

University of Groningen

Context matters when striving to promote active and lifelong learning in medical education

Berkhout, Joris J.; Helmich, Esther; Teunissen, Pim W.; van der Vleuten, Cees P. M.;
Jaarsma, Alexandra

Published in:
Medical Education

DOI:
[10.1111/medu.13463](https://doi.org/10.1111/medu.13463)

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Document Version
Publisher's PDF, also known as Version of record

Publication date:
2018

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):

Berkhout, J. J., Helmich, E., Teunissen, P. W., van der Vleuten, C. P. M., & Jaarsma, A. D. C. (2018). Context matters when striving to promote active and lifelong learning in medical education. *Medical Education*, 52(1), 34-44. DOI: 10.1111/medu.13463

Copyright

Other than for strictly personal use, 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), unless the work is under an open content license (like Creative Commons).

Take-down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Downloaded from the University of Groningen/UMCG research database (Pure): <http://www.rug.nl/research/portal>. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.

Context matters when striving to promote active and lifelong learning in medical education

Joris J Berkhout,¹  Esther Helmich,²  Pim W Teunissen,^{3,4} Cees P M van der Vleuten³ & A Debbie C Jaarsma²

WHERE DO WE STAND NOW? In the 30 years that have passed since The Edinburgh Declaration on Medical Education, we have made tremendous progress in research on fostering ‘self-directed and independent study’ as propagated in this declaration, of which one prime example is research carried out on problem-based learning. However, a large portion of medical education happens outside of classrooms, in authentic clinical contexts. Therefore, this article discusses recent developments in research regarding fostering active learning in clinical contexts.

SELF-REGULATED, LIFELONG LEARNING IN MEDICAL EDUCATION Clinical contexts are much more complex and flexible than classrooms, and therefore require a modified approach when fostering active learning. Recent efforts have been increasingly focused on understanding the more complex subject of supporting active learning in clinical contexts. One way of doing this is by using theory regarding self-regulated learning (SRL), as well as situated learning, workplace affordances, self-determination theory and achievement goal theory. Combining

these different perspectives provides a holistic view of active learning in clinical contexts.

ENTRY TO PRACTICE, VOCATIONAL TRAINING AND CONTINUING

PROFESSIONAL DEVELOPMENT Research on SRL in clinical contexts has mostly focused on the undergraduate setting, showing that active learning in clinical contexts requires not only proficiency in metacognition and SRL, but also in reactive, opportunistic learning. These studies have also made us aware of the large influence one’s social environment has on SRL, the importance of professional relationships for learners, and the role of identity development in learning in clinical contexts. Additionally, research regarding postgraduate lifelong learning also highlights the importance of learners interacting about learning in clinical contexts, as well as the difficulties that clinical contexts may pose for lifelong learning. However, stimulating self-regulated learning in undergraduate medical education may also make postgraduate lifelong learning easier for learners in clinical contexts.

Medical Education 2018; 52: 34–44
doi: 10.1111/medu.13463



This is an open access article under the terms of the Creative Commons Attribution License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited.

¹Center for Evidence-Based Education, Academic Medical Center (AMC-UvA), University of Amsterdam, Amsterdam, The Netherlands

²Center for Research and Innovation in Medical Education, University Medical Center Groningen, University of Groningen, Groningen, The Netherlands

³Department of Educational Development and Research, Faculty of Health, Medicine and Life Sciences, Maastricht University, Maastricht, The Netherlands

⁴Department of Obstetrics and Gynecology, VU University Medical Center, VU University Amsterdam, Amsterdam, The Netherlands

Correspondence: Joris Berkhout, Center for Evidence-Based Education, Academic Medical Center (AMC-UvA), University of Amsterdam, Meibergdreef 9, Room J1A-138, 1105 AZ Amsterdam, The Netherlands. Tel: +31 (0)6 2121 8947; E-mail: jj.berkhout@antoniuziekenhuis.nl

 WHERE DO WE STAND?

Thirty years ago, The Edinburgh Declaration on Medical Education was published by the World Federation for Medical Education.¹ This declaration originated from a conference where the results from a global inquiry on medical education were discussed and which identified 12 improvements to be achieved for medical education in the future. This article discusses where we stand now and how we can proceed, focusing on one of the recommendations: 'Ensure continuity of learning throughout life by shifting emphasis from the didactic methods so widespread now to self-directed and independent study as well as tutorial methods'.¹ In this article, we will discuss current knowledge on promoting active learning in medical education and introduce some theoretical frameworks that may foster the understanding of active learning. By doing so, we aim to move beyond discussing active learning in a specific setting, and to provide a discussion about active learning and lifelong learning as a doctor in a broader variety of contexts, emphasising more complex ones such as clinical contexts.

To ensure continuity in lifelong learning, it is important to understand what active lifelong learning is, what it entails, and how one can foster the development of lifelong learning. A definition often used to describe lifelong learning is: 'the development of human potential through a continuously supportive process which stimulates and empowers individuals to acquire the knowledge, values and skills and understanding they will require throughout their lifetimes and apply them with confidence, creativity, and enjoyment in all roles, circumstances, and environment.'² This definition by Longworth and Davies emphasises how lifelong learning is a continuous process of employing metacognitive skills to acquire and use cognitive and non-cognitive competencies in different situations. In other words, it is imperative for a lifelong learner to always actively engage in one's own learning in different circumstances and contexts.³ This implies that lifelong learning is a great responsibility for the individual. However, it does not imply that active lifelong learning is a solely individual, cognitive, process. On the contrary, actively engaging in learning is a process influenced by both person and context.⁴

