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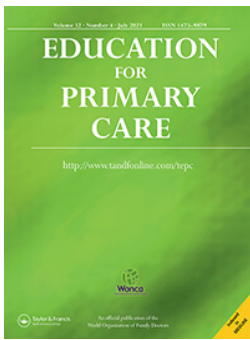
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Medical students' experiences of a longitudinal integrated clerkship: a threshold concepts analysis

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ABSTRACT

Longitudinal Integrated Clerkships (LIC) are known to provide several pedagogical advantages including transformational educational experiences. The study explored the learning experience of undergraduate medical students who undertook a rural LIC in a Scottish primary care setting. This paper presents an analysis of the transformative role of LIC placements using the Threshold Concept (TC) theory. This qualitative study gathered students' perceptions of their LIC experience longitudinally through written and audio diaries over a period of 1–2 months. The issues narrated in diaries were followed-up in individual semi-structured interviews. Transcripts were thematically analysed to identify key characteristics of TCs using a criterion-based approach. Data from 12 audio and nine written diaries, and five interviews led to identification of three inter-connected themes associated with the LIC year: professional identity formation, becoming an agentic learner and comfort with uncertainty. These appeared transformative in nature and resembled threshold concepts in their character and effect. An active and legitimate role in the healthcare team, longitudinality and transdisciplinary learning during LIC placements were contributory towards navigating these thresholds. The LIC exposure provided transformative learning experiences, and a stable environment that facilitated acquisition of specific TCs in the medical students' journey towards becoming a doctor. LIC affordances fostered a transformed view of self, which was more confident in dealing with uncertainty, comfortable in the emerging professional identity, and described having enhanced agentic capabilities.

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Introduction

Longitudinal integrated clerkships (LIC) are increasingly implemented by medical schools worldwide to address health services provision in the underserved regions, and to provide established educational advantages to students. These involve extended placements in the community which are typically more than six months, and are a contrast to the traditional model of shorter discipline-specific rotations [1]. There are abundant reports confirming the pedagogical success of the LIC model with regard to academic outcomes, learner satisfaction and patient-centeredness [2,3]. LICs involve learning in a patient-centred experiential apprenticeship, which is thought to aid in the development of holistic care and robust clinical reasoning skills [4]. The core principles of LICs such as integrated learning which is beyond transdisciplinary boundaries, together with longitudinality and continuity with patients, tutors and clinical teams, create an educational milieu suitable for navigating threshold concepts.

A threshold concept (TC) has been described as a portal to a 'previously unknown way of thinking

about something' [5]. It represents a transformed way of understanding resulting in an epistemological as well as an ontological shift in the learner which is both exciting and overwhelming. Interestingly, the medical education literature on LICs frequently suggests a transformative impact of extended community placements, possibly due to the immersive nature of these programmes [4]. TC theory offers a valuable way of looking at LICs, given the frequent discussions regarding community workplace contexts being rich learning spaces with a transformative impact. Table 1 enumerates the key characteristics of TCs sourced from the seminal papers by Meyer and Land [5,6]. While not all features of TCs need be embodied in the learning experience, most educationalists emphasise that the one non-negotiable feature of a TC is its transformative nature [7].

Students encounter troublesome areas throughout their course, but not all experiences would be truly transformative in effect. LICs are known to provide 'a safe haven' to learners [8], which might be considered similar to a safe 'holding environment' that encourages

Table 1. Characteristics of threshold concepts – as informed by literature [5,6].

Characteristics of Threshold Concepts	Brief description (sourced from Meyer & Land 2003, 2005)
Transformative	Alteration and reconstruction of subjectivity and identity, how one sees oneself or the world: viewing, being and becoming
Troublesome	Involves conceptual difficulty and/or emotional uncertainty
Integrative	Pulling together of fundamental knowledge to develop a more sophisticated understanding, akin to an 'aha' moment
Bounded Irreversible	Located in a distinctive discipline Difficult to unlearn once fully grasped, as a reformed understanding results in a shift in self
Reconstitutive	Cumulative learning effect associated with developing expertise, related to transformation
Discursive	Discussing and utilising knowledge in appropriate disciplinary ways
Liminality	Oscillating state during the learning journey, associated with cognitive and/or emotional discomfort; related to troublesome feature

