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Augmenting the Clinical Apprenticeship Model

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Abstract

The School of Medicine at The University of Notre Dame Australia (UNDA) has adopted a clinical apprenticeship model for the final two years of its MBBS course. In the context of real clinical settings, students observe experienced clinicians as they consult with real patients. Students are provided with opportunities to practice clinical skills under the watchful eye of these clinicians who provide constructive feedback and gradually relax their level of intervention as the students become more proficient.

For the first time since the course commenced, UNDA medical students began their clinical apprenticeships in 2007 and participated in six three week rotations at a variety of hospital sites. Whilst literature on clinical apprenticeship suggests that this approach has the potential to provide rich learning opportunities, data gathered over the semester intimates that there were deficits in the learning environment. Students largely found the experience to be a positive one but problems with implementation of the clinical apprenticeship model across most sites resulted in ineffective learning.

This paper presents the findings from this evaluation program and describes the features of an implementation framework that will be used to facilitate the management of the clinical apprenticeship model in subsequent years. It is hoped that this framework will *augment* the clinical apprenticeship model and enable its affordances to be realised through the active participation of both the clinicians and the students.

What is the apprenticeship model?

The apprenticeship model is one of the oldest forms of learning by doing, where a novice learns how to perform a task (e.g., weaving) under the close tutelage of an expert (Honebein, Duffy & Fishman, 1993). The task provides a purpose for learning (e.g., weaving a net), however multiple skills and knowledge will be learned in the process of completing the task. Also, the authenticity of the task (e.g., weaving a net to catch fish) is intrinsically motivating and gives value and meaning to knowledge and skills learned in the process. Learned in the context within which the task is most functional and useful (e.g., on the banks of the river where the fish are to be caught), the novice also comes to understand the complexities, pitfalls, customs and rituals common to that environment (Honbein et al, 1993) all of which are important to his / her ability to perform the task effectively.

The principles of learning underpinning this definition of the apprenticeship model are:

- a) Knowledge is individually constructed by learners
- b) Knowledge construction is mediated by others

- c) Knowledge construction is most effective when activities are authentic
- d) Knowledge construction is context-dependent

These principles are explored below:

Knowledge is individually constructed by learners:

People do not simply absorb information from the environment but rather they construct personally meaningful understandings by relating new information to what they already know. Existing knowledge then, becomes an important factor in the process of learning, as it determines to a large extent what will be learned in the future (Shuell, 1986). This view stems from Piaget's (1963) theory that understanding something occurs through interaction with, and active manipulation of, the physical world. These interactions provide opportunities for students to make interpretations of experiences based on their existing knowledge structures. In an effort to understand an event or a problem, a student will attempt to link incoming information to understandings already held in his or her mind. If this new information somehow challenges the existing knowledge structures, then the student must reconstruct and reorganise his or her schemata to accommodate this disparity accordingly (Hodson & Hodson, 1998).

Knowledge construction is mediated by others:

As a result of his work into the social context of cognitive development, Vygotsky (1978), found that all cognitive functions originate in social activity and are inextricably linked to language, which in itself is a social construction. It is through social interactions (whether they are in a classroom, office, café or on a river bank) that the cognitive and communicative skills of a particular culture are learned. Therefore, in order to explain the phenomenon of learning, we must consider not only the student's mental constructions (as Piaget did) but also the immediate social world in which the student is located and the nature of the interactions that take place within it. In other words, all mental functions have social origins and occur, initially, between students before they become internalised within the student (Vygotsky, 1978).

Language plays a key role in this process of internalisation (Vygotsky, 1978). Various concepts, skills and understandings are first revealed to students in social situations where they are disseminated through language – written or spoken. As the student becomes comfortable with these new understandings, they are transformed into an inner speech, otherwise known as 'thought', for the subsequent construction and reconstruction of related understandings. So, "What has started out as an external socially-constructed artefact is transformed by the [student], first into an external aid to help organise problem-solving, and later into the very constructive core of thought itself" (Hodson & Hodson, 1998, p. 36). Consequently, cognitive achievements are essentially the outcomes of participation in particular 'communities of practice' (Crook, 1994, p. 38).