 LEARNING IN CONTEXT

As Ellaway and Bates have argued, it is important to systematically describe what context entails to enable critical engagement and advance understanding of learning in such contexts.⁵ Following a constructivist theory on learning, meaning that humans construct knowledge and meaning from their experiences, we can define context to be: an occasional, relational property between objects or activities that arises from activity and which features are defined dynamically.⁶ Therefore context includes what people do in a context, the roles that people have in a context, interpersonal relationships, and the physical context in which learners learn. This results in a context that is not static but rather flexible, emergent, dynamic and changing, and can be interpreted differently by individuals.^{7,8} This explains why learners in different contexts may engage in active learning very differently. How learners engage in active learning will in turn also effect their contexts.⁹ For example, in a recent empirical study, one medical student explained how being the sole student in the context of a clinical ward was beneficial for his active learning because it allowed freedom in deliberately choosing learning opportunities. By contrast, another medical student felt that being the sole student on a ward limited her learning opportunities because there were no possibilities to talk to other students, which was one of her main strategies for learning in a clinical ward.⁷ As hospital staff responded differently to these students, this created a complex chain of events and subsequent changes in learning behaviour, exemplifying how context and individual both effect active learning.

 SELF-REGULATED LIFELONG LEARNING IN MEDICAL EDUCATION

Entry to practice

In the 30 years since the Edinburgh Declaration, we have learned a lot about how to facilitate learners to actively engage in their own learning in classroom contexts.¹⁰ A prime example of this is the vast amount of research regarding problem-based learning (PBL), which emphasises learning as being a self-directed, contextual, constructive and collaborative process.¹¹⁻¹⁴ In PBL, learners get challenged with professionally relevant problems regarding a certain topic, which they need to

research and then debate and discuss within a small group, rather than being given all relevant information regarding a certain topic. Researchers generally tend to agree that PBL has a positive effect on active learning and learning outcomes, but that it also depends on other factors than the instructional method of PBL, such as students' motivation for PBL, the quality and level of the problems presented to them, and the faculty members that work with the students.¹⁵ More recently, team-based learning (TBL) has been gaining attention. Studies on TBL also show high student engagement in their own education, and it requires less time from faculty members as it combines certain aspects of small- and large-group learning.^{16–19}

By contrast with classroom learning, little is known about how to facilitate active engagement in lifelong learning in contexts other than those dedicated to learning, for instance the clinical workplace.^{20,21} This is important because a major part of medical education happens within clinical contexts and those are not intrinsically suited for active learning.²² Additionally, active engagement in lifelong learning in clinical contexts requires modified learning strategies compared with classroom contexts.⁷ Therefore, in the remainder of this article we will focus on facilitating (the development of) lifelong learning competencies within clinical contexts.

Clinical contexts have some unique features not found in many other contexts, which relate to the prime focus of a clinical context, which is to provide patient care, and to the belief that learning in a clinical context largely takes place by participating in activities regarding patient care.²³ Learning and patient care should be intertwined in these contexts, because not doing this may harm the embodiment of knowledge.²⁴ The clinical context is therefore also shaped by: the care of patients, physical settings, supervision from senior staff members and other health care professionals, the curriculum in which learners are enrolled and peers involved.⁵

Self-regulated learning

One way of trying to understand active engagement in lifelong learning in such a personal, social and ever-changing context is by using self-regulated learning (SRL) theories.^{25–33} A widely used definition of SRL, overarching separate but related theories, is that: 'Self-regulated learning

is the modulation of affective, cognitive and behavioral processes throughout a learning experience to reach a desired level of achievement'.³⁴ SRL consists of various regulatory processes, which can be categorised as: regulatory agents (goal setting), regulatory mechanisms (planning, monitoring, metacognition, attention, learning strategies, persistence, time management, environmental structuring, help-seeking, motivation, emotion control and effort) and regulatory appraisals (self-evaluation, attributions and self-efficacy).³⁴ Traditionally, this was theorised as an orderly, cyclical (meta)cognitive process. However, recent findings in SRL research advocate that SRL processes are not purely individual, but also highly dependent on context and therefore SRL should be regarded as such.^{34–38} SRL theories originated from settings in which certain goals are set for the learner, by contrast with lifelong learning where learners must determine many goals themselves.³⁹ However, the vast majority of skills required for self-regulated learning are also vital for effective lifelong learning.^{3,39,40} Therefore, to understand more about developing and supporting lifelong learning in medical education, it is interesting to understand how learners self-regulate their learning. Besides using theory on self-regulated learning, it is helpful to use multiple theories to study active learning because this aids a more holistic, comprehensive understanding of it.⁴¹ Therefore we will also discuss self-regulated lifelong learning in medical education from a broader perspective using other theories. The key theories used are defined and summarised in Table 1.

Self-regulated learning is traditionally regarded as a planned, orderly, cyclical, (meta)cognitive process initiated by goal setting. However, part of SRL can be opportunistic and reactive to the ever-changing context it takes place in.⁷ This means that for medical students in a clerkship, there is a spectrum of how students engage themselves in self-regulated, lifelong learning. At one end of the spectrum there is traditional, planned, cyclical self-regulated learning, initiated by the goals of a learner. At the other end of the spectrum there is a reactive form of self-regulated, lifelong learning that is initiated by reacting to opportunistic learning activities that present themselves. This means that besides being able to self-regulate planned learning, medical students learning in clinical contexts are also required to adapt to their context and utilise a flexible, opportunistic variant of self-regulated learning.

