Medical students’ self-regulated learning in clinical contexts
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Chapter 6

General discussion
Summary of our findings

In the previous chapters I have presented four studies on self-regulated learning in a clinical context. In this chapter I will start out with a brief summary of our findings and I will relate them to the overall research question: How do medical students self-regulate their learning in a clinical context?

The first two studies reported in this thesis aimed to improve our understanding of how specific aspects of a clinical context influence self-regulated learning (SRL). Chapter 2 described routines that affected students’ SRL through enabling or hindering professional relationships between students and staff and through investing effort in students’ learning. Chapter 3 showed how single people in a clinical context influenced students’ SRL. Novice students’ learning was easily influenced by others, often peers or residents, and they had a relatively small social network to engage in their SRL than more experienced students.

The other two studies reported in this thesis aimed at improving our understanding of how the interaction between person and context affects SRL in a clinical context and what behavior results from it. Chapter 4 deepened our knowledge of how SRL works in a clinical context and the complex, intertwined role personal, social and contextual attributes have in this process. These attributes combine into four major factors influencing students’ SRL: goals, experienced autonomy, opportunities and anticipated results. In chapter 5 we distinguished five patterns in learning behavior that resulted from SRL in a clinical context. Students varied in self-regulated versus externally regulated learning, which led to different strengths and potential pitfalls in students’ SRL.

In this chapter, I will interpret these findings and discuss how two important contextual attributes, social interactions and routines, influence students’ SRL. I relate our findings to theories on self-regulated learning to current scientific knowledge. I will also link our findings to other theories on (workplace) learning. This thesis concludes with a methodological reflection, a discussion of the practical implications, and suggestions for future research.
Interpreting our findings

By using a variety of mostly qualitative methodologies in our studies, I gained an understanding of the process of self-regulated learning in a clinical context. SRL is a process influenced by a complex, unpredictable context, and therefore should be regarded and studied whilst explicitly taking this context into account.\textsuperscript{1,2} This means that to discuss the overall research question “\textit{How do medical students self-regulate their learning in a clinical context?}” it is also important to understand crucial aspects of a ‘clinical context’. Therefore, I will first discuss how self-regulated learning works in clinical contexts, and then focus on the effects different factors have in a clinical context.

\textit{How does self-regulated learning work in a clinical context?}

Clinical contexts have some unique attributes which makes studying SRL in vivo essential for understanding it. As was shown in chapter 4, students’ SRL is influenced by many personal, contextual and social attributes in a complex and intertwined fashion. Two students learning in the same clinical context can have very different learning experiences. For example, in chapter 4, one student explained how being the sole student on a ward was beneficial and allowed freedom in choosing what learning opportunities to grasp. Another student felt learning opportunities were sparse because being the sole student on a ward inhibited her from talking to other students, which she usually did to share emotions and discuss uncertainty. As a consequence of these differences in experience, hospital staff was likely to respond differently to these students, creating a complex chain of events and subsequent changes in SRL behavior. Altogether, person and context, including social attributes of a context such as perceived hierarchical barriers, resulted in four major factors which influenced the choices students made in their SRL: goals, experienced autonomy, opportunities and anticipated results. These four major factors also frequently played a prominent role (sometimes with some slight alterations in manifestation) in the other chapters, validating the importance of these four factors. Students chose different strategies to self-regulate their learning, on which the four factors mentioned above had a substantial influence. In chapter 5 we were able to identify five distinct behavioral patterns that resulted from SRL in a clinical context: we distinguished engaged, critically opportunistic, uncertain, restrained, and effortful students. These findings not only demonstrated that different patterns in SRL behavior exist, but also gave us insight into what students may find difficult about learning in a clinical context and how their SRL could improve.
I have come to the conclusion there is no such thing as the clinical context. Instead, many clinical contexts exist, however when undergraduate medical students describe the clinical contexts in which they learn, many similarities can be found. An important one is that a clinical context is not static, but rather something flexible and one that can be interpreted differently by individuals. Chapter 2 for instance, provided insight in how some students deemed structured learning activities (e.g. daily plenary educational meetings) to be supportive to their SRL because it aided their goal setting. Other students however, perceived structured learning activities as a lack in autonomy to engage in SRL. Additionally, as we discussed in chapter 4, context and individuals both have an influence on SRL and the effects of both individual and context, are intertwined. This results in a clinical context that is personal, social, ever changing and has a significant influence on students’ SRL. Therefore, it is very difficult to study the effect of a single contextual factor on students’ SRL and the entire process should be regarded holistically.

