a position in between induction and deduction that highlights the dialectic connection between empirical and theoretical perspectives. Thus, the abductive position contributes to the interpretation of the meaning of the data.[38,40,41] In this process, inductive coding emerged from the collected empirical data, whereas deductive coding was derived from the applied theoretical framework—namely, Antonovsky's[6,7] sense of coherence and transformative learning theory.[8–12] In this case, the analysis was a synthesis of the data collected and the applied theoretical framework, which, according to Cohen et al,[42] is a preferable process because it is the most faithful to the data. Additionally, during the process of writing this text, the authors extensively discussed the interplay between theory and the collected data to present a valid interpretation and analysis.

Findings

Our focus was on characteristics of transformative learning activities at the various learning sites, which, from the students' perspectives, seemed to impact their learning outcomes greatly. These learning activities are linking theoretical knowledge to professional practice, experiencing authentic placement situations with real patients, and discussing cases and critically reflecting on professional practice with experienced doctors. The various learning activities are elaborated upon below according to on-campus learning and placement learning (as practical clinical teaching, in the casualty ward, and as extensive practice in hospitals).

On-Campus Learning

On-campus learning includes lectures and problem-based seminars. Linking theoretical knowledge to professional experience and practical cases is, according to the students' statements, "a key characteristic of high-quality, on-campus teaching." Linking theoretical knowledge to professional practices is a transformative learning activity that may give students a broader perspective and a deeper understanding of a specific medical phenomenon.[28] The students reported, however, that the lectures given in the auditorium differed qualitatively with respect to quality. According to one student, "A good lecturer relates theoretical knowledge to practical cases and their own practical experiences during the lecture." Another student said, "The main difference between a good and a bad lecturer is whether the lecturer uses examples from clinical practice." All the interviewed students agreed that the lecturers who were able to exemplify medical theory by means of patient cases were regarded as clever and inspiring teachers who motivated and stimulated the students in their learning processes. Thus, the theory became understandable and meaningful, which are two of the core components in sensing coherence. However, according to the students, not all lecturers related theoretical knowledge to practical cases. One student said, "Together, these doctors have over a hundred years of experience. So, why don't they share any of their experiences with us when they are lecturing?"

According to the students' statements, "problematizing," "discussing," and "reflecting on cases with a more experienced teacher," which is a typical transformative learning activity that provides students with alternative interpretations[11] during the problem-based seminars, seemed to be beneficial in reassuring them that they were on the right track. One student said, "I am very happy with the seminars and cases. We immediately get to know whether we are right or not." Another student said, "A problem-based seminar is a very good way of learning, I think." The students reported that they appreciated this learning site because it gave them an even deeper

understanding of the theory and cases presented—the first core component in developing a sense of coherence. The following quotation from a student is representative: "A good lecture, combined with a practical case and experiences, can really open up our learning. It is motivating and inspiring!" Additionally, the students reported that they ensured that they were well-prepared for every seminar in order to be able to participate in the discussions. One student expressed this notion by saying,

> I am always very well prepared before attending a seminar. Thus, I feel that I can contribute to the discussions in a positive way. It makes me feel good, and I like it.

These findings indicate that students' study engagement is a prerequisite for taking full advantage of transformative learning activities in teaching lessons similar to those offered in the problem-based seminars.

Placement Learning as Practical Clinical Teaching

Practical clinical teaching (PCT) took place in different departments at the university hospital. PCT is longitudinal and occurs throughout the program after theoretical on-campus teaching courses have been completed. One principal point that all the students expressed was that PCT quality depended significantly on student access to patients. When the students had opportunities to meet patients, they claimed that they became more conscious of the problem, which is a typical characteristic of transformative learning. One student said,

> In practical clinical teaching together with a patient and a mentor, I can experience the relevance of theory in clinical settings, which is very motivating for further reading.