Table 1 Key theories and definitions

Key theories	Definition
Achievement goal theory ⁷⁶	Achievement goal theory addresses the issue of the purpose of or reason why an individual pursues a task as well as the standards or criteria they use to evaluate their competence or success in the task. The term 'goal orientation' is used to represent the idea that achievement goals are not just simple target goals or more general goals, but represent a general orientation to tasks that includes a number of related beliefs about purposes, competence, success, ability, effort, errors and standards.
Constructivist theory on learning ¹⁰⁰	Constructivist theories on learning suggest that learning is an interpretive, recursive, nonlinear building process by active learners interacting with their surroundings, and the physical and social world. It describes how structures, language, activity and meaning making come about, rather than simply characterising the structure and stages of thought, or isolating behaviours learned through reinforcement.
Self-determination theory ^{71,72}	Self-determination theory (SDT) is concerned with the motivation behind choices people make without external influence and interference. SDT focuses on the degree to which an individual's behaviour is self-motivated and self-determined. The fulfillment of three main intrinsic needs is required for self-determination: competence, autonomy and psychological relatedness.
Self-regulated learning ^{101,102}	Self-regulated learning emphasises autonomy and control by a learner who monitors, directs and regulates actions toward goals of information acquisition, expanding expertise and self-improvement. Self-regulated learners are aware of their academic strengths and weaknesses, and they have a repertoire of strategies they appropriately apply to tackle the day-to-day challenges of academic tasks.
Situated learning ⁴⁴	Situated learning theory describes how individuals acquire professional skills and how legitimate peripheral participation leads to membership in a community of practice. Situated learning 'takes as its focus the relationship between learning and the social situation in which it occurs'.
Workplace affordances ⁶⁵	Workplace affordances identifies factors that shape how learning proceeds in workplaces, how workplaces afford opportunities for learning and how individuals elect to engage in work activities. The readiness of the workplace to afford opportunities for individuals to engage in work activities and access support is a key determinant of the quality of learning in workplaces.

One of the most important elements influencing how learners self-regulate their learning is relationships with others^{7,8,22} Social interactions have, at least for medical students at the clerkship level, proved to be important influences because students' SRL strategies very frequently involve asking questions, asking for feedback or discussing learning goals^{8,42} Who students involve in their SRL depends on their social network, and in a clinical context this network can expand and change over time.⁸ Students who are new to a clinical context may have relatively limited social capital and involve only a few people in their SRL because they can feel insecure about their role in a certain context.⁴³ This means they only interact with a few people

regarding what their learning goals could be and what strategies they could use to achieve those goals, and gather feedback from these few people to self-reflect on their progress. Consequently, the vagaries of a single resident, peer or consultant can have a major impact on students' SRL and can make learning thrive or diminish. More experienced students on the other hand often have a larger social network and therefore the influence a single person has on their SRL is smaller. These students are able to navigate and understand the clinical community and all of its members and know what their role in the process of patient care can be. Subsequently, they know what to do in patient care and how to learn from that. More experienced

students are therefore more resilient in suboptimal learning contexts and can better cope with transitions.

Situated learning

That social relationships are such an important issue in medical students' SRL in clinical contexts can also be understood using situated learning concepts.^{44,45} This notion describes how learners learn in the workplace through legitimate peripheral participation in a community of practice. By gradually taking up meaningful activities, trainees learn to think, act and feel like doctors. During this process, they will become full members of a clinical community of practice and collaborate in daily activities.^{46,47} This helps them to develop a new identity, first as a medical trainee and ultimately as a medical professional.

Learners who are new to a clinical context are in an active struggle to manage themselves, at least partially, because they are in the process of constructing their professional identities in that context.^{48,49} To do this, learners need to be able to acclimatise to a context. Learners need to feel like a valuable member of a clinical community, by thinking, acting and feeling like a future doctor, and deciding what they believe it is to be an academic and a good doctor. Therefore, helping learners to engage in effective SRL in a clinical context begins with helping them to understand what learning is and what effective learning strategies are in a clinical context, and helping learners create a clear idea of what kind of professional identity they want to develop. This can be achieved in a multitude of ways; however, a constructive learning climate is essential, and learners need to be engaged in professional socialisation, and the formation of professional relationships to facilitate social interactions needs to be stimulated.^{46,50,51} Forming professional relationships requires time and the possibility to participate in patient care.²² We suggest that it is therefore highly important to foster a safe learning environment, without rotating learners between departments too often, to enable them to develop professional relationships in a certain context.

Situated learning therefore strengthens the case for longitudinally integrated clerkships (LICs), because ongoing participation facilitates learners' understanding of a clinical community of practice, and consequently what a learner's role in a team might be. Research regarding LICs has also shown

benefits in practice, reporting deeper relationships between students and staff, supporting the identity development process, more active involvement in a team, and better learning outcomes.^{52–56} These studies on LICs have also highlighted the importance of context for fostering active learning. Additionally, LICs are suitable to provide scaffolded support because faculty members can get to know individual students and better understand individual students' needs. Mentoring, mapping and using microanalysis protocols to gain an insight into learners' current engagement in SRL may provide insight into the needs of learners, which may prove to be especially important for learners who are struggling.^{57–63} Using this knowledge to engage in 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), seems promising.^{37,64}

Workplace affordances

Literature about workplace affordances can aid our understanding of how opportunities have a major influence on a learner's engagement in SRL in a clinical context.^{7,65,66} Workplace affordances describe the engagement opportunities and invitational qualities of the workplace.⁶⁵ Workplace affordances include readily available opportunities for learners, possibilities for a learner to create opportunities, and teaching practices.

Similar to workplace affordances, opportunities are an important influence on SRL in a clinical context. Literature on both SRL and workplace affordances has pointed out that learner agency is important for a learner's learning opportunities in a clinical context, once again emphasising the interplay between individual and context.⁶⁷ Learner agency can create workplace affordances by asking for learning opportunities or by advocating for yourself.⁶⁷ In SRL in clinical contexts this has also been described as a 'creating learning opportunities' approach.⁶⁸ Workplace affordances are influenced by learners interacting with activities, artefacts, tools, aims, goals, procedures, values and norms of a context.⁶⁹ Similarly, these influences proved to be important aspects of how a clinical context and students can interact to influence students' SRL.^{4,7,37} Using theory regarding workplace affordance, self-regulated learning, and other theories such as those described in Table 1, together helps us understand how active learning in a clinical context works.