**Relationships in a clinical context**

One of the most important elements of the clinical context influencing students’ SRL resulting from our studies was the social aspect, or relationships with others. Relationships with others in a clinical context were affected by two important factors: students’ social network and routines of clinical departments that enabled or hindered creating and maintaining relationships. Social interactions have proved to be important influences throughout the research described in this thesis. Chapters 2 and 5 provided us with the insight that students’ SRL strategies very frequently involved asking or answering questions. Likewise, students frequently discussed learning goals and proactively asked for feedback in their SRL strategies. Who students asked for feedback and discussed their learning goals with depended on their social network in a clinical context.

A significant finding presented in this thesis is how the social network of students in a clinical context expands and changes, as I have described in chapter 3. Students who were new or feel insecure about their role in a clinical context have a relatively limited social context and their SRL was therefore influenced by a relatively small number of people. Consequently, the vagaries of a single resident, peer, or consultant could have a major impact on students’ SRL and could make learning thrive or diminish. More experienced students on the other hand had a much larger social network in a clinical context and the influence a single person had on their SRL is smaller. These students were able to navigate and understand the clinical community and all of its members and knew what their role in the process of patient care could be. Sub-
sequently, they knew what to do in patient care and how to learn from that. More experienced students were therefore more resilient in suboptimal learning contexts and could better cope with transitions across rotations.

Another significant finding in this thesis was how students perceived routines of clinical departments to support or hinder their possibilities to form relationships with others in the workplace, as is remarked in chapter 2. Therefore, to support students’ SRL, it is essential to stimulate the formation of professional relationships to facilitate interactions. Forming these relationships requires time and the possibility to collaborate (in patient care). This explains why students valued longer clinical placements to support their SRL and wanted to feel like a legitimate part of a team, for instance by including them in informal moments such as lunch and giving them responsibilities, for instance in handovers. This gives them the opportunity to start to feel and act like a professional. Additionally, students regarded some routines exercised by the people in a clinical department to indicate a lack of effort that was invested in their learning. This lack of effort was frequently followed by a loss in motivation for learning by the student because of a need for a feeling of reciprocity. In other words, if students felt the people in a clinical department invested time and effort in them, they would invest time and effort in the clerkship. If students did not feel reciprocity of the effort they invested in a clinical department, they were more likely to decrease the effort they put into the clerkship. This is likely to have had a negative impact on learning, and not be beneficial for supervisors’ well-being and motivation for teaching,3,4 resulting in a downwards spiral.

Combining these two significant findings results in the realization that especially novice students are very susceptible to routines of departments influencing their possibilities to create relationships with others and perceiving reciprocity of effort. For these students’ SRL, it is therefore highly important to foster a safe learning environment, without rotating them between departments too often to enable them to develop themselves in a certain context. Having departmental routines that stimulate the creation of professional relationships may also facilitate students settling into a clinical context and the transition towards SRL like an experienced student.
Identity development and transitioning into an experienced student

Leading authors have recently postulated that the development of a professional identity should be a principal goal of medical education. James Marcia’s Ego-Identity status theory describes four statuses of identity development which are influenced by context. These four statuses represent modes of reacting to an identity crisis in late adolescence. The four statuses were originally identified in college students and are characterized by the presence or absence of crisis, and by commitment in the areas of occupation and ideology. Looking at the SRL behavior patterns reported in chapter 5 and the transition from ‘novice’ to ‘experienced’ student as reported in chapter 3, from the perspective of identity development, we observed a resemblance between patterns of SRL behavior found in this thesis and Marcia’s statuses of identity development.

