Pharmacy students' perceptions of instructional methods of cognitive apprenticeship in clinical teaching: A qualitative study

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Abstract

Background: Clinical training provides many opportunities to acquire complex skills safely. The cognitive apprenticeship (CA) model advocates six teaching methods: modelling, coaching, scaffolding, reflection, articulation and exploration, which are useful teaching strategies. Little is known about how these strategies best fit into pharmacy clinical teaching. **Methods:** This study used a qualitative research approach using individual interviews and focus groups. All interviews were audio recorded, transcribed verbatim and thematically analysed. **Results:** Twenty students participated in six focus groups and three interviews. Two major themes were identified: the value of teaching and the influences of teaching methods and learning. Results indicated that coaching was predominantly applied in pharmacy clinical teaching. Other teaching methods were inconsistently applied. **Conclusion:** The findings support the use of cognitive apprenticeship teaching methods in pharmacy skills teaching, but the effective application of these methods hinges on instructional design and teacher development. Guided by the literature and the findings, a teaching framework may be tested in further research and used for teacher development and evaluation.

Introduction

Cognitive apprenticeship (CA) is a theoretical framework in education that draws inspiration from the traditional concept of apprenticeship, where novices learn from experts through hands-on experience and guided instruction. The main idea behind CA is to engage learners in authentic and meaningful tasks guided by experts who model the cognitive processes and pedagogical strategies necessary to complete those tasks effectively (Collins *et al.*, 1989).

CA model offers strategies for coaching learners towards the independent performance of the tasks encountered in professional practice (Collins *et al.*, 1989; Dennen, 2004; Brown *et al.*, 2005; Dennen & Burner, 2008;). The critical focus of CA, as applied to the student-teacher dynamic, requires that thought processes be brought to the surface "*to make them visible*". The model advocates six teaching methods: modelling, coaching, scaffolding, reflection, articulation and exploration.

CA instructional methods of coaching, modelling, and scaffolding have been widely applied in various disciplines (e.g. nursing, medicine, veterinary) and educational settings (e.g. clinical, simulations, online) (Lyons *et al.*, 2017). For example, student modelling (described as role-playing) has been reported as an activity to teach pharmacy students empathy or care for unique populations (Chen *et al.*, 2008; Koo *et al.*, 2014; Chen *et al.*, 2015; Tomishige-Mukai *et al.*, 2016). Role play is usually followed by feedback from practitioners, standardised patients or peers. In complex tasks, such as motivational interviewing, teacher or expert modelling and coaching have improved pharmacy students' self-efficacy (Bailey *et al.*, 2017).

CA methods are a useful model for teaching strategies in clinical training. The model also offers valuable guidance in structuring clinical teaching activities. However, the applicability of CA teaching methods from the pharmacy student perspective is unknown. Hence, this study explored students' perceptions of CA teaching methods in clinical training with two research questions: What are pharmacy students' perceptions of these teaching methods in clinical teaching, and how can these teaching methods be best used in clinical teaching? The study aims to gain insight into developing a conceptually robust and testable framework for skills teaching, faculty development and evaluation in the educational context.

Methods

The study took an explorative, qualitative approach, employing individual and focus group (FG) interviews to collect rich data. Having experienced the sociocultural phenomenon of some Malaysian students being "*passive*" or "*shy*", it was anticipated that some would be more comfortable expressing ideas in individual interviews, whilst some would find group interviews less threatening. The study is conducted by the principles of the Declaration of Helsinki.

Context and settings

The study setting was a clinical session, i.e. Pharmacy Skills Development (PSD) curriculum strand undertaken by Bachelor of Pharmacy (B.Pharm.) students throughout the four-year programme at International Medical University, Kuala Lumpur. The pharmacy practice skills developed in this strand were communications-based and included the whole professional tasks of medication history taking, medication counselling, responding to symptoms or product requests, counselling to facilitate beneficial lifestyle change, and responding to medicines information queries. The clinical sessions occurred in small groups of up to ten students, each with a clinical tutor in a dedicated purpose-built skills centre. It was a simulation-based instruction to replicate clinical scenarios, using role-play between students and tutors or Simulated/Standardised Patients (SP) based on semi-scripted teaching material. The sessions were conducted remotely online using Microsoft Teams during the lockdown due to the COVID-19 pandemic.

Participants and sampling strategy

Convenient sampling was employed to select and recruit Year 2 to Year 4 B.Pharm. students. Year 2 to Year 4 students were selected because they would have undertaken at least two PSD sessions and would have adequate experience with PSD conduct. Direct contacts and snowballing were used to elicit participation and maximal diversity in terms of the year of study. All participation was voluntary. Consenting students were invited to participate in an FG or an individual interview based on their preference.

Data collection

All interviews were carried out by the first author, facilitated by an interview guide (Table I) developed based on research questions and tested with one student. Vignettes derived from a previous study were used to stimulate discussion (Stalmeijer *et al.*, 2009). Queries identified during testing were addressed, and minor amendments were made to the interview guide.