Other people within these communities of practice (teachers, parents, peers, clinicians etc) play an essential role in a student's ability to participate effectively and grow

intellectually. They offer a type of mediating support that will guide the student through the appropriate learning steps before he or she can appreciate the significance of these steps independently. This support is typically appropriate to the student's zone of proximal development (ZPD), that is, the level between what the student can achieve alone and what he or she can achieve with the assistance of others (Vygostky, 1978). In this way, "... knowledge is not merely handed on, nor is it discovered solely by the individual learner. Rather it is co-constructed through social interaction" (Hodson & Hodson, 1998, p. 37).

Knowledge construction is most effective when activities are authentic

Theories of situated cognition contend that it is ineffective to separate learning from 'doing' (Hendricks, 2001). Knowledge and skills are related to context and it is context which gives the knowledge and skills purpose and meaning. Effective learning, therefore, is when students develop knowledge and skills by engaging in activities that are genuinely representative of a context within which the knowledge and skills will be used. Otherwise known as authentic activities, these tasks contain the complexities and nuances associated with the context within which they are applicable. In attempting to complete this task, students learn the domain-specific knowledge and skills as well as the complexities and nuances representative of that domain (discipline).

Knowledge construction is context dependent.

Any account of learning cannot be separated from the environment within which it occurs (Vygotsky, 1978; Wertsch, 1985). The environment provides the catalyst, that is, the experiences from which knowledge is constructed. In relation to this, Savery and Duffy (1996) write, "...what we understand is a function of the content, the context [and] the activity of the learner..." (p. 136). Knowledge, then, is not located within the student alone, but is in fact a property of the entire learning context.

In essence, context is made up of people, language, objects, symbols and situations that are steeped in knowledge and which together constitute a type of 'collective memory' (Hodson & Hodson, 1998). This collective memory provides students (and groups of students) with the appropriate tools and background knowledge they need to construct new and more advanced understandings. The history embedded in the context is rich with meaning that has been defined and re-defined over time and is accessed by students as a springboard for new and subsequent learnings.

The clinical apprenticeship

These principles also underpin clinical apprenticeship. Clinical apprenticeship is when students are provided with opportunities to practice clinical skills under the watchful eye of experienced clinicians who provide constructive feedback and gradually relax their level of intervention as the students become more proficient (Ashley, 2000). Teaching moments are not directed by a prescribed, fixed curriculum. Rather, clinicians make the most of opportunities as they arise, thus making learning more meaningful and relevant

for students. The AMA suggests that the apprenticeship model remains the most effective approach for training doctors. Students are able to acquire and cultivate clinical skills in the context of solving genuine patient problems (AMA, 2005).

A quick scan of undergraduate medical curricula around the world indicates that most medical schools follow this approach to some extent. Towards the latter half of their course, students participate in a series of hospital-based clerkships whereby they become integrated into a team to learn basic clinical sciences associated with a specific discipline. The duration of these clerkships varies from school to school but ranges from two to twelve weeks. During this time, students will work with a range of healthcare professionals but will be allocated a primary supervisor who will oversee the activities and interactions students have with patients in his/her care. This person acts as a mentor who models expert behaviour in the diagnosis, treatment and management of various patient presentations. Students observe these behaviours and assist where possible all the while receiving on-the-spot feedback about their performance.

Ashley argues that the strength of this style of learning lies with the mentor's ability to customize learning to meet the student's specific needs. He states, "The mentor, acutely aware of the personal strengths and weaknesses of their student can, over an extended period of time, tailor learning according to those needs" (p. 457, 2000). In essence, this means that the mentor facilitates tailored training within the student's ZPD. Using the student's existing capabilities as the starting point, the mentor is able to provide the necessary scaffolding required to push the student's knowledge and skills to new levels in a supportive environment.