There is a large overlap in the behavior associated with the ‘engaged’ and ‘critically opportunistic’ patterns and the Identity Achievement status described by Marcia. In the Identity Achievement status, individuals are committed to an ideology, have considered various alternatives and have made a decision on their own terms. The behavior of students associated with the ‘uncertain’ and ‘restrained’ patterns appears to resemble the behavior of individuals in Marcia’s Moratorium. In Moratorium, individuals are in an active struggle to determine which commitments to make, are very aware of how they appear, and try to compromise between societal demands and their own capabilities. Lastly, behavior associated with the ‘effortful’ pattern seems to be closely related to the Foreclosure status of identity development. In this status individuals have not gone through a crisis, but rather become what others expect them to become. The resemblance between the patterns and the identity development statuses is comprehensible because what students want to learn and what they find important might result from students’ process of identity development. This is coherent with theoretical beliefs that self-regulated learning, and regulation of behavior specifically, is a consequence of trying to convey a specific identity towards others and that students may experiment with possible alternative identities. We did not find behavior patterns that we could relate to Marcia’s Identity Diffusion status. The Identity Diffusion status is hallmarked by a lack of commitment. It is possible a behavior pattern reflecting low motivation and lack of commitment did not show up in our study because of a corresponding lack of motivation from these students to participate in this study, or because this status is uncommon among medical students who are generally known to be highly motivated.
In chapter 3 we found how ‘experienced’ students had managed to settle in a clinical context. Regarded from an Identity Development point of view, these students had reached the Identity Achievement status. Likewise, ‘novice’ students can be regarded to be in Marcia’s Moratorium status, because they are in an active struggle of managing themselves in a new context. Lastly, some ‘novice’ students, enrolled in clerkships for a long time did not appear to make the transition to ‘experienced’. This may be understood because these students are in the Foreclosure status of identity development. They have accepted not to be able to find their way in a clinical context and rather just do what they are told. This also shows resemblance to the ‘acquiescing to a lack of learning opportunities’ approach to SRL as described by Woods et al. This theoretical reflection gives additional theoretical support to the recent call for increasing the attention for identity development in medical education.

**Situated learning theory and transitioning into an experienced student**

Why identity development is such an important issue in SRL can also be understood using Situated Learning Theory. This theory describes that learners learn in the workplace through legitimate participation in the periphery of a community of practice. This means that it is vital for students to think, act and feel like physicians, because it enables them to become legitimate members of a clinical community of practice and collaborate in daily activities. Therefore, placing a students’ professional identity formation more at the core of medical education, as suggested by various authors, might also benefit students’ engagement in SRL in a clinical context.

In all studies presented in this thesis, students reported learning most from participating in real clinical activities, similar as in Situated Learning theory. From a Situated Learning perspective, the transition from novice to experienced student relies on an adequate understanding of a clinical community of practice and developing an identity as a physician in a clinical context. This makes a stronger case for longer clinical placements, because longer exposure facilitates students’ understanding of a clinical community of practice, and consequently what a student’s role in a team might be.

Situated Learning theory explains how learning happens through legitimate peripheral participation in a community of practice. Novice students in chapter 3 explained learning from a small number of people. They acted in the periphery of a clinical community of practice. Novice students reported a feeling of illegitimacy when their SRL was hindered, when they felt they were of little added value, or even a nuisance to the clinical team. Experienced students on the other hand, reported feeling like a real member of the clinical team. They could quickly establish their le-
gitimacy within the team. Experienced students understood how their community of practice works, and knew how to navigate it to become full participants. This enabled them to engage core members of the clinical team, usually consultants or supervising physicians, in their SRL. Chapter 2 gave us insight in how various routines in clinical contexts could support students’ legitimate peripheral participation in a community of practice. Especially important for this was to make students feel like a real member of a team and making them feel appreciated. This could for instance be done by faculty knowing students’ names, engaging them in activities, explaining complicated discussions to them, and involving them in social and informal activities of a department such as having lunch together.

**Theorizing SRL in a complex context**

This thesis adds empirical evidence about SRL in a clinical context to the body of scientific knowledge already available. Chapter 4 gave us insight in how SRL in a clinical context may not be such an orderly, cyclical process as theorized by many, including Pintrich and Zimmerman. Rather, SRL in a clinical context may be more flexible and dynamic. Part of SRL in a clinical context is opportunistic and reactive to the ever-changing context it takes place in. This does not mean that SRL needs to be regarded completely differently in a clinical context in comparison to other contexts. Rather, it means that in a complex clinical context there is also a reactive form of self-regulated learning which is not initiated by goal setting, but by reacting to opportunistic learning activities that present itself. This variant coexists with more planned, cyclical self-regulated learning, meaning that besides being able to self-regulate their planned learning, students are also required to adapt to their context and utilize a flexible, opportunistic variant of self-regulated learning. When regarding SRL in a clinical context, a difficulty in goal setting and a need for more opportunistic SRL should be addressed as planned learning and goal setting are deemed essential in SRL.
Figure 1. Attributes and factors influencing clinical students’ self-regulated learning, adapted from chapter 4.
Both the planned and the reactive, opportunistic variant of self-regulated learning were dependent on four major influencing factors: goals, experienced autonomy, opportunities and expected results, see figure 1. When reviewing these factors using Sitzmann and Ely’s meta-analysis about SRL in vocational settings it was reassuring to see that they also found that goal setting and self-efficacy had the biggest effect on the outcomes of SRL. Self-efficacy was not an apparent factor in the study reported in chapter 4. However, the studies in chapters 2, 3, and 5 did show how valuable self-efficacy and self-reflection are for SRL. These might therefore be a fifth and sixth major factor, not clearly articulated by students as such in chapter 4, but made visible through studying routines, interactions and identifying patterns in students’ SRL behavior.