Self-determination

In other vocational contexts, the outcomes of SRL are greatly affected by motivation.³⁴ From an educational point of view this makes sense, because intrinsic motivation is positively associated with learning and academic performance.⁷⁰ Self-determination theory describes how intrinsic motivation requires three psychological needs: autonomy, a feeling of relatedness, and a feeling of competence.^{71,72} A result of this is that supporting autonomy can foster self-determination and intrinsic motivation. Autonomy is also a major factor influencing engagement in SRL in a clinical context and many studies have highlighted that students need to feel like a true member of a clinical team to learn in a clinical context.^{9,22,47,54,73–75} These can be considered to be the appearances of an ultimate need for a feeling of relatedness and self-efficacy. Such a need for relatedness has never been described in SRL theories, but makes sense when combined with self-determination theory. In one of our studies on SRL in clinical contexts, the importance of relatedness and relationships for SRL was also evident.⁸ Just like SRL, relatedness is inextricably linked to context, because to have a sense of relatedness other people need to be present. Therefore, also from a self-determination theory viewpoint, context matters in supporting active learning.

Achievement goals

Context also affects what goals learners set for themselves in their SRL, because certain goals can be forced upon learners, such as getting a certain grade on a test or performing a procedure a set number of times. Achievement goal theory gives insight into what goals learners set for themselves in SRL, because it helps in understanding why learners may decide to work on specific goals and why they may expect better results from pursuing some of their own goals, rather than those of a curriculum.^{76,77} Achievement goal theory aims to answer how learners 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 various theories, but generally can aim to make a good impression (proving goal orientation; performance-approach goal orientation), aim to avoid looking incompetent (avoiding goal orientation; performance-avoid orientation), be intrinsically driven to perform (relative ability goal

orientation) or extrinsically driven to perform (extrinsic goal orientation).^{76–81} Research using achievement goal theory has studied how different goals lead to varying degrees of adaptive learning behaviour, self-regulation, self-efficacy and performance.⁸¹ Learners aiming for learning-oriented goals showed most adaptive learning behaviour, higher self-regulation, higher self-efficacy and better performance. Learners who set relative ability goals also show adaptive learning behaviour, high self-regulation, high self-efficacy and good performance. Learners with extrinsic goals showed maladaptive learning behaviour, low self-regulation, low self-efficacy and lower performance.⁸¹ Therefore, it appears plausible that having learners focus on learning rather than performance in a vocational context will be beneficial to their SRL and subsequent active learning outcomes. Likewise, social relationships once again may be key here because having learners be afraid to appear inferior to others and continuously having to prove themselves, is likely to be detrimental for subsequent SRL and active learning outcomes.⁸²

Vocational training phase

The importance of active lifelong, self-regulated learning has also been gaining attention in the vocational training phase of doctors.⁸³ In this phase, junior doctors in their postgraduate years are trained to work more independently and to eventually become consultants. Even though the literature studying how to support active lifelong learning in vocational training is less abundant than for undergraduate medical education, there is certainly evidence that active educational methods are effective in changing doctors' performance and patients' health.⁸⁴ This is especially well researched regarding more technical and procedural skills such as cardiac life support skills and lumbar punctures in postgraduate simulation training.^{85–88} Besides technical skills, other competencies, such as professionalism, may also benefit from more active self-regulated learning.^{46,89} This is not surprising, as residents or interns learn, similar to medical students in clinical environments, through work-related activities and through interpretation of experiences and social interaction.⁹⁰ Multiple studies on residents' active learning in clinical contexts have highlighted the importance of scaffolding their learning opportunities to foster their feelings of competence and autonomy, similar to medical students.^{91,92} Other studies have shown additional similarities, such as how residents' active learning in clinical contexts also varies to include

both planned and reactive learning,⁹³ how questions of others (such as the patient) may be strong motivators for goal setting in active learning,⁹⁴ and how individualised learning plans may be helpful to support active learning.⁹⁴

To guide this learning, vocational training curricula have often been using competency frameworks to plan lifelong learning activities.⁹⁵ However, learners in vocational training are known to struggle with this.^{96,97} Learners in vocational training reported understanding how valuable self-regulated lifelong learning is, but experienced a lack of skills to manage their own learning, and would value more traditional teacher-centred approaches.⁹⁶ This is understandable because much of their undergraduate education was likely to be teacher centered and learners have adjusted their own learning strategies to this. Additionally, learners may feel that patient care and learning are competing priorities.⁹⁶ However, there might be a shift taking place in recent years, as more recent studies indicate that postgraduate trainees engage in self-regulated learning before, during and after patient encounters, and deliberately use feedback on their performance and engage in reflection to guide their learning.⁹⁸ This might indicate that the efforts to make undergraduate medical education more active, self-regulated and learner centred are also having an effect on postgraduate learning.

One of the most recent innovations in vocational training has been the introduction of entrustable professional activities (EPAs). EPAs are 'units of professional practice, defined as tasks or responsibilities to be entrusted to the unsupervised execution by a trainee once he or she has attained sufficient specific competence'.⁹⁹ In practice, EPAs are used to assess what level of supervision a trainee requires in performing a specific professional activity. EPAs aim to achieve a more flexible, individualised curriculum, but also allow for granting trainees full responsibility for specific tasks they have proven to be entrustable and competent in.⁷⁰ From a self-determination theory point-of-view, the implementation of EPAs is also likely to improve active learning as it may nourish feelings of competence and autonomy.

