Medical students’ self-regulated learning in clinical contexts

Berkhout, J.J.

Citation for published version (APA):

General rights
It is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), other than for strictly personal, individual use, unless the work is under an open content license (like Creative Commons).

Disclaimer/Complaints regulations
If you believe that digital publication of certain material infringes any of your rights or (privacy) interests, please let the Library know, stating your reasons. In case of a legitimate complaint, the Library will make the material inaccessible and/or remove it from the website. Please Ask the Library: https://uba.uva.nl/en/contact, or a letter to: Library of the University of Amsterdam, Secretariat, Singel 425, 1012 WP Amsterdam, The Netherlands. You will be contacted as soon as possible.

UvA-DARE is a service provided by the library of the University of Amsterdam (http://dare.uva.nl)
Chapter 4

Exploring the factors influencing clinical students’ self-regulated learning

J.J. Berkhout, E. Helmich, P.W. Teunissen, J.W. van den Berg, C.P.M. van der Vleuten, A.D.C. Jaarsma

Medical Education, 2015; 49: 589-600
Abstract

Objectives
The importance of self-regulated learning has been broadly recognized by medical education institutions and regulatory bodies. Supporting the development of self-regulated learning skills has proven difficult since self-regulation is a complex interactive process, and we know relatively little about the factors influencing this process in real practice settings. The aim of our study was therefore to identify factors that support or hamper medical students’ self-regulated learning in a clinical context.

Methods
We conducted a constructivist grounded theory study using semi-structured interviews with 17 medical students enrolled in the clerkships of two universities. The participants were purposively sampled to ensure variety in age, gender, experience, and current clerkship. A day-reconstruction method was used to help participants memorize their activities of the previous day. The interviews were transcribed verbatim and analyzed iteratively using constant comparison and open, axial and interpretive coding.

Results
Self-regulated learning by students in a clinical context was influenced by the specific goals students perceived, the autonomy they experienced, the learning opportunities they were given or created themselves, and the anticipated outcomes of an activity. All of these factors were affected by personal, contextual and social attributes.

Discussion
Self-regulated learning of medical students in a clinical context is different for every individual. The factors influencing this process are affected by personal, social and contextual attributes. Some of these are similar to those known from previous research in classroom settings, but others are unique to a clinical context such as the available facilities, the role of patients, and social relations pertaining to peers and other hospital staff. To better support students’ self-regulated learning, we believe it is important to increase students’ metacognitive awareness and to offer students more tailored learning opportunities.
Introduction

The importance of self-regulated learning in medical education has been broadly recognized by medical education institutions and regulatory bodies. For healthcare professionals, the competency to self-regulate learning is essential for lifelong learning, which starts already during students’ undergraduate education. According to the literature on self-regulation, most students do not fully develop the competency to adequately self-regulate their learning independently. They need to be supported in this process. Supporting the development of self-regulated learning is challenging, because self-regulation is a complex interactive process of physical and mental activities. These activities are affected by personal and contextual attributes, and the interaction between those, which makes self-regulation highly context specific.

Several theoretical models have been developed to describe the process of self-regulated learning. Many similarities can be found between these models, but their differences are more interesting. These differences pertain to the level of self-regulation, e.g. task-specific or more general for a person, and the question if cognition and affect are separately regulated areas. A popular theory in medical education is that of Zimmerman, who conceptualized self-regulation on a more general level, including metacognition and the regulation of affect. Zimmerman described self-regulated learning (SRL) as a cyclical process in which a student is actively engaged. In the forethought phase students set learning goals and choose a strategy for attaining those goals. In the performance phase students monitor and control their behavior to attain their learning goals. In the self-reflection phase students self-evaluate their performance by gathering feedback and choosing a strategy for a future, similar, situation.