Understanding the major factors influencing clinical students’ SRL using other learning theories

Sitzmann and Ely did not report autonomy, opportunities and expected results to be major influencing factors on SRL. This might be a result from some unique features of a clinical context, but it might also be because self-regulated learning theories did not originate from vocational learning settings but from many other contexts. Our studies therefore provide a valuable insight in the added complexity of SRL in clinical workplaces. However, using one main paradigm to view our results with may also have limited our understanding somewhat. Therefore, I will also discuss our findings using other theories originating from other research paradigms to better understand how SRL works in a clinical context.

Besides goals, which is also a notable part of all other SRL theories, we found in chapter 4 that autonomy, opportunities and expected results are major influences on SRL. This can be understood using literature about workplace affordances, Self-Determination Theory, and Achievement Goal Theory. Workplace affordances are used to describe the engagement opportunities and invitational qualities of the workplace. Workplace affordances include readily available opportunities for students, possibilities for a student to create opportunities, and faculty teaching practices. Chen et al. studied how workplace affordances and learner agency are both important to students’ learning opportunities in a clinical context. Likewise, in chapter 4 we also found that opportunities or workplace affordances are important for clinical students’ SRL and that students in a clinical context also talked about creating workplace affordances. This is similar to the learner agency described by Chen et al, and the ‘creating learning opportunities’ approach described by Woods et al. Workplace affordances are influenced by students interacting with activities, arte-
facts, tools, aims, goals, procedures, values and norms of a context. Similarly, these influences proved to be important aspects of how a clinical context and students can interact to influence students’ SRL as we found in chapters 2, 3, and 4. Altogether, using these theories helps us understand how clinical SRL works, and that it is more complex than in classroom settings.

According to Sitzmann and Ely the outcomes of SRL in vocational contexts is greatly affected by motivation. Self-Determination Theory describes how intrinsic motivation is most beneficial for learning, and that it requires three psychological needs: autonomy, a feeling of relatedness, and a feeling of competence. This may explain why autonomy was also a major factor resulting from our study reported in chapter 4. Additionally, students frequently reported in chapters 2 and 3 that they wanted to feel they were part of a clinical team, wanted to feel reciprocity for the amount of effort they put into a clerkship and wanted to be able to take responsibilities. We consider these to be appearances of an ultimate need for a feeling of relatedness and self-efficacy. The need for relatedness has never been described in SRL theories, but makes sense when combined with the Self-Determination Theory and Achievement Goal Theory.

Achievement Goal Theory gives us an insight in why students may decide to work on certain goals and why they may expect better results from pursuing some of their own set goals, rather than those of a curriculum. Achievement Goal Theory is a motivation-theory aiming to answer how students approach learning using three types of goals. These goals can either be learning oriented, or performance oriented. Learning oriented goals aim for achieving excellence. Performance oriented goals are classified differently in varying theories, but generally can either aim for making a good impression (proving goal orientation, performance-approach goal orientation), aim for avoiding to look incompetent (avoiding goal orientation, performance-avoid orientation), be intrinsically driven to perform (relative ability goal orientation), or extrinsically driven to perform (extrinsic goal orientation). Students generally have a natural tendency to adopt one of these types of goals most frequently in challenging situations, which is referred to as their goal orientation. Research using Achievement Goal Theory has studied how different goals lead to varying degrees of adaptive learning behavior, self-regulation, self-efficacy and performance. Students aiming for learning oriented goals showed most adaptive learning behavior, higher self-regulation, higher self-efficacy and better performance. This shows close similarities with the ‘engaged’ pattern in SRL behavior we found in chapter 5, which might imply these students mostly pursue learning oriented goals in their SRL.
with a relative ability goal orientation also showed adaptive learning behavior, high self-regulation, high self-efficacy and good performance. This shows similarities with the ‘effortful’ pattern in SRL behavior we found in chapter 5, though these students were not highly self-regulating in a sophisticated way but regulated their learning by increasing the effort they invested. Students with an extrinsic goal orientation showed maladaptive learning behavior, low self-regulation, low self-efficacy and lower performance. This shows similarities with the ‘restrained’ pattern we found in chapter 5, who also wanted to avoid looking inferior to others.