Kolb's theory of experiential learning effectively demonstrates how this process actually supports learning (1984). In the context of genuine clinical presentations, the student observes the mentor interact with a patient. He/she reflects on these observations and attempts to accommodate new information into existing knowledge structures. This requires some form of abstract conceptualization that is supported by explanations provided by the mentor and/or further research carried out by the student. The next time a patient presents with a similar problem, the student practices the newly learned skill under the guidance of the mentor. The more opportunity the student has for carrying out this cycle, the more proficient he/she will become. "Novices develop into experts by incrementally acquiring skills that depend on accruing experience" (Maudsley & Strivens, 2000).

The UNDA experience

For the first time since the course commenced in 2005, UNDA medical students began their clinical apprenticeships at the beginning of 2007 and participated in six three week rotations in the following disciplines:

- General Medicine
- Surgery
- Obstetrics and Gynaecology

- Paediatrics
- Orthopaedics
- Psychiatry

These rotations were supplemented with campus-based fixed resource sessions one day per week (e.g., lectures, expert tutorials, clinical skills sessions etc). The same rotations will be repeated next semester but at different hospital sites.

In an effort to evaluate the effectiveness of the clinical apprenticeship over the course of the semester, students were asked to complete a survey at the end of each three-week rotation. This survey addressed issues such as a) learning opportunities during the rotations b) the role of the clinicians in teaching the students c) access to patients d) the nature of the learning activities / experiences, and e) the suitability of the various sites as learning environments. Two groups of approximately ten students (at two separate sites) were also interviewed mid way through the semester to elaborate on the sorts of responses that were emerging in the surveys.

Additionally, focus group discussions were held with clinical team leaders from each site on a monthly basis. Although these discussions centred on the same categories of questions in the student surveys, the aim was to gain insight into these areas from the clinicians' perspectives.

Qualitative methodology was used to guide this evaluation process as its approaches were considered to be more sensitive to the nuances characteristic of social situations evident within hospital sites, and more likely to provide results that were rich, descriptive and a genuine reflection of the students' and clinicians' perspectives. Surveys and recorded interviews were transcribed and interrogated using a constant comparative method of data analysis (Glaser and Strauss, cited in Lincoln & Guba, 1985). Categories of meaning in relation to the extent to which the apprenticeship model facilitated learning at the various sites were described and refined. These categories are described below:

Findings

The findings suggest that, on the whole, the rotations were a positive experience for students. In keeping with the apprenticeship model, there was evidence that students were exposed to a range of authentic tasks that gave purpose to their learning; that they were coached through these tasks by clinicians who endeavored to push their learning to new levels and that the context of the hospital sites allowed students to understand and appreciate the rituals and routines associated with specific disciplines. Extracts from the transcripts supports these findings:

Exposure to wide range of authentic tasks and experiences:

Students had opportunities to not only observe, but engage in clinical activities such as obtaining a history to assisting with surgical operations. Comments by students suggest that these activities were extremely valuable learning opportunities.

Mr B was a fabulous teacher who allowed me to think things through, from a cellular level to the final differential diagnosis! He gave us many different surgical experiences by introducing us to his colleagues. He allowed us to assist in surgery, take histories, do basic clinical examinations, present and clerk patients, and write in notes. He also provided excellent tutorials for us. I thoroughly enjoyed my surgical rotation and learnt more than I thought possible in three weeks (S1HA).

Very good exposure to neonatal care and examination – a diverse rotation with speech pathology, rural health services and occupational exposure (S3HB).

It was great to have the opportunity to see the same patients in rooms, in surgery then in the surgical ward following their procedures (S5HA).

Exceptional exposure to a number of theatre procedures and operations. Overwhelming opportunities for practical experience in theatre, the ward and in outpatients' clinics relation to clinical examination techniques (S3HB).

An intensive and informative rotation with very good exposure to patient care, emergencies and follow-up. Teaching was very enthusiastic and opportunities for procedural work were plentiful (S3HB).

Clinicians as mentors and coaches:

Although not frequent, students did comment on the valuable occasions when clinicians coached them through authentic clinical activities, modeling expert actions all the while explaining the processes. At times, these clinicians allowed students to carry out procedures under their watchful eye and providing on-the-spot feedback.