The students also reported experiencing better concentration and a greater sense of responsibility because they had met with a real person suffering from an illness. One student said, "I have experienced that I concentrate in another way when examining a patient. I really do my very best in these situations." Elaborating on this notion, another student said,

> There is a big difference if you have PCT with or without a patient. You are aware of your own behavior while talking with a patient, and you remember the case study better because you have a face to relate to.

These findings indicate that meeting a real patient gave the students a better understanding of the medical knowledge required to help different patients, which corresponds to the first and third core components in sensing coherence. The students also stressed the importance of having the opportunity to talk about the patient and a possible treatment with their mentors after the patient consultation. As one student said, "It is important that we discuss with the doctor afterwards about what the patient is suffering from, about the treatment and all that."

Placement Learning in the Casualty Ward

Teaching in the casualty ward took place twice a semester during the medical students' third or fourth years of study. The students were paired up and assigned an experienced doctor as a mentor. Each pair met an authentic patient, and neither the students nor the mentors knew beforehand what illness the patient had. One student examined the patient and proposed a course of treatment while the second student and their mentor observed. After the consultation, the three discussed the case and drew their conclusions. This typical transformative learning activity was reported to be an excellent learning situation because the students could test their medical knowledge, apply this knowledge to an authentic patient, discuss the chosen solution with the mentor, and receive immediate feedback. One student said,

> I want to brag about the casualty ward. I learned a lot. Indeed, it was a steep learning curve. I examined the patient, drew a conclusion, and then discussed it with my mentor and fellow student. The discussion and feedback were very important.

Mastery experiences and immediate feedback from a significant other, in our case a mentor, is emphasized by Bandura[24] as an influential source when it comes to believing that one will succeed in undertaking a task. One student expressed this notion by saying,

> Here, you have the opportunity to try independently, and I think that is good for professional maturation. And you also have someone to discuss the case with, and that is also important.

The interviewed students viewed their experience in the casualty ward as a beneficial and well-organized learning arena where they were able to apply their medical knowledge in new and different settings, which was important for experiencing professional practice as being manageable (the second core component in sensing

coherence). In these contexts, the students reported that their opportunity to test themselves as physicians in the making and gain experience enabled them to transform their theoretical knowledge into professional practice. One student said,

> I am more able to relate theory to practice now. I feel more like a physician in the making compared to what I felt when I started this practice six months ago. I feel safer now.

Furthermore, they received constructive criticism and could have discussions with their mentors, which prepared them for their futures as medical doctors. One student said,

> In these situations I felt more like a doctor than a medical student. I drew my conclusion, and I got immediate feedback, not being yelled at exactly, but criticized. This was important for my further development.

All the students were satisfied with the time and location of this practice; a possible explanation may be that the students had attained a minimum level of medical knowledge that they could apply in concrete cases. This interpretation is in line with findings from Vågan's[43] study, which indicated that physicians in the making should reach a certain theoretical level before they start examining patients.

Placement Learning as Extensive Practice in Hospitals

During the fifth year of the medical program, students attend 26 weeks of extensive placement in hospitals. The students reported that this lengthy placement greatly helped their understanding of the interplay between theory and practice. The following quotation from a student is representative: "This was a very good period with a long-lasting practice where I had to connect theory to practical patient cases all the time." Participating in authentic patient cases resulted in typical transformative learning outcomes that were perceived and reflected on in a complex and problematizing way, and these experiences motivated the students to pursue further theoretical studies. One student expressed this notion by saying, "After a day in hospital I often went home to read and get further insight into patient cases. Meeting patients is very important for further motivation." Meeting patients in various situations required reflecting on and combining different forms of medical knowledge, testing their skills and previously acquired knowledge, and attempting to obtain a deeper and broader understanding of the individual patient's overall situation. In some cases, the students expressed their empathy with the patients; one of them said that she was "thinking about her mother and what to do if this had happened to her." Another student told about a patient case related to a similar situation in his family, and how he was concerned with finding a good solution for this specific illness. Thus, theoretical medical knowledge was transformed into concrete cases requiring practical solutions to care for the patients. These findings also indicate that empathy is not only a prerequisite for transformative learning to occur,[12] an increased level of empathy towards patients is also a positive learning outcome. Furthermore, the students claimed that they underwent a "transformative process." One student said, "I entered the fifth year as a hard-working medical student and completed it as a doctor in the making, which I experienced as a steep learning curve." Moreover, the extensive, external placement experiences helped the students perceive future professional practice as manageable (the second core component in sensing coherence) because they realized their potential to cope with various medical cases. One student said, "This fifth year has been like a revelation. The pieces have started to fall into place. This practice has made me more fit for use." Additionally, the students stressed the importance of being invited to discuss cases with experienced doctors. One student expressed this by saying, "Having a good mentor to discuss with is worth its weight in gold." Concerning this typical transformative learning activity, the study revealed different practices. Broadly speaking, the students' experiences could be classified into two categories: the students as participants and the students as observers. Medical teachers who treated students as participants discussed patient cases with them, whereas, the medical teachers who treated students as observers left the students on their own to seek out information about what had happened to different patients. In the latter category, students only had fellow students and intern doctors to discuss patient cases with, which meant fewer opportunities to participate in facilitated transformative learning activities.