Personal attributes found to affect self-regulated learning in a classroom setting include the students’ skills in regulatory mechanisms such as: planning, monitoring, metacognition, attention focusing, employing various learning strategies, persistence, time management, environment structuring, help seeking, emotion control and effort control. Other personal attributes include motivational beliefs such as self-efficacy and attitudes about the perceived importance, with higher self-efficacy and higher perceived importance resulting in trainees devoting more of their resources towards achieving their goal. Lastly, the tasks set by a context and the affective reaction of the student to this task, affect students’ self-regulated learning in the classroom. Contextual and social attributes known to stimulate self-regulation in more structured classroom settings include: social support, feedback, the
opportunity for guided and independent practice, supporting reflective practice, and the opportunity to make errors. Direct instruction of possible learning strategies by teachers, and the possibility to model these strategies by students, have also proven to support self-regulated learning, especially in young students, since they may not know how to use effective learning strategies in a new context. Suggestively, a similar parallel might be suitable in students new to a clinical context. In opposition, a curriculum assessment strategy and pedagogy hindering strategic problem solving and autonomous inquiry has shown to hamper self-regulated learning. This also happens when teachers have limited time to support students’ self-regulated learning.

Contrary to experimental settings, a clinical learning context is not a controlled setting but a complex context primarily aimed at providing healthcare to patients. Learning in a clinical context entails many informal and tacit learning processes. Woods et al. addressed the process of self-regulated learning in a clinical context by studying students in a surgical clerkship. Their results provided insight in how students approach self-regulated learning and what activities they undertake. However, the factors influencing this process were not studied.

By gaining more insight in the factors influencing medical students’ self-regulated learning in a clinical context on an experience level, we can better support students’ learning processes and improve clerkship effectiveness. Therefore the issue under investigation in this study was: what are the factors that affect medical students’ self-regulated learning in the clinical workplace?
Method

Design
Our research was based within an interpretivist paradigm in which reality is subjective, context-specific and no ultimate truth exists in the experience of workplace learning. We carried out a constructivist grounded theory study, including purposive sampling and constant comparison methods, iteratively collecting, coding and interpreting data until saturation was reached, after which two more interviews were held to confirm saturation. We used semi-structured interviews to create a safe environment in which students would feel free to offer their personal experiences on how they regulate their learning.

Setting
The participants were purposively sampled to ensure variety in age, gender, experience, and current clerkship. We sampled students from a traditional and a problem-based (PBL) university, knowing that PBL may influence SRL. Furthermore, we sampled students who were enrolled in different clerkships because of the influence of context on SRL, and who were in different years of the clerkships because we know prior experience influences SRL. We recruited students from two Dutch training regions, consisting of a university hospital, affiliated regional hospitals, and non-hospital healthcare institutions.

The medical curricula of both universities include a preclinical phase (year 1-3) and a clinical phase (year 4-6), the latter consisting of rotational clerkships ranging from 3 to 10 weeks. The preclinical curriculum of the first (traditional) university has a horizontally and vertically integrated curriculum, the preclinical curriculum of the second university (PBL university) is a problem-based curriculum based on the principles of self-directed, collaborative and contextual learning. Students of the PBL university are required to keep a portfolio during their clerkships to note learning goals in, and to monitor and reflect on their progress. Students of the traditional university are not required to keep such a portfolio. During the clerkships, medical students participate in work on the wards, the outpatient clinics, the emergency room, public-health institutions, and general practices. In both universities, approximately 350 students enroll in the clerkships each year.

Participants
Between June of 2013 and February of 2014, the first author (JB) approached students by sending an email. In total 17 students agreed to inclusion in our study by...
sending an email to the first author and signing an informed consent. Details of the participants are given in table 1. After the interview participants were given a €12,50 gift certificate as compensation for their time.