Continuing professional development

There is very little research that has specifically been aimed towards understanding how to facilitate

doctors' active lifelong learning in clinical contexts. However, it is evident that social relationships such as those described in situated learning theory, and self-reflection on real issues encountered in a doctor's life whilst practising medicine, are essential for the acquisition and improvement of competencies.⁴⁶ This has been studied for both medical-technical and more generic competencies.⁸⁹ Besides self-reflection, which is incorporated into self-regulated learning theory, other studies have shown how a feeling of competence and autonomy (as described in self-determination theory) is important in fostering clinicians' autonomous self-regulation.⁷⁰ Feeling competent and the autonomy to guide one's own professional practice not only led to self-regulation, but also an actual change in behaviour and time spent on learning.⁷⁰ Even though active lifelong learning in continuing professional development remains an area that requires further study, the limited evidence available leads us to believe it may not be very different from learners still in training in a clinical context. Therefore, it is likely to be very useful to study doctors' continuing professional development in clinical contexts specifically, and the opportunities and burdens this context may contain, as well as using multiple theoretical perspectives to try and grasp the issue more holistically.

CONCLUSION

Medical education has made tremendous progress in 'ensuring continuity of learning throughout life by shifting emphasis from the didactic methods so widespread now to self-directed and independent study as well as tutorial methods'.¹ Besides much research on pre-clinical active learning such as problem-based learning, recent efforts have been increasingly focused on the more complex subject of supporting active learning in clinical contexts. The effects of these efforts, such as the implementation of more longitudinal integrated clerkships, on the development of learners' SRL competencies and lifelong learning are yet to be studied. However, it has become clear that active and lifelong learning in clinical contexts is challenging, requires both metacognitive skills and the ability to learn opportunistically, and should be fostered. One issue that repeatedly arises from studies regarding active learning in clinical contexts, including undergraduate learning, vocational training and continuing professional development, is how beneficial social interaction is for active and

lifelong learning, and that discussions about learning between trainees and professionals should be stimulated.

Contributors: All authors of this paper have directly participated in the conception and design of the article, and writing the article or revising it, and have approved the final version submitted. All authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Acknowledgements: None.

Funding: None.

Conflicts of interest: None.

Ethical approval: As this study did not involve human subjects no ethical approval has been sought.

REFERENCES

- 1 World Federation for Medical Education. The Edinburgh declaration. *Med Educ* 1988;**22** (5):481–2.
- 2 Longworth N, Davies WK. *Lifelong Learning: New Vision, New Implications, New Roles for People, Organizations, Nations and Communities in the 21st Century*. London, United Kingdom: Kogan Page Limited 1996.
- 3 Murdoch-Eaton D, Whittle S. Generic skills in medical education: developing the tools for successful lifelong learning. *Med Educ* 2012;**46** (1):120–8.
- 4 Pimmer C, Pachler N, Genewein U. Contextual dynamics in clinical workplaces: learning from doctor-doctor consultations. *Med Educ* 2013;**47** (5):463–75.
- 5 Ellaway RH, Bates J. Exploring patterns and pattern languages of medical education. *Med Educ* 2015;**49** (12):1189–96.
- 6 Dourish P. What we talk about when we talk about context. *Pers Ubiquitous Comput* 2004;**8** (1):19–30.
- 7 Berkhout JJ, Helmich E, Teunissen PW, van den Berg JW, van der Vleuten CPM, Jaarsma ADC. Exploring the factors influencing clinical students' self-regulated learning. *Med Educ* 2015;**49** (6):589–600.
- 8 Berkhout JJ, Helmich E, Teunissen PW, van der Vleuten CPM, Jaarsma ADC. How clinical medical students perceive others to influence their self-regulated learning. *Med Educ* 2017;**51** (3):269–79.
- 9 Gordon J, Hazlett C, Ten Cate O, Mann K, Kilminster S, Prince K, O'Driscoll E, Snell L, Newble D. Strategic planning in medical education: enhancing the learning environment for students in clinical settings. *Med Educ* 2000;**34** (10):841–50.
- 10 Bjork RA, Dunlosky J, Kornell N. Self-regulated learning: beliefs, techniques, and illusions. *Annu Rev Psychol* 2013;**64**:417–44.
- 11 Colliver JA. Effectiveness of problem-based learning curricula: research and theory. *Acad Med* 2000;**75** (3):259–66.
- 12 Dolmans DHJM, De Grave W, Wolfhagen IHAP, van der Vleuten CPM. Problem-based learning: future challenges for educational practice and research. *Med Educ* 2005;**39** (7):732–41.
- 13 Koh GCH, Khoo HE, Wong ML, Koh D. The effects of problem-based learning during medical school on physician competency: a systematic review. *Can Med Assoc J* 2008;**178** (1):34–41.
- 14 Schmidt HG, Cohen-Schotanus J, Arends LR. Impact of problem-based, active learning on graduation rates for 10 generations of Dutch medical students. *Med Educ* 2009;**43** (3):211–8.
- 15 Bate E, Hommes J, Duvivier R, Taylor DCM. Problem-based learning (PBL): getting the most out of your students – Their roles and responsibilities: AMEE Guide No. 84. *Med Teach* 2014;**36** (1):1–12.
- 16 Dolmans D, Michaelsen L, van Merriënboer J, van der Vleuten C. Should we choose between problem-based learning and team-based learning? No, combine the best of both worlds!. *Med Teach* 2015;**37** (4):354–9.
- 17 Haidet P, Kubitz K, McCormack WT. Analysis of the team-based learning literature: TBL comes of age. *J Excell Coll Teach* 2014;**25** (3–4):303–33.
- 18 Burgess AW, McGregor DM, Mellis CM. Applying established guidelines to team-based learning programs in medical schools: a systematic review. *Acad Med* 2014;**89** (4):678–88.
- 19 Parmelee D, Michaelsen LK, Cook S, Hudes PD. Team-based learning: a practical guide: AMEE Guide No. 65. *Med Teach* 2012;**34** (5):e275–87.
- 20 Melo Prado H, Hanois Falbo G, Rodrigues Falbo A, Natal Figueiróia J. Active learning on the ward: outcomes from a comparative trial with traditional methods. *Med Educ* 2011;**45** (3):273–9.
- 21 Sandars J, Patel R. Self-regulated learning: the challenge of learning in clinical settings. *Med Educ* 2015;**49** (6):554–5.
- 22 Young L, Orlandi A, Galichet B, Heussler H. Effective teaching and learning on the wards: easier said than done? *Med Educ* 2009;**43** (8):808–17.
- 23 Steven K, Wenger E, Boshuizen HPA, Scherpbier AJJA, Dornan T. How clerkship students learn from real patients in practice settings. *Acad Med* 2014;**89** (3):469–76.
- 24 Eskilsson C, Hörberg U, Ekebergh M, Carlsson G. Student nurses' experiences of how caring and learning is intertwined – A phenomenological study. *J Nurs Educ Pract* 2013;**4** (2):82–94.
- 25 Zimmerman BJ. Becoming a self-regulated learner: an overview. *Theory Pract* 2002;**41** (2):64–70.
- 26 Zimmerman BJ. Attaining self-regulation: a social cognitive perspective. In: Boekaerts M, Pintrich P, Zeidner M, eds. *Handbook of Self-Regulation*. New York, NY: Academic Press 2000; 13–39.