As for the sixth and final year of the program, the students' placement learning occurred in the university hospital where they worked with experienced doctors and attended lectures on medical topics. The students reported that the year "reinforced their experience," "further deepening" and "problematizing" their medical knowledge. They also emphasized that this final year greatly prepared

them to become responsible physicians. One student elaborated on this notion by saying,

> This has been the most important year for further professional development as a medical doctor. I have deepened my theoretical perspectives and related them to practical cases and patients, and I have been discussing with experienced mentors. I feel safer and more prepared to become a responsible medical doctor now.

Discussion

Our findings yielded three key features that characterize transformative learning activities that can foster students' sense of coherence[6] in medical education: linking theoretical knowledge with professional practice, participating in authentic learning situations, and discussing and critically reflecting on cases and one's own placement experiences with experienced doctors. These transformative learning activities go beyond the acquisition of new knowledge and elaboration of existing knowledge by transforming the learner's understanding and assumptions regarding medical practice and their role as future professionals. One may argue that these transformative learning activities are fairly common in medical education; however, our findings show that even in a medical program that explicitly reports focusing on integrating theory and practice, a substantial number of the medical educators do not use these types of transformative learning activities. Furthermore, our findings indicate that the use of transformative learning activities presupposes thoughtful planning and facilitation by a medical educator. Moreover, an absence of these types of learning activities may indicate that the respective medical educator in charge of the lecture, seminar, or mentoring situation are not familiar with the benefits of transformative learning for student learning outcomes. Hence, our findings may have implications for practice, that is, a need for enhanced awareness among medical educators regarding the importance of knowing why and how to promote transformative learning.

Students highlighted linking theoretical knowledge to professional practice as a significant aspect of good teaching at both on-campus and placement learning sites because it made the theoretical content comprehensible and meaningful for their professional practice—the first and third core components of sensing coherence.[6] Opportunities to discuss cases and practice with peers and lecturers on campus and with mentors at the placement site were emphasized as vital for learning. Having been given opportunities to discuss cases and practical experiences with peers, lecturers, and experienced doctors, the students received alternative perspectives and explanations—a central feature of transformative learning.[11] Moreover, the findings indicate that authentic learning situations in which students meet actual patients, work with experienced doctors and examine, discuss, and put forth possible treatment scenarios for patients are essential for experiencing professional practice as manageable, which is the second core component of sensing coherence.[6] The students stated that these types of learning opportunities helped them gain confidence that they would be able to handle similar situations as future physicians. Using Bandura's[24] terminology, these situations enhanced their professional self-efficacy. This indicate that both first-hand experiences, that is students' own placement experiences, and second-hand experiences, that is practical cases or others experiences mediated by a lecturer, can be used by medical educators to make the educational content comprehensible and meaningful. Not unexpectedly, first-hand experiences are even more powerful than second-hand experiences, because discussing first-hand placement experiences with a medical educator contributes to the students' perceiving future professional practice as manageable. Hence, it is especially important in medical education to ensure that that students have mentors who invite them to discuss their placement experiences.