By linking our findings to previous studies, it appears plausible that having students focus on learning rather than performance in a clinical context will be beneficial to their SRL behavior and subsequent learning outcomes. Likewise, having students be afraid to appear inferior to others and continuously having to prove themselves is likely to be detrimental for subsequent SRL and learning outcomes. Achievement Goal Theory therefore gives us interesting additional insights in why students aim for certain goals in their SRL.

**Methodological reflections**

In this thesis I have used a broad range of mostly qualitative methodologies to study self-regulated learning in clinical contexts. I have chosen to use different methods for data gathering and analysis in order to get multiple perspectives on this subject and try to methodologically triangulate the findings. One of the most important aspects of scientific research is methodological rigor to improve the legitimacy of the research process and outcomes. I have done this in this thesis through multiple methods. Firstly, all studies were audited and approved by the Ethical Research Board of the Netherlands Association for Medical Education. Before starting any study I determined the rationale for doing the study based on previous scientific research. Also, located the research within existing scientific theories as to build upon a knowledge base already available.

During data gathering and analysis I performed member checks in order to allow participants to provide us with additional insights. Additionally, I frequently discussed our analysis and initial findings within the research team to restrict the influence of a single researcher interpreting the data. Likewise, the first and second authors of chapters 2, 3, and 4, read and discussed entire transcripts of interviews and focus group sessions to discuss emerging themes. All of the considerations made were noted in a scientific log as to make sure our discussions and decisions were retrievable and reviewable. Lastly, by engaging in reflexivity I have tried to help readers
understand who we are, what our prior experiences are, and how our identities may have colored the results we found. This hopefully helps readers understand our influence during data gathering, analysis, and writing up.

In my research I have tried to be transparent, trustworthy and rigorous. This also means that I acknowledge there will always remain a degree of uncertainty regarding the outcomes of the studies presented in this thesis. For instance, we now know that multiple patterns in how students engage in self-regulated learning exist, however we cannot be sure that all patterns that exist were found in the study presented in chapter 5. Likewise, as I have explained in the previous section, our findings regarding SRL appeared to closely relate to other theories used in education sciences. However, these similarities were not explicitly addressed in the studies presented, and conceptual links need to be looked into in more detail. My findings give us an insight in the SRL of our participants, but may be very different for other participants or in another setting.

With this thesis using mostly qualitative data I have gained a deeper understanding of how self-regulated learning works in clinical contexts. However, quantitative research would be required to determine the size of effect that routines of clinical departments (chapter 2), single people (chapter 3) and the four main factors influencing SRL (chapter 4) have on SRL.

Strengths and limitations of this thesis
In scientific research, any study will have certain strengths and limitations. I regard the fact that I used mostly qualitative data to answer the overall research question of how students self-regulated their learning in clinical contexts as a strength because it enabled me to engage in a discussion with students about how they approach this. Conducting these studies as a recently graduated MD is another strength, because this created a low hierarchical difference between participant and researcher. Additionally, because of my own experiences, I was able to understand and envision the situations students discussed and ask meaningful follow-up questions. I am aware that this also opens up the possibility of the results representing my personal experiences too much. Therefore I collaborated with having a multi-institutional, multi-disciplinary research team as to prevent this from happening excessively and using a variety of professional perspectives to interpret the findings. Lastly, I regard using different ‘grain sizes’ to look at the process of self-regulated learning in clinical contexts as a strength of this thesis. As Brydges and Butler pointed out, it is valuable if consecutive studies use a narrow and a broad focus as to best understand SRL.1
therefore used a broad focus of a department in chapter 2, studied students’ self-reported SRL behavior in clerkships in general in chapters 3 and 5, and narrowed chapter 4 to describe SRL in a single day of a student.