On a couple of occasions [I was] scrubbing in and providing Mr X with a little assistance for some major surgeries including bilateral prophylactic mastectomies. This was an excellent experience – even cutting the consultant's knot rather than just the redundant piece of suture material (S7HC).

On Friday with Mr N ... we scrubbed in and assisted (or pretended to) with a number of procedures including a radical neck resection for a squamous carcinoma metastasis to lymph node/submandibular gland as well as the industrial accidents involving hands ... and a cosmetic procedure (S7HC).

There is evidence to suggest that some clinicians attempted to push students' learning to new levels thus extending their ZPD:

I was offered the opportunity to place a cannula but declined until I had seen a couple more done (S7HC).

Although [the clinician] knew we were medical students, he treated us like interns / RMOs and had a high expectation of us, which kept pushing me to improve (S4HB).

Contextual / ritualistic experience:

Students were given opportunities to learn in the context of real-life, meaningful situations. Apart from developing their clinical sciences, they came to understand the complexities, customs, rituals and routines that were common to the discipline they were rotating through.

I enjoyed this rotation. It is hard to say quantitatively what I got out of it but it ... is amazing what a human being can tolerate and survive. The staff –from consultant and registrar, to front desk and nurse – was very helpful and encouraging. The plastics / hand dressing clinic is a site and sight to behold; it is a must for any politician who thinks that there are no major problems with the public health clinic to visit.

The scrub nurses acted as assistants in many of the procedures and it appears that the surgeons rely and appreciate their skills and there appears to be a great deal of camaraderie and respect between surgeons and other theatre staff. The experience at Site A where we saw follow-up patients was invaluable. Learning what is irrelevant and what to write in the notes from follow-up history and examination was very helpful.

I was very grateful to the theatre nurses and one of the interns who kindly took me through scrubbing and gowning for theatre. I think that this was very useful as different people do it / like it done different ways and it helps one gain confidence in undertaking these very basic aspects of working in an operating theatre (S5HA).

On the whole, the sentiments of the findings are positive in that the students appreciated and enjoyed the opportunities to observe talented clinicians at work, and to experience the day-to-day functions of a hospital. However, there is evidence in the data to suggest that in terms of providing an environment conducive to effective learning, there were obvious deficits in the clinical apprenticeship. Students frequently commented on the curriculum being too vague and ambiguous; that learning was too teacher-centred and that opportunities to learn were haphazard and inconsistent. Clinicians also commented that they felt detached from the curriculum and had little insight into what to teach. These themes are described below.

Ambiguous curriculum:

Prior to the rotations, clinicians within each discipline were provided with a set of learning objectives. The learning objectives were designed by the School of Medicine and were deliberately brief and broad. The School did not want to burden clinicians with long lists of specific objectives that prescribed what had to be taught over the three-week rotation. Instead, it was hoped that the broad objectives would guide clinicians in maximizing the potential of teaching / learning opportunities when they arose.

This approach was aimed at providing clinicians with flexibility in their teaching. In reality, it was considered too vague to be of any use to either the clinicians or the students. Students noted that clinicians often appeared to be at a loss as to what they should do with them when they arrived for their rotations.

... I think the clinicians are at a loss sometimes because they have said, "What are we supposed to do with these students". Some of them have taken it on themselves to say "Okay, I think this is what you guys should do", and they've taken us though a kind of 'on the fly' curriculum that they've developed (S7HC).

On many occasions both students and clinicians commented on a lack of clarity as to what was expected of both parties.

There didn't seem to be any understanding of what was expected, on both our parts (I didn't know what I was supposed to be doing and neither did [the clinician] and subsequently I feel that this was a bit of a wasted opportunity. Having some learning objectives or some formal teaching about paediatrics would make ...what ... we are supposed to be doing [a lot clearer] (S7HC).

My teachers were keen to teach ... [but] they were unsure of what they needed to teach us (S6HB).

Some specific paed learning objectives would've been great to have during the placement and I think my supervisors would've appreciated this too (S10HA).

There needs to be a clearly defined structure for this program with more relevant objectives in place. The doctors at Site B are knowledgeable, keen and willing and so their expertise needs to be harnessed (S8HA).