<table>
<thead>
<tr>
<th>Fictional name</th>
<th>Gender</th>
<th>Age (in years)</th>
<th>Ethnicity</th>
<th>Current clerkship</th>
<th>Setting</th>
<th>University</th>
<th>Experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linda</td>
<td>Female</td>
<td>26</td>
<td>Dutch</td>
<td>General practice</td>
<td>Community based</td>
<td>Traditional</td>
<td>6th year</td>
</tr>
<tr>
<td>Danielle</td>
<td>Female</td>
<td>24</td>
<td>Dutch</td>
<td>Internal medicine</td>
<td>Outpatient clinic, academic hospital</td>
<td>Traditional</td>
<td>6th year</td>
</tr>
<tr>
<td>Irene</td>
<td>Female</td>
<td>30</td>
<td>Dutch</td>
<td>Surgery</td>
<td>Outpatient clinic, peripheral hospital</td>
<td>Traditional</td>
<td>6th year</td>
</tr>
<tr>
<td>Eveline</td>
<td>Female</td>
<td>29</td>
<td>Dutch</td>
<td>General practice</td>
<td>Community based</td>
<td>Traditional</td>
<td>6th year</td>
</tr>
<tr>
<td>Sarah</td>
<td>Female</td>
<td>25</td>
<td>Dutch</td>
<td>Ophthalmology</td>
<td>Outpatient clinic, academic hospital</td>
<td>Traditional</td>
<td>5th year</td>
</tr>
<tr>
<td>Anna</td>
<td>Female</td>
<td>24</td>
<td>Dutch</td>
<td>Surgery</td>
<td>Outpatient clinic, peripheral hospital</td>
<td>Traditional</td>
<td>6th year</td>
</tr>
<tr>
<td>Rosanne</td>
<td>Female</td>
<td>27</td>
<td>Dutch</td>
<td>Otolaryngology</td>
<td>Outpatient clinic, academic hospital</td>
<td>Traditional</td>
<td>5th year</td>
</tr>
<tr>
<td>Danny</td>
<td>Male</td>
<td>23</td>
<td>Turkish</td>
<td>Surgery</td>
<td>Ward, academic hospital</td>
<td>Traditional</td>
<td>5th year</td>
</tr>
<tr>
<td>Whitney</td>
<td>Female</td>
<td>22</td>
<td>Surinamese</td>
<td>Pediatrics</td>
<td>Ward, academic hospital</td>
<td>Traditional</td>
<td>5th year</td>
</tr>
<tr>
<td>Rick</td>
<td>Male</td>
<td>23</td>
<td>Dutch</td>
<td>Obstetrics and Gynecology</td>
<td>Ward + operating room, peripheral hospital</td>
<td>PBL</td>
<td>5th year</td>
</tr>
<tr>
<td>Cathy</td>
<td>Female</td>
<td>23</td>
<td>Dutch</td>
<td>Pediatrics</td>
<td>Ward, peripheral hospital</td>
<td>PBL</td>
<td>6th year</td>
</tr>
<tr>
<td>Laura</td>
<td>Female</td>
<td>22</td>
<td>Dutch</td>
<td>Intensive care</td>
<td>Intensive Care, academic hospital</td>
<td>PBL</td>
<td>6th year</td>
</tr>
<tr>
<td>Claire</td>
<td>Female</td>
<td>21</td>
<td>Dutch</td>
<td>Internal medicine</td>
<td>Ward, peripheral hospital</td>
<td>PBL</td>
<td>4th year</td>
</tr>
<tr>
<td>Sven</td>
<td>Male</td>
<td>25</td>
<td>Dutch</td>
<td>Community medicine</td>
<td>Outpatient clinic, community based</td>
<td>PBL</td>
<td>5th year</td>
</tr>
<tr>
<td>Isabelle</td>
<td>Female</td>
<td>22</td>
<td>Dutch</td>
<td>Neurology</td>
<td>Ward, peripheral hospital</td>
<td>PBL</td>
<td>4th year</td>
</tr>
<tr>
<td>Eva</td>
<td>Female</td>
<td>23</td>
<td>Dutch</td>
<td>Surgery</td>
<td>Outpatient clinic + Operating room, academic hospital</td>
<td>PBL</td>
<td>4th year</td>
</tr>
<tr>
<td>Robin</td>
<td>Female</td>
<td>23</td>
<td>Dutch</td>
<td>Pulmonology</td>
<td>Ward, academic hospital</td>
<td>PBL</td>
<td>4th year</td>
</tr>
</tbody>
</table>

Table 1. Characteristics participants
**Data collection**

The first author (JB) conducted all the interviews. Three pilot interviews were used to test an initial interview guide. This resulted in the addition of the Day Reconstruction Method (DRM) as a tool to aid students’ recall of the diverse activities they engaged in.\(^3\)\(^3\)\(^4\) The goal of the DRM is “to get an accurate picture of the experience associated with activities and circumstances and to elicit specific and recent memories, [...] thereby reducing errors and biases of recall”.\(^3\)\(^3\) This is achieved by making a diary consisting of a sequence of episodes. Because we used the DRM to reflect on the previous workday, only students who could schedule the interview the day after a clerkship-day were included in the study. Two students were excluded from the study due to scheduling problems to meet the aforementioned requirement for the DRM.