Additionally, the students reported that experiencing a lack of understanding and knowledge in these practice settings led to a desire to change[12] and motivated them to study further. Therefore, our findings indicate that experiencing a lack of knowledge and competence in either case-based learning on campus or when meeting an actual patient in practice can contribute to experiencing tensions and what Mezirow[11] terms a "disorienting dilemma." Thus, the need to acquire new skills, knowledge, and alternative perspectives and explanations emerges. The findings show that experiencing a disorienting dilemma motivated the students to discuss the case at hand and study further to broaden their knowledge and deepen their understanding of health-related phenomenon. Thus, providing students with opportunities to experience lack of understandings may be a way for medical educators to engage students in learning activities that have the potential to lead them to shifts in perspectives.[12]

Furthermore, the findings show that the students experienced a progression in difficulty level regarding linking theoretical knowledge to professional practice. At the beginning of the medical program, cases and the

lecturers' own medical practice were primarily used to illustrate and actualize theoretical knowledge. Later in the program, the students' own practical experiences were increasingly used as a basis for reflection and further study, and during the latter part of the program, when the students experienced extensive practice, they reported experiencing the pieces coming together and fully sensing coherence in their medical training. This sense of coherence enhanced their motivation to enter their final year of study and actually become physicians. In addition, the findings indicate that a sense of coherence between theory and practice is something that students must create, requiring effort in one's studies, a certain level of acquired medical knowledge, practical experience, and critical reflection. Thus, at the beginning of the medical program, the lecturers, in addition to linking theory to practical cases and facilitating critical reflection on professional practice, should communicate to the students that fully experiencing a sense of coherence is something that develops over time.

Finally, the findings underline the importance of facilitating a balance between various learning situations, such as acquiring new knowledge through participation in lectures, reading medical literature, participating in dialogue and critically reflecting on professional practice with experienced doctors, and practical training, which includes applying new insights in authentic or close-to-authentic practice situations. Mezirow[11] emphasizes that transformative learning involves developing a specific kind of attitude that corresponds to engaging in these types of learning activities. For medical students, this attitude involves constantly testing their assumptions about a medical condition and how to best treat a patient against other professionals' understanding and scientific knowledge. This is an important attitude to develop, both in terms of being responsive to patients and in relation to the rapid development of the latest in medical knowledge. Moreover, this kind of attitude is essential for justifying physicians' professional autonomy and space for discretion.[44]

Conclusion

This paper theoretically and empirically describes how transformative learning activities promote medical students' understanding of the interplay between theoretical knowledge and professional practice, thereby creating a sense of coherence in their medical education. This study contributes to the knowledge of some characteristics of good quality learning opportunities that can foster transformative learning, motivate students to partake in further theoretical studies, and give them a deeper understanding of professional practice, which is important knowledge for medical educators. The results indicate that linking theoretical knowledge to practical cases or placement experiences, having authentic placement experiences with real patients, and providing opportunities for discussing cases with experienced doctors help students perceive learning content as comprehensible and meaningful and makes educational demands manageable, which are the core components for sensing coherence in professional education. Based on the findings, we conclude that promoting transformative learning necessitates offering various types of learning activities that together provide a balance between acquiring and applying professional knowledge and critically reflecting on assumptions and professional practice. With critical reflection, students move beyond an individual viewpoint and learn how to deeply analyze a range of complex information and issues.

In spite of this knowledge, it is not a given that learning activities that may promote transformative learning are present in the teaching offered at various learning sites; therefore, we argue that an enhanced awareness of why and how to promote transformative learning is required among medical educators. Because this is a qualitative study, it is only possible to show our findings; thus, a need exists for more research in this field using both qualitative and quantitative approaches. However, within these limitations, the study offers valuable insight into how students perceive various learning opportunities offered on campus and at clinical placement sites.

Disclosure

The authors report no conflicts of interest for this work.

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