- 27 Boekaerts M. Self-regulated learning: a new concept embraced by researchers, policy makers, educators, teachers, and students. *Learn Instr* 1997;**7** (2):161–86.
- 28 Bandura A. Social cognitive theory of self-regulation. *Organ Behav Hum Decis Process* 1991;**50** (2):248–87.
- 29 Pintrich PR. Understanding self-regulated learning. *New Dir Teach Learn* 1995;**63**:3–12.
- 30 Winne PH. Students' calibration of knowledge and learning processes: implications for designing powerful software learning environments. *Int J Educ Res* 2004;**41** (6):466–88.
- 31 Kanfer R, Ackerman PL. Motivation and cognitive abilities: an integrative/aptitude-treatment interaction approach to skill acquisition. *J Appl Psychol* 1989;**74** (4):657–90.
- 32 Carver CS, Scheier MF. *Attention and Self-Regulation: A Control-Theory Approach to Human Behavior*. New York: Springer-Verlag 1981.
- 33 Pintrich PR. *The Role of Goal Orientation in Self-Regulated Learning*. New York, NY: Academic Press 2000.
- 34 Sitzmann T, Ely K. A meta-analysis of self-regulated learning in work-related training and educational attainment: what we know and where we need to go. *Psychol Bull* 2011;**137** (3):421–42.
- 35 Butler DL, Cartier SC. Promoting effective task interpretation as an important work habit: a key to successful teaching and learning. *Teach Coll Rec* 2004;**106** (9):1729–58.
- 36 Butler DL, Cartier SC, Schnellert L, Gagnon F, Giammarino M. Secondary students' self-regulated engagement in reading: researching self-regulation as situated in context. *Psychol Test Assess Model* 2011;**53** (1):73–105.
- 37 Brydges R, Butler D. A reflective analysis of medical education research on self-regulation in learning and practice. *Med Educ* 2012;**46** (1):71–9.
- 38 Wolters CA, Pintrich PR. Contextual differences in student motivation and self-regulated learning in mathematics, English, and social studies classrooms. *Instr Sci* 1998;**26** (1–2):27–47.
- 39 Loyens SMM, Magda J, Rikers RMJP. Self-directed learning in problem-based learning and its relationships with self-regulated learning. *Educ Psychol Rev* 2008;**20** (4):411–27.
- 40 White CB. Smoothing out transitions: how pedagogy influences medical students' achievement of self-regulated learning goals. *Adv Health Sci Educ Theory Pract* 2007;**12** (3):279–97.
- 41 Bleakley A. Broadening conceptions of learning in medical education: the message from teamworking. *Med Educ* 2006;**40** (2):150–7.
- 42 Berkhout JJ, Teunissen PW, Helmich E, van Exel J, van der Vleuten CPM, Jaarsma ADC. Patterns in clinical students' self-regulated learning behavior: a Q-methodology study. *Adv Health Sci Educ Theory Pract* 2017;**22** (1):105–21.
- 43 Teunissen PW, Westerman M. Opportunity or threat: the ambiguity of the consequences of transitions in medical education. *Med Educ* 2011;**45** (1):51–9.
- 44 Lave J, Wenger E. *Situated learning: Legitimate Peripheral Participation*. Cambridge, UK: Cambridge university press 1991.
- 45 Wenger E. *Communities of Practice: Learning, Meaning and Identity*. Cambridge, UK: Cambridge university press 1999.
- 46 Cruess RL, Cruess SR, Boudreau JD, Snell L, Steinert Y. Reframing medical education to support professional identity formation. *Acad Med* 2014;**89** (11):1446–51.
- 47 Weaver R, Peters K, Koch J, Wilson I. "Part of the team": professional identity and social exclusivity in medical students. *Med Educ* 2011;**45** (12):1220–29.
- 48 Denson JL, Jensen A, Saag HS, Wang B, Fang Y, Horwitz LI, Evans L, Sherman SE. Association between end-of-rotation resident transition in care and mortality among hospitalized patients. *JAMA* 2016;**316** (21):2204–13.
- 49 Bernabeo EC, Holtman MC, Ginsburg S, Rosenbaum JR, Holmboe ES. Lost in transition: the experience and impact of frequent changes in the inpatient learning environment. *Acad Med* 2011;**86** (5):591–8.
- 50 Wong A, Trollope-Kumar K. Reflections: an inquiry into medical students' professional identity formation. *Med Educ* 2014;**48** (5):489–501.
- 51 Boor K, Scheele F, van der Vleuten CPM, Teunissen PW, den Breejen EME, Scherpbier AJJA. How undergraduate clinical learning climates differ: a multi-method case study. *Med Educ* 2008;**42** (10):1029–36.
- 52 Hauer KE, Hirsh D, Ma I, Hansen L, Ogur B, Poncelet AN, Alexander EK, O'Brien BC. The role of role: learning in longitudinal integrated and traditional block clerkships. *Med Educ* 2012;**46** (7):698–710.
- 53 Dubé TV, Schinke RJ, Strasser R, Couper I, Lightfoot NE. Transition processes through a longitudinal integrated clerkship: a qualitative study of medical students' experiences. *Med Educ* 2015;**49** (10):1028–37.
- 54 Shahi R, Walters L, Ward H, Woodman RJ, Prideaux D. Clinical participation of medical students in three contemporary training models. *Med Educ* 2015;**49** (12):1219–28.
- 55 Teherani A, Irby DM, Loeser H. Outcomes of different clerkship models: longitudinal integrated, hybrid, and block. *Acad Med* 2013;**88** (1):35–43.
- 56 Ogur B, Hirsh D, Krupat E, Bor D. The harvard medical school-cambridge integrated clerkship: an innovative model of clinical education. *Acad Med* 2007;**82** (4):397–404.
- 57 Driessen EW, Overeem K. Mentoring. In: Walsh K, ed. *Oxford Textbook of Medical Education*. Oxford: Oxford University Press 2013;265–84.
- 58 Patel R, Sandars J, Carr S. Clinical diagnostic decision-making in real life contexts: a trans-theoretical approach for teaching: AMEE Guide No. 95. *Med Teach* 2015;**37** (3):211–27.