While some of the teachers were amazing, they still had no idea what we needed to learn or be taught ... these people are only too willing to help yet they are not being informed of their responsibility and have nothing even close to a curriculum to follow (S3HB).

I think there needs to be some sort of mutual expectation on the clinicians and the students. The clinicians all need to know what they have to get us to do and we all need to know exactly what we need to accomplish (S16HA).

Teacher-centred learning:

Students described learning experiences that were largely teacher-centred. On the whole, clinicians were responsible for identifying teachable opportunities, explaining cases, actions and decisions. There was little opportunity for students to pursue their own learning goals. Even if they were given this opportunity, there was very little guidance as to which patient presentations should be explored and why. In reality, students *shadowed* their clinicians rather than worked with them as active apprentices.

I spent most of the time simply observing the consultant in his rooms. Not many opportunities to do anything... [I] took one history only (S7HC).

Surgeons were too busy to discuss much about the cases with us. The clinic is a very fast process therefore there was no opportunity for us to perform any procedures (history, examinations etc). There was only time to sit and observe. In theatre we were only able to observe operations (S6HB).

Didn't have a meaningful education experience. Was in Site B for two weeks doing nothing – a waste of time (S3HB).

The teaching started in the last week from Dr Y – just one session. We had quite a lot of 'dead time' just waiting around. Never really knew what was happening (S11HA).

The staff were polite and professional but seemed uninterested in teaching medical students. My involvement / exposure was limited to clinics and theatre with no patient contact directly. I had no contact with the interns or care of patients on the ward. Teaching by the consultant was more directed to surgical instructions to the registrar. The registrar provided only occasional teaching (direct or indirect) (S11HA).

Random opportunities to learn:

Teaching and learning opportunities appeared to be somewhat random. Teaching moments tended to favour clinicians available time rather than what students needed to learn. In most instances, there was no routine that students and clinicians could use to guide the experience. Both commented on a lack of structure to the curriculum which resulted in adhoc teaching and learning experiences across all disciplines.

The clinical rotations are described as “opportunistic learning”. I agree with this but would perhaps call them “pot luck” (S10HA).

We were distributed to too many different surgeons. There was no consistency or continuity in teaching styles or activities that we did. Some surgeons were very good so it was frustrating to spend little time with them (S7HC).

Neither Bob nor I reviewed a patient nor practiced any interviewing / history taking during this rotation. I know others did – it's just the luck of the draw (S14HB).

Practicing skills is very opportunistic and as such hard to practice skills which need development. Hopefully this will resolve / evolve over the course of the placement (S14HB).

O&G had four different obstetricians and there was no guidance to them of what their role was for us and what we should learn from the rotation (S12HB).

... there is no consistency in the rotations. They're all different and no-one will have the same experience (S10HA).

No ownership of curriculum:

The desire to ensure clinicians were not overloaded with work by teaching students was problematic in that they had very little ownership of the curriculum and accountability in ensuring learning objectives were met. Clinicians commented on a number of occasions that they did not know what the expectations were of them. They also noted that they would like to be involved in more formal opportunities for teaching, rather than simply allow students to follow them on their duties.

The lack of learning objectives has been a problem [for most of the clinicians]. They have found the [broad list] too broad and not very helpful in working out what level to teach at. They need to know what level the students are working at. They have a rough idea but it should be more precise. They would also like to be involved in a more formal teaching program. The opportunities aren't providing enough explicit teaching material. They [the clinicians] are only too happy to explain and teach but they need more direction; more of an explicit curriculum. At the moment they don't know what's going on – what the students know and what they should know, and what's expected of the clinicians to get them there. They're only too happy to get more involved (CFG2604).

Discussion

The common issue underscoring these concerns is the potential that learning during the rotations was left to chance; that the opportunities for learning were haphazard as students passively shadowed the clinicians as they went about their daily work.

Inherent within this concern is the element of *implementation*, that is, in the hands of the clinicians, to what extent were they going to be able to maximize the potential offered by the apprenticeship model of learning? While the apprenticeship model in itself is underpinned by contemporary theories of learning, the extent to which it is effectively implemented at the clinical sites will ultimately determine the extent to which learning is promoted.