At the start of the interview, we asked participants to fill in the diary pages of the DRM. This was used as the main prompt for the interview. Per activity they were asked to describe what they had done, who were involved in the activity, what choices they had made, why they made these choices, and what the results of their choices were. Follow-up questions focused on the three phases of the self-regulated learning cycle and included questions about learning goals, monitoring progress towards their learning goals, and evaluating/reflective activities.\(^3\) Although the DRM was used as a starting point for the interviews, other interesting issues were also pursued during the interviews. The interviews lasted for approximately one hour.

The interviews were audio-recorded and transcribed verbatim. Students were given an alias. After each interview, the first author performed a preliminary analysis and provided the participant with a single page summary of the interview as a member check. All participants verified the summary of the interview, with two participants suggesting small revisions.

**Data analysis**

The first and second author met weekly during a period of 8 months. The first 5 meetings involved training the first author (JB) in coding within grounded theory, by the second author (EH) who has much experience in this field. They both read the first 5 transcripts and assigned initial codes on a line-by-line basis for training purposes. Next, the first author interviewed the other participants, directly followed by open coding, and in a later stage by axial coding of the data and interpretive analysis. Subsequent meetings between the first and second author in between the interviews and after the final interview were used to discuss the emerging concepts. To further develop our interpretations, the first and second author kept memos
to record reflections and analytical ideas as they arose. We used the three phases described by Zimmerman as sensitizing concepts, meaning they provided starting points for building our analysis. Students from the same university and/or enrolled in the same year were re-analyzed after saturation had been reached. This was done to study whether salient differences between, groups of, students emerged within our purposive sample.

We discussed all our interpretations within the entire research group, 6 times in total, both during the coding process and during writing-up. The research group consisted of a heterogeneous group of researchers, which helped us look at our data from different perspectives. Two authors (JB and JvdB) are recently graduated as MD’s and are PhD-students in medical education. All other authors have significant experiences in medical education and have different backgrounds. These backgrounds include elderly care medicine (EH), obstetrics/gynecology (PT), psychology and psychometrics (CvdV) and veterinary medicine (AJ). Data analysis was supported by the use of MaxQDA V11 (Verbi GmbH, Berlin Germany).

**Ethics**

When approached, students were informed about the voluntary nature of this study and were assured that the data would be processed anonymously. Students were not told beforehand they would be rewarded for participating. The study was approved by the ethical review board of the Netherlands Association for Medical Education (NVMO).

*Side note: all the names used in the results are fictional.*
Results

Students’ stories about learning in the clinic were highly specific for person, context and social setting, were complex in nature, and involved many interacting influences, as can be seen in figure 1. Firstly we describe what personal, contextual and social attributes affect students’ self-regulated learning in a clinical context. After that, we describe the four most prominent factors that supported or hampered students’ self-regulated learning: the goals students had, the autonomy they experienced, the opportunities they recognized, and the outcomes they anticipated.

Figure 1. Attributes and factors influencing clinical students’ self-regulated learning
Personal, contextual and social attributes

The process of students’ self-regulated learning is the result of many different attributes of influence pertaining to person, context and social relationships. These attributes influenced the four factors directly relating to students’ self-regulated learning, as will be portrayed in the coming paragraphs.