- 59 Patel R, Tarrant C, Bonas S, Yates J, Sandars J. The struggling student: a thematic analysis from the self-regulated learning perspective. *Med Educ* 2015;**49** (4):417–26.
- 60 Durning SJ, Cleary TJ, Sandars J, Hemmer PA, Kokotailo P, Artino AR. Perspective: Viewing “strugglers” through a different lens: how a self-regulated learning perspective can help medical educators with assessment and remediation. *Acad Med* 2011;**86** (4):488–95.
- 61 Cleary TJ, Sandars J. Assessing self-regulatory processes during clinical skill performance: a pilot study. *Med Teach* 2011;**33** (7):e368–74.
- 62 Sandars J, Cleary TJ. Self-regulation theory: applications to medical education: AMEE Guide No. 58. *Med Teach* 2011;**33** (11):875–86.
- 63 Cleary TJ, Callan GL, Zimmerman BJ. Assessing self-regulation as a cyclical, context-specific phenomenon: overview and analysis of SRL microanalytic protocols. *Educ Res Int* 2012;**2012**:1–19.
- 64 Brydges R, Dubrowski A, Regehr G. A new concept of unsupervised learning: directed Self-guided learning in the health professions. *Acad Med* 2010;**85** (10 Suppl):S49–55.
- 65 Billett S. Learning through work : workplace affordances and individual engagement. *J Workplace Learn* 2001;**13** (5):209–14.
- 66 Van der Zwet J, Zwietering PJ, Teunissen PW, Van der Vleuten CPM, Scherpbier AJJA. Workplace learning from a socio-cultural perspective: creating developmental space during the general practice clerkship. *Adv Health Sci Educ Theory Pract* 2011;**16** (3):359–73.
- 67 Chen HC, Cate O, O’Sullivan P, Boscardin C, Eidson-Ton WS, Basaviah P, Woehrle T, Teherani A. Students’ goal orientations, perceptions of early clinical experiences and learning outcomes. *Med Educ* 2016;**50** (2):203–13.
- 68 Woods NN, Mylopoulos M, Brydges R. Informal self-regulated learning on a surgical rotation: uncovering student experiences in context. *Adv Health Sci Educ* 2011;**16** (5):643–53.
- 69 Billett S. Workplace Learning as Co-Participation. Paper presented at the Annual Meeting of the American Educational Research Association 2002.
- 70 Ten Cate OTJ, Kusurkar RA, Williams GC. How self-determination theory can assist our understanding of the teaching and learning processes in medical education. AMEE guide No. 59. *Med Teach* 2011;**33** (12):961–73.
- 71 Ryan RM, Deci EL. Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *Am Psychol* 2000;**55** (1):68–78.
- 72 Deci EL, Ryan RM. The “what” and “why” of goal pursuits: human needs and the self-determination of behavior. *Psychol Inq* 2000;**11** (4):227–68.
- 73 Hägg-Martinell A, Hult H, Henriksson P, Kiessling A. Community of practice and student interaction at an acute medical ward: an ethnographic study. *Med Teach* 2016;**38** (8):793–800.
- 74 Stegeman JH, Schoten EJ, Terpstra OT. Knowing and acting in the clinical workplace: trainees’ perspectives on modelling and feedback. *Adv Health Sci Educ* 2013;**18** (4):597–615.
- 75 Turner SR, White JS, Poth C, Rogers WT. Learning the CanMEDS roles in a near-peer shadowing program: a mixed methods randomized control trial. *Med Teach* 2012;**34** (11):888–92.
- 76 Pintrich P. An achievement goal theory perspective on issues in motivation terminology, theory, and research. *Contemp Educ Psychol* 2000;**25** (1):92–104.
- 77 Ames C, Archer J. Achievement goals in the classroom: students’ learning strategies and motivation processes. *J Educ Psychol* 1988;**80** (3):260–7.
- 78 Vansteenkiste M, Lens W, Elliot AJ, Soenens B, Mouratidis A. Moving the achievement goal approach one step forward: toward a systematic examination of the autonomous and controlled reasons underlying achievement goals. *Educ Psychol* 2014;**49** (3):153–74.
- 79 Pintrich PR, Conley AM, Kempler TM. Current issues in achievement goal theory and research. *Int J Educ Res* 2003;**39** (4):319–37.
- 80 Teunissen PW, Bok HGJ. Believing is seeing: how people’s beliefs influence goals, emotions and behaviour. *Med Educ* 2013;**47** (11):1064–72.
- 81 Wolters CA, Yu SL, Pintrich PR. The relation between goal orientation and students’ motivational beliefs and self-regulated learning. *Learn Individ Differ* 1996;**8** (3):211–38.
- 82 Raat AN(J), Kuks JBM, Van Hell EA, Cohen-Schotanus J. Peer influence on students’ estimates of performance: social comparison in clinical rotations. *Med Educ* 2013;**47** (2):190–7.
- 83 Colleges TR, Brigley S, Young Y, Littlejohns P, Mcewen J. Continuing education for medical professionals: a reflective model. *Postgrad Med J* 1997;**73** (855):23–6.
- 84 Smits PBA, Verbeek JHAM, de Buissonjé CD. Problem based learning in continuing medical education: a review of controlled evaluation studies. (*BMJ*) *Br Med J* 2002;**324** (7330):153–6.
- 85 Brydges R, Nair P, Ma I, Shanks D, Hatala R. Directed self-regulated learning versus instructor-regulated learning in simulation training. *Med Educ* 2012;**46** (7):648–56.
- 86 Devine LA, Donkers J, Brydges R, Perelman V, Cavalcanti RB, Issenberg SB. An equivalence trial comparing instructor-regulated with directed self-regulated mastery learning of advanced cardiac life support skills. *Simul Healthc J Soc Simul Healthc* 2015;**10** (4):202–9.
- 87 Shanks D, Brydges R, den Brok W, Nair P, Hatala R. Are two heads better than one? comparing dyad and self-regulated learning in simulation training. *Med Educ* 2013;**47** (12):1215–22.