recursiveness required for acquiring TCs. Furthermore, LIC learners are exposed to several clinical disciplines simultaneously which might aid in making meaningful connections between concepts and disciplines, thus facilitating the journey through liminal spaces. Ross et al. [9] have predicted the tacit nature of many TCs and we wonder if the predominant informal and less structured learning environment in LICs favours acquisition of TCs through the hidden curriculum therein. There have been discussions regarding the vast power of practical experiences in an authentic setting, combined with situations that prompt autonomy in clinical education, triggering transformational learning [10]. Interestingly, authenticity and autonomy are integral features of the LIC model. These together with longitudinality and continuity could further contribute towards facilitating the shift or crossing practical thresholds. TCs are seen as leading to threshold 'capabilities' which represent the ability to act effectively in future professional situations [7]. TCs theory has been widely used in health sciences research to study transformative learning [11–13]. Our interest to explore TCs involved in a primary care LIC setting was triggered by a recent paper by Neve [14] which discussed the TCs in the context of postgraduate General Practice (GP) training. Exploring potential TCs in the LIC context will be useful to inform curriculum organisation in relation to developing learning environments, and guide student support and faculty development programmes.

Methods

Our research context is the Dundee-LIC (DLIC) programme, which was introduced in the medical school at

the University of Dundee (UoD) in 2016. Educational success of LIC placements worldwide, and primary care workforce shortages have accelerated the contextual adaptation of the LIC model amongst the UK medical schools [15]. UoD offers DLIC as an elective strand in the fourth year of the 5-year-long undergraduate medical course. It is a comprehensive LIC-Cluster C [16], implying that it spans over the entire academic year with no discipline-based rotations. Fourth year medical students selecting the DLIC strand are placed in GP surgeries in Scottish rural settings for the entire academic year, and return to join the main cohort for their final year which is a traditional rotational clerkship model [17]. The authors conducted a study aimed to research DLIC alumni's perceptions of transitioning into a traditional clerkship in an urban tertiary care hospital after a rural LIC experience, with a focus on contributions afforded by the recent LIC programme [18]. The study participants displayed an ongoing enthusiasm to speak about the DLIC experiences and the research team managed to collect a lot of unsolicited information on the LIC exposure. The learners' perceptions gathered as a part of the above study suggested a strong transformative impact of the DLIC experience: this feature has been frequently suggested in other LIC programmes worldwide [19]. It motivated the researchers to revisit the data and view student experiences through the theoretical lens of TCs to identify thresholds navigated by the learners during their LIC placements.

The primary research was a qualitative longitudinal study, conducted to explore the lived experiences of final year students who undertook the DLIC strand in the previous year of their course [18]. There were only eight DLIC alumni out of 160 final-year students, given that DLIC is relatively new and not mandatory. This purposive sample of eight potential participants were sent an invitation to participate in the study through the medical school administrator to avoid possible coercion as the principal researcher is also a tutor in Dundee School of Medicine. Five of the eight DLIC alumni expressed an interest to participate and shared their clerkship experiences through written and audio diaries (AD) over a period of 1–2 months. This period varied for each student depending on their timetable and convenience, but it was ensured that the diaries were submitted during the hospital rotations – the elective weeks and the primary care postings were consciously avoided. The primary study from which this paper is drawn, focused on the transition from LIC to traditional hospital clerkship [18]. Hence, the participants were directed to record their learning and transitioning experiences of undertaking the two clerkships successively. However,

for the current secondary analysis using the TC framework, the researchers were particularly interested in the moments when students reflected on the transformative impact of DLIC. ADs are known to be a convenient and time-efficient process for participants, allowing access to unfiltered student accounts compared to some of the other methods used in qualitative research, owing to little cognitive processing before recording [20,21]. Both ADs and written narratives were uploaded by the participants directly on to a secure UoD online repository to which only the researchers had access. Individual semi-structured interviews were conducted with each of the participants to follow up the issues narrated in the diaries. Voluntary informed consent was obtained from all participants, and it included permission for audio-recording and transcribing.

All AD recordings and interviews were manually transcribed and thematically analysed using the key characteristics of TCs listed in Table 1. The existing literature on identification of TCs acknowledges the conceptual and methodological challenges [22]. Some researchers have employed a criterion-based approach using different starting points [23]; while others have used a concept mapping technique [24] to visualise chains of practice and networks of understanding. All have argued and justified their stance making it clear that there are various ways to explore TCs. A criterion-based method suited our study as we were interested in transformative experiences during DLIC placements, and were not mapping knowledge structures. Several researchers including Land and Meyer [25] have predominantly focussed on the transformative attribute in their assessment of educational experiences. The researchers attended to the sections of transcripts demonstrating transformation in the learners' understanding of the discipline during the DLIC exposure. The specific student accounts of DLIC placements indicating transformative features were further analysed to identify other key characteristics of TC listed in Table 1. Iterative data analysis involved discussion and negotiation amongst researchers together with constant comparison of interview scripts and data from diaries. Memos were noted to ensure that any unique and puzzling insights were not lost [26]. Triangulation of data was attempted through cross-examining the spontaneous student reflections gathered in ADs, with those in the individual interviews leading to well-developed and robust accounts. Thus, triangulation in time illuminated any blind spots in data capture and detected development in participants' thoughts with the passage of time through collecting perceptions multiple times from the same student [27]. Relevant interrelated scripts were organised to articulate themes as TCs to capture

the essence of LIC students' ways of thinking, being or viewing the discipline [28]. Researchers strived to maintain reflexivity during the analysis, through repeatedly referring back to transcripts to assess if the interpretations were indeed accurate representations of the participants' experiences.