The studies reported in this thesis have limitations and caution must be used when interpreting the findings. First of all, the studies have taken place in one western European country. Therefore the findings may not be easily transferrable to other contexts. It is for instance likely that the major factors influencing SRL reported in chapter 4, such as autonomy, may not present in the same way in other cultures with stronger hierarchy. Similarly, I believe that patterns in SRL behavior will exist everywhere, however the content of these patterns might be very different in other settings and cultures than the patterns reported in chapter 5. The same is true for how routines in clinical departments and social interactions influence students’ SRL. Moreover, our results should also not be generalized directly to other stages of clinical training (e.g. early clinical experience, postgraduate, or staff’s lifelong learning). It is also unknown whether our results are transferrable for other health professions learning in clinical contexts such as nursing students and physiotherapy students. Additionally, we know the pedagogy used in a bachelor curriculum influences SRL. We included students from two universities using different preclinical pedagogical approaches in chapter 4 but not in the other studies reported in this thesis. None of the participants in the studies presented in chapter 2, 3, and 5 were trained to self-regulate their learning. Therefore, it is likely that students who are, such as those educated in a problem-based learning pedagogy, would have responded differently to the questions we asked. These students might not have a similar need for structure in their environment as some of the students in chapter 2 had, but benefit from more autonomy. Another clear limitation is that our studies are solely based on self-report. This is insuperable because SRL also entails mental processes, but is a limitation as many studies have shown self-report and self-assessment may be unreliable. As we have only used students as participants we do not know whether faculty and others view students’ SRL similarly. It might be that staff do not recognize students’ SRL at all. Because this is still unclear, we have to be cautious with making suggestions about how students’ SRL could be supported by others. Lastly, we have identified many ways in which students’ SRL can be influenced. However, we did not study which of these influences’ effect is largest or should be addressed most urgently.
Practical implications

SRL is a highly complex process, influenced by individual and context. Therefore, I will first discuss the practical implications of this research that relate to the students themselves, and afterwards I will discuss how students’ SRL can be supported by a clinical context on both an individual and a curricular level.

Preparing students for SRL in a clinical context

Students’ SRL is influenced by their personal conceptions regarding learning and healthcare.1 This involves what they believe it is to be an academic and what a good doctor is, e.g. the professional identity they want to develop. All of their conceptions are influenced by previous experiences. Therefore, helping students to engage in effective SRL in a clinical context begins with helping them to understand what learning is, what effective learning strategies are in a clinical context, and helping them create a clear idea of what kind of professional they want to become.

In our studies it became apparent students in a clinical context frequently used learning strategies they also used in preclinical medical education. We therefore need to increase students’ metacognitive awareness from early on in medical education to overcome these issues.38 Mentoring,39 mapping,40 and using microanalysis protocols to gain an insight in students’ current engagement in SRL41–43 may provide insight in the issues that need to be addressed most urgently, which may prove to be especially important for struggling students.44,45 A learning to learn course might also be beneficial for students’ engagement in SRL.46

Additionally, a stronger focus on professional socialization in clinical contexts is imperative. It is essential to adapt departmental routines that engage students in the clinical team, because students learn from participating in real, meaningful activities participating in the periphery of a community of practice.40 By doing this, students will increasingly feel like a true valuable member of a clinical community. This includes that students will start to think, act and feel like physicians and gradually adopt a clinical identity.5 Besides support in developing a clinical identity, a constructive learning climate is also crucial for achieving this.47 Additionally, as we described in chapter 3 and 5, students who feel comfortable in a clinical context are likely to have better learning outcomes because the range of people they engage with in their self-regulated learning is larger.
To aid identity development in medical education it is also vital to make it an explicit part of a curriculum.\textsuperscript{5} Students need to be engaged in discussions about what it is to be a doctor and about their clinical experiences, to facilitate students’ own understanding of who they are.\textsuperscript{12} Lastly, students’ identity as a doctor-to-be is mainly developed in clinical contexts. As identity development happens through interactions with others, it is important for clinical contexts to identify and be aware of the messages they portray through their daily routines. These are often shaped by underlying unofficial rules, implicit values, beliefs and attitudes.\textsuperscript{12}

**Enhancing individual support in a clinical context**

Supporting students’ SRL requires individual support because all students are different and have different needs. I would therefore like to advocate for individualized support for students’ SRL in a clinical context. Especially students new to a context may experience difficulty with self-regulated learning. Novice, insecure students may require help with setting learning goals for their SRL navigating the context, and planning learning in a clinical context as showed in chapter 5 because they are unsure of what to expect. Additionally, it seems plausible that especially novice students and other students, who feel insecure about their role in a clinical team, require more emotional and metacognitive support than others. Providing students with some sort of scaffolding using a form of co-regulated learning from the onset of clinical learning, with generally decreasing support over time (both within a single clerkship and throughout the curriculum) as suggested by Brydges et al. seems a promising strategy to achieve more individualized support for SRL.\textsuperscript{1,48}