- 88 Brydges R, Manzone J, Shanks D, Hatala R, Hamstra SJ, Zendejas B, Cook DA. Self-regulated learning in simulation-based training: a systematic review and meta-analysis. *Med Educ* 2015;**49** (4):368–78.
- 89 Murad MH, Coto-Yglesias F, Varkey P, Prokop LJ, Murad AL. The effectiveness of self-directed learning in health professions education: a systematic review. *Med Educ* 2010;**44** (11):1057–68.
- 90 Teunissen PW, Scheele F, Scherpbier AJJA, Van der Vleuten CPM, Boor K, Van Luijk SJ, Van Diemen-Steenvoorde JAAM. How residents learn: qualitative evidence for the pivotal role of clinical activities. *Med Educ* 2007;**41** (8):763–70.
- 91 Biondi EA, Varade WS, Garfunkel LC, Lynn JF, Craig MS, Cellini MM, Shone LP, Harris JP, Baldwin CD. Discordance between resident and faculty perceptions of resident autonomy: can self-determination theory help interpret differences and guide strategies for bridging the divide? *Acad Med* 2015;**90** (4):462–71.
- 92 Olmos-Vega FM, Dolmans DHJM, Vargas-Castro N, Stalmeijer RE. Dealing with the tension: how residents seek autonomy and participation in the workplace. *Med Educ* 2017;**51** (7):699–707.
- 93 Goldman E, Plack M, Roche C, Smith J, Turley C. Learning in a chaotic environment. *J Workplace Learn* 2009;**21** (7):555–74.
- 94 Smith SJ, Kakarala RR, Talluri SK, Sud P, Parboosingh J. Internal medicine residents' acceptance of self-directed learning plans at the point of care. *J Grad Med Educ* 2011;**3** (3):425–8.
- 95 Campbell C, Silver I, Sherbino J, Ten Cate O, Holmboe ES. Competency-based continuing professional development. *Med Teach* 2010;**32** (8):657–62.
- 96 Nothnagle M, Anandarajah G, Goldman RE, Reis S. Struggling to be self-directed: residents' paradoxical beliefs about learning. *Acad Med* 2011;**86** (12):1539–44.
- 97 Nothnagle M, Goldman R, Quirk M, Reis SP. Promoting self-directed learning skills in residency: a case study in program development. *Acad Med* 2010;**85** (12):1874–9.
- 98 Sagasser MH, Kramer AWM, Fluit CRMG, Van Weel C, van der Vleuten CPM. Self-entrustment: how trainees' self-regulated learning supports participation in the workplace. *Adv Heal Sci Educ Theory Pract* 2016. <https://link.springer.com/article/10.1007/s10459-016-9723-4>.
- 99 ten Cate O. Nuts and bolts of entrustable professional activities. *J Grad Med Educ* 2013;**5** (1):157–8.
- 100 Bunniss S, Kelly DR. Research paradigms in medical education research. *Med Educ* 2010;**44** (4):358–66.
- 101 Dweck CS. Self-theories: Their role in motivation, personality, and development. Philadelphia: Psychology Press 2000.
- 102 Paris SG, Byrnes JP, Paris AH. Constructing theories, identities, and actions of self-regulated learners. In: Zimmerman BJ, Schunk DH, eds. *Self-Regulated Learning and Academic Achievement: Theoretical Perspectives*. 2nd edn. Abingdon, UK: Routledge 2001;253–87.

Received 26 January 2017; editorial comments to author 5 April 2017, accepted for publication 14 August 2017