Results

The research team received a wealth of data despite a small sample size. An earlier paper by the research team [29] describes the demographic characteristics of the five study subjects who contributed data for the research, and the details of the diaries (number and type-written versus audio). UoD secure online repository received 12 audio and nine written diaries, with the length of audio diaries varying from 1 minute 20 seconds to 7 minutes 35 seconds. The individual semi-structured interviews of the five participants ranged from 52 minutes to 105 minutes with an average of 73.4 minutes. Data from these led to identification of the following three interwoven themes which resembled TCs in their character and effect as described by learners. These appeared transformative in nature illustrating the role of DLIC experiences in students' learning journeys and their becoming a doctor. Apart from being transformative, these themes also incorporated other key characteristics of TCs, such as troublesomeness and liminality, integrative and potential irreversibility. Elaborate student quotations below support the themes and have been selected on the basis of representativeness. The student quotation labels 'M' and 'F' are used for male or female respectively, followed by participant identity number, 'N' and 'I' signify narrative or interview, respectively, being the source of the quotation, followed by page and line numbers.

Professional identity formation (PIF) over the LIC year

Student transcripts suggested that students took on an active and legitimate role in the healthcare team during the LIC year which was a contrast to the relatively passive role students usually assume in the traditional hospital rotations. The diary and interview transcripts had frequent suggestions of a change in students' view of themselves and their role, e.g. 'big thing that changed now', 'have a right to be here', 'this is where I want to be', 'feel more confident in my role in the healthcare team', 'I would be a lot less sure of myself if I hadn't done DLIC'. The experience of being treated as a legitimate member of the team and functioning like one during

DLIC placements fostered PIF and this is evident in the quotation below.

F1-I 3, 8–20: DLIC has helped me become a doctor. and helped my career, helped the way I think about medicine. and definitely was a big thing that changed. how I felt in terms of communicating with patients, and my role. Before that I felt that my role was that of a silent observer [.] DLIC makes you feel like an important member of the healthcare team. You feel like you have a right to be there, you have got a right to ask someone about their alcohol or their smoking because you are there providing a service. [.] So it **definitely changed my view and my ability** to do that

The diary accounts revealed that the LIC experience aided in developing their confidence in relation to the new and developing identity of a doctor.

F1-N5 1,21–26: Also DLIC **made me more confident** in even small areas such as calling a patient's name in a busy waiting room. Best part was feeling like part of the practice team and I even went to the local LMC [Local Medical Committee] group Christmas dinner with my supervisor where it was very interesting to listen to discussions on the current problems in general practice and plans for the future.

The study participants revealed their struggle with confidence prior to undertaking the clerkship, and their eventual transformation into a more confident professional, crediting DLIC for this development.

F2-I 15,5–13: Because one of the reasons I did the clerkship is because I struggle with confidence. Doing something like that you can't escape and so in many ways this made me much more uncomfortable. Because you can do 4th year and kind of slip under the radar quite easily. So I wanted to do something that would force me out of my comfort zone. I think **it gave me a lot of confidence.** And I think if I had done normal 4th year I would be possibly still just be flying under the radar, feeling not particularly confident. And obviously I can't compare that. But I much more feel so. I think the clerkship was particularly good for me

The growth in confidence described by learners appeared to be a sustained effect which persisted into the subsequent year, during the hospital rotations.

F1-I 38,32–33: I don't think I would feel the same way if I hadn't done DLIC, I would have been a lot less sure of myself if I hadn't done DLIC.

Becoming an agentic learner over the LIC year

According to students, the LIC experience aided in instilling an enthusiasm and agency towards learning which they reported they lacked prior to undertaking the clerkship as evidenced below. There is frequent and

repetitive reference to a major 'change' in self during the DLIC year.