Personal, contextual and social attributes could both hamper or support self-regulated learning depending on the situation. Personal attributes affecting self-regulated learning included skills in regulatory mechanisms such as emotion control, metacognition, attention focusing and effort control. Furthermore, beliefs about learning, motivation, previous experiences and the level of a task perceived had an effect. Attributes relating to self-efficacy such as dealing with pressure, insecurity, perceptions of expectations, and knowing one’s own limits and needs, also played a role. Contextual attributes affecting self-regulated learning pertained to: the curriculum, facilities, atmosphere, patient-related aspects, available time, the people present, and engagement in the team. Social attributes affecting self-regulated learning pertained to: the familiarity with the other people present in a certain setting, the type of relationship with them, the experience and motivation for teaching of these other people, and whether they created possibilities for the student to self-regulate learning.

Goals

Students perceived many different goals they should work towards. This was affected by personal, contextual and social attributes such as previous experiences, or the experienced pressure to comply to goals set by the curriculum or a supervisor. Two specific types of personal goals were identified, those were: 1) where they strived to learn something, and 2) where they wanted to look good or avoid looking bad. The external goals were goals aimed either: 1) to help the students learn, or 2) because they were beneficial to the organization, such as administrative tasks.

These perceived goals could then act as regulatory agent and initiate self-regulated learning, by having students set a specific goal for themselves, and start to work on achieving that specific goal. In the following quote Eva explains how having to formulate curricular learning goals in her portfolio, and her affective reaction to this affects her self-regulated learning in the clinic to some degree, but that this is also influenced by her metacognitive beliefs and the opportunities she recognizes.
Eva: “Before [the clerkship] we have to write down our learning goals [...] I don’t think the goals I set really determine: “oh I should work on achieving that goal” [...] But it does make you consciously think about: “what shall I do next?” However what you plan on doing often differs from what ends up happening. You can’t always say: “I want to learn this or that”, because the opportunity will sometimes come by and sometimes not.”

Students often focused on personal goals because they did not see the relevance of the external goals that were presented, for instance because of negative previous experiences. External goals could hamper students’ self-regulated learning as is illustrated by Anna who was told her goal should be to go study in the library instead of helping with paperwork. She wanted to self-regulate her learning and create learning opportunities by joining the resident, because she believed this would be more useful, but didn’t feel the autonomy to do so.

Anna: “She [resident] basically decided: “that is not interesting for you.” Umm, but I actually would rather tag along and see if it really is not interesting for me because that still leaves me with the option to go study in the library if it really isn’t interesting.”

**Opportunity**

Students described that to self-regulate learning they need to have the opportunity to do so. Whether this opportunity was seen by, created by or given to students, was influenced by personal, contextual and social attributes described earlier and large individual differences were seen. An example of how attributes such as insecurity, pressure, experience and the level of a task affect the opportunity to self-regulate learning is given by Danny, talking about why he doesn’t dare to join a discussion and ask questions during the morning layover.

Danny: “They [consultants] will ask: “who has seen this patient”; or: “what does this patient have?” We as students often do not have sufficient knowledge, and perhaps we don’t have the guts to say or ask anything in front of all the consultants. [...] Also, simple things are not discussed, usually it is something very complex that is talked about, we can’t do anything with that. We don’t have the knowledge, so… probably we can’t be of added value.”
The opportunity to self-regulated learning can also be affected by contextual attributes such as the number of peers present in a context. In one interview a student explained that having other peers present hampered his self-regulated learning because this reduced his learning opportunities when he wanted to do something another student was already doing. However, as Robin explains in the following quote, in her case, having no peers present hampered her self-regulated learning, because she did not have the opportunity to employ a learning strategy she frequently uses, which is to informally discuss doubts and questions she does not dare to ask a supervisor.

Robin: “In pulmonology I’m the only clerk around [...] I think that’s a shame; umm yes for social purposes of course and I think there’s is plenty to do for another clerk [...] and you have no one to deliberate with, or to ask whether something is normal or not.”

Social attributes, for example regarding a supervisor, can also affect the opportunity to self-regulate learning, as is explained by Sven in the coming quote.

Sven: “Most important for learning in the clerkships is [...] doing activities independently. That can be very broad, like a consultation or a procedure, that you do it yourself and receive helpful feedback afterwards, and ask for it as well [...] Having many different supervisors is a disadvantage. I think that if you have the same supervisor for a couple of weeks, or a week, you get to know this person and are allowed to do more things independently.”