Multiple approaches can be taken when individualizing support for students’ SRL in a clinical context by co-regulated learning. A staff member can aid in a students’ SRL by engaging in discussions about a students’ learning goals, engaging in discussions about learning strategies, and by frequently asking reflective questions regarding whether set goals are met.\textsuperscript{39}

Many clinical students ultimately work towards the goal of being able to function independently as a resident. Therefore, it is important that students are able to take responsibilities similar to those of a resident, under close observation. This allows them to self-assess performance and monitor their progress towards their goal of functioning as a resident, and actively self-regulate their learning whilst getting there. Implementing Entrustable Professional Activities (EPA’s) in undergraduate medical education may support such an increase in responsibilities for students, whilst ensuring patient safety and high quality care.\textsuperscript{49}
Lastly, chapter 2 gave us an insight in how reciprocity of effort is vital. If students feel effort is invested in them and into their learning, they will also invest more effort in a clerkship. That students invest effort into their learning is important, because as Sitzmann and Ely concluded, effort is one of the most beneficial factors for learning outcomes resulting from SRL. Having students feel that attention and effort is invested in them and their learning can be achieved in multiple ways. Something simple like knowing students by their name may be highly beneficial. This is also true for involving them in social activities and making them feel appreciated, for instance by a periodical free lunch. Similarly, it is important educational sessions are not frequently cancelled, and students get adequate resources to learn, including frequent supervision and feedback.

*Curricular improvements to enhance contextual support for students’ SRL*

Combining the results of the studies presented in this thesis also sheds some light on curricular elements that can support students’ SRL in clinical contexts. The study presented in chapter 2 provided us with the insight that it is highly important for students to feel recognized as a part of the team. Students also noted how supervisors can best track their progress and grant them adequate entrustment to work independently, if they work together for a longer period of time. Additionally, the study in chapter 3 showed how students need to learn like an experienced student who knows and understands the way in which a clinical community works. Our findings, together with previous research, advocate for the implementation of longitudinal integrated clerkships. Longer clerkships and longer placements in the same institution limit the number of times students need time to settle and therefore allow more time to be spent and real learning in a clinical setting. Dubé et al. showed the phases of transitioning into clinical learning usually take four to six months, and end in adopting a clinical identity. Participants in chapter 3 talked about a similar timeframe before they started to learn like an experienced students. Therefore a long clinical placement of four to six months at the start of clerkships might be especially desirable for students relatively new to learning in clinical contexts. Additionally, longer clerkships will result in less frequent transitions from one department or institution to another. Literature regarding the need to reduce the number and intensity of transitions to benefit student learning and reduce stress is abundant. Lastly, longer clerkships will also make entrusting students with responsibilities easier, because supervisors get to know what a student is capable of doing on its own.

Besides longer clinical placements, it is also important where these placements take place and how many students are allocated to each placement simultaneously. As
chapter 2 showed us, highly specialized departments, long procedures, high time pressure, and a large proportion of follow-up patients, limit students’ perceived learning opportunities. Many students discussed how they perceived their clerkships in peripheral hospitals to be much more beneficial for their learning. In these hospitals, students more easily integrated in the clinical teams because these were generally smaller, patient care was overall less complex allowing them to work more independently, and lastly the number of peers was generally smaller. As students expounded on in chapter 3, large numbers of peers simultaneously enrolled in a clerkship was usually a barrier to students’ self-regulated learning. It often meant there was a limited amount of possibilities for learning and it promoted competition between students. Competition between students was destructive for peer-learning, could be detrimental for students’ motivation and helped fuel unwanted unsupportive behavior. Smaller numbers of students (or at least clearly separate responsibilities for each student) could help solve competition issues.