F1-I 36, 1–9: I never really thought too much about my own learning before DLIC, it really **made me reflect,** made me think about how I learn and **who I am and it changed me a lot.** Like when I was in 3rd year in Dundee I was quite an immature student [.] often didn't attend things, now looking back I think 'that would have been such a rich experience [.] I think **DLIC changed me!**

Similar to other LICs worldwide, DLIC too is inherently less structured compared to traditional rotational clerkships in the hospital environment. The requirement to be proactive in organising the learning opportunities and self-directing the course provoked anxiety and doubts in the initial months of LIC as confessed by all subjects. The quotation below echoes the liminal feature of developing self-directed learning capacities.

F2-N2 1,24–7: And I do remember.ahmm. in the sort of October November period feeling quite overwhelmed by how much I had to organise .and the fear that you weren't covering everything properly when you were in GP.

According to LIC alumni, the ability to self-direct the learning and transformation into an agentic motivated learner continued later into the traditional rotations during the final year in the hospital. The difference with respect to enthusiasm and engagement with clinical learning, between the LIC and the non-LIC students was appreciated by other members in the team (see below).

F1-I 6, 12–19: Definitely before DLIC, I had always seen myself as one of the lazy ones may be, not the keenest one to keep going. but DLIC flipped that out [.] the FY [foundation year doctor] commented a few times about how present I was, how often I was there.

This student noted that they could never return to their old self – that of being a disengaged or passive learner, hinting an irreversible change due to undertaking the DLIC.

F1-I 38, 1–9: Ever since I have come back, I have been the one in any group who seems to be volunteering the most, speaking out the most [.] There was that group who would always sit at the back and was almost bored. Whereas **ever since I have come back, I can never be that person anymore!** Now I am much more active, much more engaged.

Another participant confirmed a growth in assertiveness in relation to seeking learning opportunities through the DLIC year.

F3-I 22, 7–14: I was not very good at being assertive. Some students are much better at just asking for things, can you show me this, can I come with you when you do this. And it can be quite hard to do that when you feel like the doctor is busy, and you don't want to distract them or take up their time [...] But it's something that we all got better at throughout the year.

Comfort with uncertainty over the LIC year

The study participants voiced their struggle in dealing with uncertainty inherent in primary care practice at the onset of DLIC, which follows an integrated curriculum where students are exposed to several specialities simultaneously. This required students to approach patients without mentally compartmentalising different subjects. While this appeared to overwhelm the learners in the beginning, they gradually developed confidence with approaching the uncertainty aspect in clinical practice. Study participants acknowledged learning the valuable skill of seeing the patient in their contextual setting and grew comfortable with 'facing what comes in through the door'.

F2-I 16,14–22: ... because you are not doing blocks you are constantly having everything in your head which is really difficult, and very overwhelming [...] "Oh my gosh! How am I ever going to know if I am learning enough and retaining anything." But actually, it's quite a good skill I think because you are less compartmentalising stuff [...] that comes in through the door. So, if you are in cardiology clinic, you think 'that's probably something to do with the heart.' So yeah, just learning to be confident with. it's ok to not know [...] being confident with uncertainty, and it is not always about having a correct answer, its more the process I suppose." [30]

Gradually, over the LIC year, students internalised that 'uncertainty' is inherent in clinical practice, especially due to repeated exposure in GP. As the comfort with uncertainty grew, the perception of 'uncertainty' changed from threatening to challenging to exciting, as expressed by another student.

M2-I 11, 2–12: I think I might be better dealing with uncertainty. I think that kind of came from GP as well. GPs do that every day! [...] they sort of worked out. who needed to be sent to the hospital and who didn't. You can't send everyone into hospital. NHS would collapse! When I was in GP, I quite. sort of liked the uncertainty aspect, sort of using the common sense. Do your best with the information you have. I think we got exposed to that a lot. [30]

Discussion

Summary of main findings

The present study researched LIC alumni's perceptions of the contributions afforded by the recent clerkship towards their subsequent learning and practice. Students reported being more confident in dealing with uncertainty, being comfortable in their emerging professional identity, and transforming into agentic learners over the LIC year. There have been frequent discussions in the past regarding medical students experiencing profound learning and transformation during an LIC placement [19]. Indeed, the DLIC alumni in this study reflected on the transformation in their 'learner capacities' and 'professional being'. An analysis of their accounts revealed the nature and attributes of the transformative process suggesting that they possibly negotiated a few thresholds during the LIC year.