**Experienced autonomy**

Another factor influencing students’ self-regulated learning in the clinic was the autonomy students experienced. This autonomy was also affected by personal, contextual and social attributes and can influence self-regulatory mechanisms, as is exemplified by Eva and Irene. Eva’s strong motivation helped her to autonomously self-regulate her learning by creating an opportunity to work towards her goal. Irene did not experience or take autonomy of her own learning, but strictly followed a tight schedule given by a context, limiting her opportunity to get to know patients and take responsibility in the ward, something she anticipated as having the most beneficial outcome.
Eva: “It is really evident in this clerkship. You can decide what you want to do […] my interest lies in the field of traumatology and orthopaedics. I’m not scheduled for those during this clerkship. I think that’s a shame, so I exchanged my schedule with someone from the traumatology ward.”

Irene: “The result is that you’re on the wards and in the OR every other day, preventing you from getting to know the patients in the ward, so you can never take responsibility for a group of patients and that is what I find valuable […] and so, when you’re on the wards you will be taking notes, writing charts and…yes, requesting laboratory test, that isn’t instructive.”

**Anticipated outcomes**
The anticipated outcomes of a self-regulated learning activity influenced students’ engagement in a particular activity. Students often self-regulated their learning if they expected favorable outcomes. A favorable outcome could be an increase in competencies, an increase in future learning opportunities, or an anticipated positive effect on their emotions. Combinations of these motives were also described. The anticipation of the outcomes was often based on personal attributes such as previous experiences or contextual elements such as the experiences of peers. This is exemplified by Danielle who self-regulated her learning by setting the goal for herself to accompany a diabetes nurse practitioner for a day, rather than an internist. She chose this as her goal because she reckoned this experience would be more helpful for her future career in obstetrics/gynecology, since diabetes management is a frequent issue in pregnant women.

Danielle: “Coincidentally, I had a discussion this morning where I said I thought it would be fun to tag along with the specialized diabetes nurse for a day, just because I have no idea what kind of advises she gives and they manage a lot in diabetes care, so I thought: it will be good to do that sometime this week.”

**Example of a narrative**
As described in the previous sections, the interaction between person, context, and social attributes affecting self-regulated learning is complex. As a final part of the results section we present a narrative by Rick to illustrate this complexity.

{Insert narrative around here}
Rick's perceived goals are multiple: to assist in the OR as much as possible, to make a good impression on the surgeon, to do as much as he can by himself, and to see many rare diseases and diseases new to him. Furthermore he feels he is expected to introduce a new clerk, an external goal slightly interfering with his own goals that morning. There were limited opportunities to work on his personal goals that week because of a holiday. Fortunately for him, the hospital he was allocated to does not train residents, meaning he was able to assist more often than would have been the case in most other hospitals. Rick’s strategies for the day were also multiple. First of all, he autonomously decided on a personal plan and decided to make haste showing the new clerk around, as a form of time management. Furthermore, he remembered from previous experience which procedures he could assist with, making him

Narrative

“Coincidentally, I ran into the new student on my way to the morning handover [...] so it became clear I would show him around. I quickly explained which supervisors would go to the outpatient clinic, how the computer system works, I showed him the wards and how everything works with the assessment forms. Then I left him at the wards and went to the OR myself [...] I want to assist in the OR as much as possible, because I like that best and I hope off course to make a good impression [...] and I always hope to see new, rare things. This week it’s the fall break, so all scheduled surgical procedures were on one of two days and there were a couple of procedures with which I could assist, laparoscopic procedures, so off course you attend those. [...] If the procedures in the OR are not suitable for a student to assist with, I rather go and do something else that I can do by myself. [...] but, this is a small peripheral hospital where there are no residents [only consultants], so that’s nice. Sometimes there are procedures where a gynaecologist and a resident are operating, and then there is no physical space anymore for the student [...] At the end of the procedure I asked: “well, can I close the wound?” She [gynaecologist] knew that I’m capable of doing that, so I could close the wound. I always try to be a little active in the OR [...] thereby you become engaged in the operating team, and I just know it’s appreciated when you show that you’re helping and not sitting quietly in a corner. In my assessment booklet they always write that I’m an engaged and enthusiastic student [...] Maybe this allows me, in my final week, to ask if I can place a Mirena IUD in a anaesthetised patient if there is time. I have the feeling that I generated quite some goodwill, so I can maybe try and ask if I can do that some time.”
anticipate on positive outcomes when attending these procedures. At the end of the procedure he autonomously created a learning opportunity for himself by asking the gynaecologist if he could close the operating wound, expecting a positive outcome from asking this because the gynaecologist knew him and knew Rick was capable of doing this. Finally, he explains his self-regulating strategy of always being active in the OR to become an engaged member of team, anticipating positive outcomes by doing this, because it would enable more learning opportunities for him in the near future.