As such, the current apprenticeship model for the clinical years has been augmented with an implementation framework that involves the clinicians at both the curriculum design *and* execution levels. Given that the responsibility for teaching students is largely in their hands, this implementation framework (illustrated in Figure 1) provides a scaffold for clinicians in their efforts to design valuable clinical learning experiences during the rotations.

This framework is informed by an outcomes focused model of curriculum that places importance on objectives as the driving force behind effective learning. Learning objectives (which are based on what students already know) are systematically articulated by clinicians in the light of what presently defines competency in their disciplines. These objectives are subsequently used by clinicians to design appropriate activities to engage students with the objectives, and are also used by the students to direct their learning. In other words, learning objectives are transparent and useable to both the clinicians and the students to drive teaching and learning.

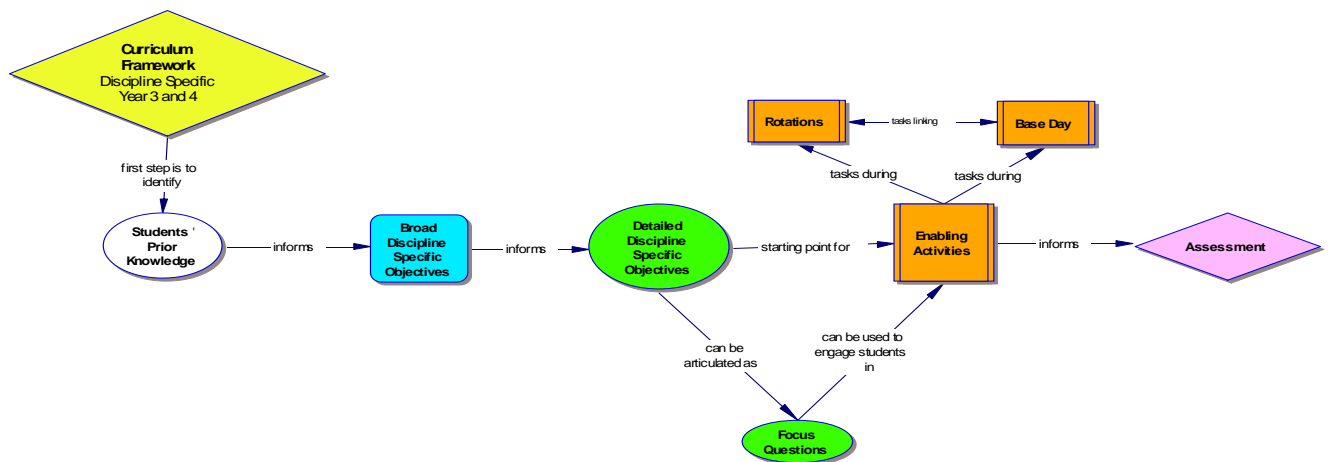


Figure 1. Curriculum design and implementation framework

Heads of the various disciplines have been requested to use this framework to design the syllabus for the clinical years at UNDA. They have attended a workshop exploring the tenets of the framework and have been instructed in the process of writing effective learning objectives. General and detailed learning objectives have been completed for all Year 3 rotations in readiness for Semester 2. Whilst this has been an added load to their schedules, the discipline heads have welcomed this input as it has given them a sense of ownership over the curriculum, and has provided structure to their interactions with the students.

As illustrated in Figure 1, learning objectives determine the instructional methods that enable students to learn the content (otherwise known as enabling activities). As the majority of enabling activities will occur during rotations in the clinical years, it is important that clinicians are aware of the types of activities that they can orchestrate to provide rich authentic learning experiences for students. A training workshop will also be

held to help clinicians identify these authentic activities and to ensure that they are appropriately aligned with the learning objectives being addressed at any one time.