Comparisons with the literature

The study participants described their initial struggle with accepting the uncertainty inherent in primary care: their descriptions of the experience such as 'overwhelming' and 'anxiety-provoking' resonate with the troublesome knowledge trait of TCs [6]. 'Uncertainty' has been identified as a TC in various health sciences research [31,32]. TCs described previously in context of postgraduate GP trainees include learning to accept and deal with 'uncertainty' [14]. The present study extends the understanding of this TC in undergraduate medical students undertaking an LIC. Learning various specialities in parallel over an extended period of time, as opposed to sequentially (as in a traditional rotational model), possibly allows recursiveness and formation of meaningful connections facilitating 'Aha!' moments [30]. The conceptual difficulty and the tacit nature of TCs, is understood as requiring a safe holding environment [32], and an LIC in primary care setting possibly provides a stable and familiar clinical setting for successful management of liminal spaces.

An informal, less structured and opportunistic learning environment in DLIC enhanced the autonomy for learners, and demanded meta-learning capabilities. Meta-learning encapsulates awareness as well as control over self-learning as defined by Biggs [33], and has been considered a TC in other disciplines [34]. An audio-diary study of problem-based learning in medical education strongly suggested the TC nature of self-

regulated learning [35]. The perceptions shared in the current study echo an ‘oscillating state’, as the transformation involved feelings of doubts and anxiety in the early months of the DLIC. A similar liminal experience has been previously described during transfiguration into confident self-directed learners [36]. The initial tensions and confusion in the early phases of LICs is also reported in other programmes worldwide [37,38]. The present study transcripts suggested that learner agency persisted beyond LIC, into the traditional 5th year; possibly transforming them into agentic learners irreversibly. Gaufer et al [39] had reported a sustained impact of an LIC exposure with regard to patient-centredness and empathy that was found to persist beyond medical school when tested 4 – 6 years after undertaking an LIC. It is possible that the effect on agentic capabilities might also be long-lasting hinting a potential irreversible reformation.

According to the study findings, LIC placements may be considered ideal pedagogic spaces to negotiate the thresholds involved in professional identity formation. PIF refers to internalised and self-defined set of core values and beliefs about professional responsibilities that are acquired gradually over a period of time, which guide appropriate behaviour to provide optimum patient care, even in highly complex settings [40]. The role confusion experienced during PIF is well established and it is frequently the source of anxiety for students and has been described as integral to healthcare education [32,41]. Students in our study described their doubts regarding their role in the healthcare teams, and their hesitation in approaching and communicating with patients prior to undertaking DLIC. However, opportunities to endorse a legitimate role in the healthcare team during LIC supported a healthy PIF. The study findings are suggestive of an ontological shift in the students owing to a newfound confidence in their role of a medical student, and also the upcoming one, that of a junior doctor. Immersive LIC placements may be considered equivalent to the clinical experiences affording autonomy and authenticity as suggested by Fredholm et al [10]. These are thought to have the power to transform thinking and identity, and aid in negotiating professional thresholds in practice.

Strengths and limitations

Longitudinal data collection is a strength of this qualitative study since it enabled access to spontaneous student thoughts through diaries. It may be argued that the accounts related to DLIC were retrospective and dependent on recall. However, some of the contrasting attributes of a traditional clerkship, such as fragmentary

learning associations and a predominantly passive role in the healthcare teams, triggered the recall of authentic LIC experiences. Triangulation in time ensured validation of issues arising in diaries to be confirmed with each of the five participants during interviews. Consensual validation with other participants enhanced trustworthiness of the findings. Students were instructed to share their learning and transitioning experiences but were not aware of our interest in TCs at the time of data collection, and hence the evidence of threshold features emerged organically. A limitation of this study, however, was the small sample of students from a single institution, who self-selected the DLIC strand; a positive bias towards their choices cannot be disregarded. Results may vary in other institutional settings and national contexts. Future comprehensive studies could explore prospective student experiences during LIC to gather data over a longer period and capture liminality. This was a modest study affording a glimpse into potential TCs in an LIC setting, but much remains unexplored. There are many TCs involved in becoming an agentic learner and PIF during longitudinal community placements, which future research could examine through multiple interviews and focus groups.

Conclusion

In this paper, we have presented the nature and attributes of the transformative impact of an LIC experience, during medical students’ learning journey towards becoming a professional. Viewing the student perceptions through the theoretical lens of TCs, we suggest that the LIC affordances appear important in helping students navigate transformational portals. LIC exposure served as a catalyst that led to a transformed view of self, which was more confident in dealing with uncertainty, comfortable in the emerging professional identity, and described having enhanced agentic capabilities. To conclude, the present study provides valuable insights into learners’ experience, and confirms that a primary care LIC affords a stable and safe environment for medical undergraduates to negotiate learning and transformational thresholds.

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Disclosure Statement

No potential conflict of interest was reported by the author(s).

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Ethical approval

Ethical approval for the research was granted by the University of Dundee Medical School Ethical Committee (SMED REC Number: 148/18).

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