**Discussion**

Our study determined the personal, contextual and social attributes and the four factors: perceived goals, opportunity, experienced autonomy and the anticipated outcomes, that support or hamper self-regulated learning by students in the clinical workplace. Self-regulated learning in the clinical workplace is a complex process in which many different influences interact, making it a highly individual, context-specific process. This has to be taken into account both in research on self-regulated learning in a clinical context and in educational strategies to try and support students’ self-regulated learning. We used the three-phase model of Zimmerman as sensitizing concept for our analysis of the factors influencing students’ self-regulated learning in the clinic. These three phases could all be retrieved in our data, though we found little evidence for the distinct stages as portrayed in Zimmerman’s model. Our results better align with Butler, Cartier and colleagues’ description that the process is recursive, dynamic, multidirectional and complex.36

The personal attributes that affect self-regulated learning were largely the same as those found in other studies, including students’ skills pertaining to regulatory mechanisms to self-regulate learning, their self-efficacy, their attitude towards learning, their previous experiences, and the task demands perceived and the affective reaction to this.11,18,19,21 Contextual and social attributes pertaining to the teacher, curriculum pedagogy, time and different elements pertaining to the learning climate, have already been described in literature to influence self-regulated learning in the classroom.18,22 However, based on our findings we emphasize that a clinical context also contains several unique attributes influencing the opportunity to self-regulate learning, such as: the facilities available, the interaction with patients, the patients present, social attributes pertaining to peers and other hospital staff, the complexities of hierarchical departments, and the engagement in a team. These contextual attributes have not been described similarly in a classroom setting.
Students described goals to be an important influencing factor because they serve a motivational function and were often a starting point for a specific goal to work towards. This is consistent with earlier research on self-regulated learning in classroom settings, stating that goals can function as regulatory agents for self-regulated learning. Furthermore, goals can direct students’ attention on specific aspects of the learning process or outcomes. The goals we found are similar to those described in the theory on mastery, and performance goals, which also relates to the opportunity to make errors as influencing factor on self-regulated learning in a classroom setting.

The opportunities that students see, create or are given, and the autonomy that students experience also have an effect on self-regulated learning in a clinical context. It can be understood that if students have some feeling of autonomy, this helps them to take control and self-regulate their learning, for instance by more actively creating learning opportunities. These contextual attributes appear to be quite unique for a clinical context because issues regarding patient safety and productivity are also important and may limit the amount of autonomy students receive and opportunities they are given.

Lastly, students’ self-regulated learning was influenced by the expected outcomes of an activity. Many external goals set by the clinical curriculum led to little effort working on those goals because students did not see the point and how they would benefit from conducting such an activity. This resonates well with earlier findings that if students do not see value in a learning task they are likely to spend little time on setting goals and planning strategies to accomplish these tasks.

We noted large individual differences in students’ self-regulated learning, making it a process that is highly specific for each person. For example some students actively set learning goals for themselves, where others seemed to rely on a more opportunistic approach. Relying on opportunistic learning especially happened at the start of clerkships, as expectations often became more clear once students grew accustomed to their workplace. Students explained they used opportunistic learning strategies because they did not know what was expected from them and what they could expect from the clerkship. This finding resonates well with the call for more longitudinal integrated clerkships.