Lastly, faculty development programs could be improved by including how to individually support students’ self-regulated learning in clinical contexts. As we have shown in chapter 3, novice students are most susceptible to the didactic qualities of a single supervisor. These students describe learning in a small social network in which the most prominent roles are usually fulfilled by peers and residents. Therefore, it is very important to train residents in how to supervise and support students learning in the clinical context. Faculty development initiatives focusing on student learning in clinical contexts should not only be catering to consultants and other faculty, but also, perhaps more importantly, to residents. Additionally, it is important to support peer learning by having students collaborate, giving and receiving meaningful feedback, asking for advice or providing help when necessary, giving emotional support etc. For this it is imperative to have a safe environment for peer learning. It is therefore advisable that students have an ‘own room’ in which they can learn from each other without having anyone around who is assessing them.

Suggestions for future research
My thesis has given us an insight in students’ self-regulated learning in clinical contexts. However, there are still many questions that are left unanswered and even more questions that arose after performing the studies presented in this thesis. Naturally, I am unable to present all possibilities for future research regarding SRL in clinical contexts. Therefore, I will present what I believe are the most promising approaches for future research on this topic.
First of all, we found that to study learning in a complex context such as a clinical one, it can be very insightful to take a holistic approach. Qualitative research can shed some light on how a large number of influences plays a role in the process of learning. Besides more traditional methodologies such as interviews and focus groups, visual methodologies have been used much too infrequently because for instance they may allow making tacit things explicit.\textsuperscript{51,62} Longitudinal designs will most likely provide us with some very valuable insights. A longitudinal study on how students develop self-regulated learning throughout clinical training and whether patterns in self-regulated learning behavior are stable, or more varying over time, seem especially promising. However, also a more quantitative approach to studying self-regulated learning in clinical contexts can be taken. For instance, by linking self-regulated learning behavior in clinical contexts to learning outcomes or future performance as a physician. Microanalysis protocols for identifying and quantification of self-regulated learning processes seem especially promising.\textsuperscript{42,43,63,64}

Specifically interesting study objectives include all the aspects I described in the practical implications section. It would be interesting to see if students can be better prepared for self-regulated learning in clinical contexts, for instance by having a preclinical curriculum put more emphasis on the importance of self-regulation. For advancing individual scaffolding of students’ self-regulated learning in clinical contexts, it would be interesting to study this from a faculty perspective. Do supervisors recognize students’ self-regulated learning? How can they recognize patterns in students’ self-regulated learning? And what should supervisors do to best scaffold the support needed by individual students? Future research is also required to establish what residents need to best support (novice) student learning because the associated skills will potentially be beneficial for them throughout their entire career.

I conclude with the issues I believe are most important for students’ SRL in clinical environments and the effects of which should be studied in closer detail in future research. First of all, starting off with some longer lasting clerkships, decreasing the number of rotations, could support students’ SRL.\textsuperscript{50,55} It would be interesting to study in what way they are implemented best; for instance, is one long four to six month rotation at the start enough to help students become experienced in SRL in clinical contexts, or do longitudinal integrated clerkships also have a beneficial effect on students’ SRL later in clinical undergraduate medical education? Secondly, how to use and support legitimate peripheral participation in clinical communities of practice to benefit SRL needs to be studied in more detail. Do longitudinal integrated clerk-
ships resolve issues of not participating in communities of practice or are there more problems that need to be addressed? Lastly, the link between identity formation and SRL is a strong one. It would be very interesting to study the effects of explicitly addressing identity formation in undergraduate medical education on students SRL in clinical environments. I feel that identity formation and longitudinal integrated clerkships are the route to be taken to improve students’ SRL in clinical contexts and future doctors’ life-long learning.

Conclusions

Self-regulated learning in clinical contexts is different from self-regulated learning in classroom contexts and should be regarded as such. Self-regulated learning in a clinical context is context-specific, and is affected by a complex, intertwined interaction between student and context. This interaction results in several patterns that can be identified in medical students’ SRL behaviors. Because of the complex nature of clinical contexts, both a planned, and a reactive variant are required to self-regulate learning in a clinical context. Both are influenced by relationships with others in a clinical context to support students’ SRL. Students who are new to a clinical setting and have not settled only have these relationships with a few others, mainly peers and residents. More experienced, settled students have relationships with a broader range of people they can engage in their SRL. The relationships these students have with others are crucial for their SRL as learning is a social process. Departmental routines have a strong effect on the possibilities for students to form relationships with others. These departmental routines need to be implemented in such a way that they best support relationships between student and faculty. I believe this is not only likely to support students’ SRL, but also SRL of residents and lifelong learning of consultants, which in the end will contribute to better doctors.

“Learn from yesterday, live for today, hope for tomorrow. The important thing is not to stop questioning.”

- Albert Einstein
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