The importance of designing tasks to actively engage students in the activity will be also explored during this workshop and emphasized as being fundamental to learning. As indicated in Figure 2, tasks link together activities and learning objectives such that students are encouraged to intellectually engage with the material. Tasks ensure learning is student-centred in that students have a responsibility to carry out an assignment during the course of an activity. Charged with this responsibility, they become active participants in the process of learning rather than passive bystanders.

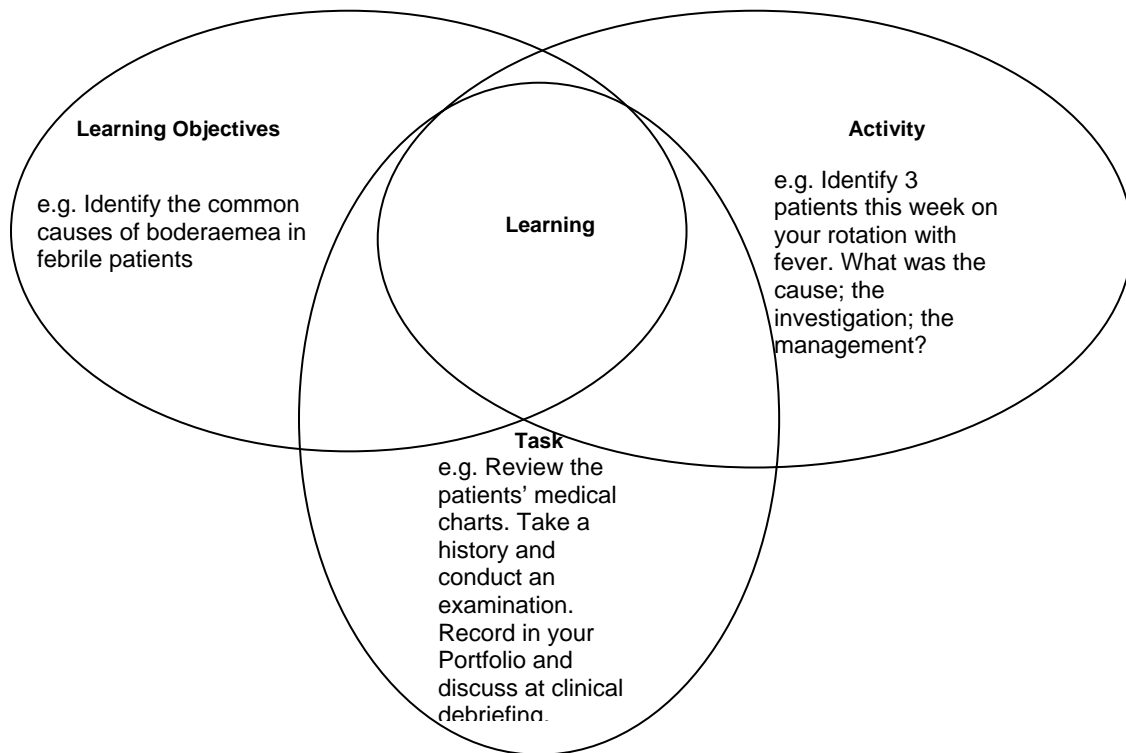


Figure 2. Interrelationship between learning objectives, activities and tasks

Conclusion

In conclusion, the theory underpinning the clinical apprenticeship model promotes the construction of meaningful learning in the context of real-life clinical settings. At the heart of this approach is the facilitation of learning by expert clinicians who are able to tailor experiences according to students' levels of readiness. However, the findings of this evaluation process indicate that for these features to be realized, the clinical

apprenticeship model must be carefully implemented by clinicians who are not only aware of its theoretical principles, but are capable of implementing them on site. As such, an implementation framework has been proposed that will support clinicians in this endeavour.

This framework recommends clinicians are involved in the curriculum design and implementation process such that they are consciously aware of what is required. This level of planned learning does not detract from opportunistic teaching, nor does it require clinicians to teach to a prescribed syllabus. It simply means that learning is not left to chance. In essence, this framework aims to *augment* the clinical apprenticeship model and will be used to guide the next series of clinical rotations due to commence next year. This process will be also be evaluated to determine the extent to which the augmented clinical apprenticeship model promoted effective learning.

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