A recent review has shown that, even though students are expected to self-regulate their learning, many college students are insufficiently capable of monitoring their
own learning, often using inefficient strategies whilst thinking they are doing well.\textsuperscript{42} Similarly, many of the stories in our study involved numerous aspects of limited awareness about students’ own learning processes.

**Strengths and limitations**

One of the strengths of this study was the use of Day Reconstruction Method. It helped to minimize bias through long-term recall of events, which has shown to be subject to memory, emotions and beliefs, with participants’ often focusing on those events that have the biggest emotional value.\textsuperscript{43} However, recall studies will always suffer from some memorization bias. One possible memorization bias can be that many choices may be memorized as active choices when asked about it, but were in fact subconscious choices when they happened.\textsuperscript{44}

Another strength of our study was that a recently graduated MD performed the interviews. This allowed us to create an atmosphere in which both interviewer and participant were interacting as equals. The interviewer was a medical student less than 2 years ago, which enabled him to relate to participants’ situations. On the other hand, personal experiences of the interviewer likely had an influence on the interview and what other interesting information was pursued besides the DRM. We are aware of this and therefore some interviews were coded with another author, also paying attention to the phrasing of the questions to make sure these were not suggestive.

We regard our sampling strategy as both a strength and weakness of our study. Our sampling enabled us to include students from two medical faculties using different pedagogical approaches. These students were enrolled in several different clerkships, in many different locations, increasing the transferability of our findings within the Dutch context. However, because we only included students from Dutch universities little can be said about the international transferability where students and contexts may be very different.

**Implications for practice and future research**

Self-regulated learning is not a simple process in a student’s mind that is easy to intervene on, but is a complex and adaptive system emerging in a clinical context. It is very difficult to generalize how to support self-regulated learning because this complex system is unique for every person in every context. One could think about several approaches, for example increasing student awareness about their own learning process could be a good start for this. Making students more aware of their
learning may improve their flexibility in using different learning strategies in different situations, and thereby increase the learning effectiveness of the clerkships.\textsuperscript{45} Increasing students’ awareness about their own learning process can be done by promoting general awareness about metacognition, improving knowledge about cognition, improving the regulation of cognition, and by fostering an environment that promotes metacognitive awareness by focusing on mastery rather than performance.\textsuperscript{46} Previous studies have looked at the effects of teaching specific SRL-skills to students learning on an academic level, which looked promising.\textsuperscript{47–49} We suggest further research to understand what the effect of such a training would be on self-regulated learning in a clinical context.

It also seems important to offer more tailored learning opportunities and supports necessary for students to self-regulate their learning, as students are known to have different needs.\textsuperscript{50} A way of doing this might be to individualize clerkship assignments, dependent of a students’ future career choice, something that looked promising in a recent small scale study.\textsuperscript{51} Another suggestion could be to more thoroughly assess the needs of individual students, because it is unlikely that one solution will work for all students. A possible way of doing this could be to see if administering an existing measurement tool for self-regulated learning can provide the information necessary to create a more tailored learning experience. If existing measurement tools seem unfit for this, developing a new measurement tool specifically designed for this could be a solution. Catering for the individual needs of students may help them improve their self-regulated learning skills and master their own life-long learning.

Our study contributes insight into what factors influence the self-regulated learning process. Future research should study the influence of making students more aware of their own learning on self-regulated learning in a clinical context. It is also interesting to study the influence of increased tailored opportunities for students to self-regulated learning. It may also be interesting to see if we could categorize the large individual differences we found in students’ self-regulated learning behavior, making it more easy to grasp and making it easier to study the effects of these differences in behavior. Lastly, students’ self-regulated learning is influenced by the expected outcomes of learning activities; it would be interesting to study what the relationship between these expected outcomes and actual learning outcomes is.
Conclusion

Self-regulated learning of medical students in a clinical context is different for every individual and is influenced by goals, opportunity, the autonomy experienced, and the expected outcomes of an activity. These factors are affected by personal, social and contextual attributes; some of these are similar to those known from previous research in classroom settings, but others are unique to a clinical context. Ultimately, self-regulated learning is complex and highly dependent of person and context, which when taken into account could help understanding students’ self-regulated learning in a clinical context.
References