Table I: Key topics covered in the interview guide

Topic and questions
Experiences with pharmacy skills development (PSD) sessions
a. What normally happens during a PSD session?
b. What are your views on the tutors' teaching styles or methods in PSD?
c. How have tutors supported your learning?
Experiences with CA teaching methods (based on vignette)
a. Have you experienced this method of teaching? Can you provide examples?
b. What are your thoughts about the teaching method?
c. How does it helps learning?
Vignettes
Modelling
The tutor demonstrates to you how to perform a task. Example: tutor shows you how to counsel a patient using inhaler.
Coaching
The tutor observes your performance of a task. The tutor gives you feedback on aspects you could improve and how.
Scaffolding
The tutor provides support to you to perform a task. Example: tutor will watch how you perform. When you had difficulty doing, The tutor provided suggestions on how to perform the task.
Articulation
The tutor encourages you to verbalise your knowledge or thinking. Example: the tutor may ask you to explain your actions or decision e.g. why do you ask if the SP is a smoker?
Reflection
The tutor encourages you to self-assess your own performance. Example: the tutor ask you think about your performance to others or look back on you have performed or learnt in the past.
Exploration
The tutor encourages you to identify and develop own learning goals and pursue them. Example: the tutor will encourage you to read further on the topic related to the PSD content.

The interviews and FGs were conducted in English, either in a closed meeting room on campus or remotely via Microsoft Teams (during the lockdown period). Each interview lasted from 35 to 55 minutes. All interviews were audio-recorded and transcribed verbatim. Sampling, recruitment, and interviews continued until no new themes or concepts were identified.

Data analysis

The coding of the transcripts was aided by NVivo qualitative data analysis software. Data were analysed using thematic analysis as described by Braun and Clarke (2006): 1) Reading and re-reading of transcripts; 2) Coding by assigning words or short phrases to the content of the data; 3) Generation of themes by linking and categorising of relevant coding; 4) Reviewing themes, by a critical examination of the data excerpts and themes; and 5) Defining and naming themes by reviewing core meaning and naming of themes. Two researchers conducted the coding process independently. Regular meetings between researchers were used to review recurring themes and to confirm codes. Illustrative quotes from the participants were then mapped onto the themes for reporting.

Researchers

The first and second authors were involved in skills teaching and designed the skills development strand when the curriculum was launched in 2004. The first author is experienced in qualitative research. The first author took measures to create a comfortable and safe environment for participants to express themselves freely. This was achieved when participants freely shared positive and negative experiences, perceptions, expectations and learning needs. The second author has a background in health professions education and had previously undertaken a qualitative study of skills tutors' self-reported use of CA teaching methods. The third author is an experienced researcher in mental health and was the academic programme director of the Master of Clinical Education at the University of Edinburgh at the point of study. The author has no relationship with the interview participants. The third author was also engaged in study design, data analysis and interpretation to provide an external perspective free from vested interests. The team maintained regular discussions to minimise unwarranted assumptions and to obtain consensus on data interpretation and reporting.

Results

A total of 20 pharmacy students participated in six FGs and three individual interviews. FGs were conducted with three groups of Year 2 students, one group of Year 3 and two groups of Year 4 students. Each group consisted of between two and five students. The demographic characteristics of participants are shown in Table II. The preponderance of female participants accurately reflects the enrolment female: male ratio and broadly reflects global pharmacy student enrolment.

Table II: Demographic characteristics of participants

Characteristics	Total participants (n = 20)
Data collection	
Focus group	17
Semi-structured interview	3
Gender	
Male	4
Female	16
Year of study	
Year 2	8
Year 3	5
Year 4	7

A total of ten subthemes emerged, organised under two major themes: the value of teaching and the influences of teaching methods and learning (Table III). Categories are marked in bold italics letters; subthemes are in bold. The findings are illustrated using verbatim quotes from the interview transcripts, specifying the year of study and a letter-number combination that identifies the participant.

Table III: Emerged themes and subthemes

Themes	Sub-themes
Value of teaching methods	Coaching
	Teacher modelling
	Scaffolding
	Articulation
	Reflection
	Exploration
Influences of teaching methods and learning	Group size and instructional time
	Teacher feedback practices
	Students' passivity
	Authenticity of learning

Value of teaching methods

Coaching was the most routinely applied teaching method, in which students interacted with a simulated patient (played by a student, tutor, or simulated patient), followed by tutor feedback. Students valued the opportunity to role-play, as it allowed them to link theory to practice. Watching their peers was a source of reflection and motivation. Students also appreciated teachers who provided specific in-depth feedback on what individual students did poorly and on why and how to improve.

> *"If I observed what my peer was doing, it gave me an impact like "Oh, my peers can do it; why can't I?". So, I will like to learn more from the peers." (Year 4, P6)*

Tutors rarely applied **teacher modelling** during PSD, but it was well appreciated by the students who had experienced it. When the tutor demonstrated a task, it allowed the student to visualise pharmacist-patient interaction. The common view was that teacher modelling was helpful for junior students when a new skill or technique was introduced or failed to achieve the expected performance standards.

> *"The lecturer (tutor) demonstrates to us, like how we actually should do (demonstration). I feel that experience very good because we see how a professional ask the patient (simulated patient) question. We learned a lot from that because we know what question we should ask, what we shouldn't ask and we try to learn their language and use it in our own sentence." (Year 3, P12)*

Students described varying ways of **scaffolding** support, although this did not seem explicit enough to be recognised as such by students. The experiences included explanation, hints, chunking down and modelling to enable learning, especially when the case was challenging. Students valued the support to assist them in solving the tasks, especially useful for those who are slow learners or whose task is very complicated.

> *"The case is quite long. He (tutor) tells us (students) many ways to solve it, then he gives us a hint; you (student) try this way, you (student) demonstrate one time. He (tutor) told us, many solutions to tell the patient."(Year 3, P1)*

The students could relate **articulation** to some tutors, using open questions to justify their performances (e.g. questions or information that students posed or provided to SP). Students felt articulation helped stimulate reflection and evaluation of effective questioning in patient communication.

> *"In some certain cases, you don't need to know all the family history and stuff (based on a checklist). When the lecturer asked, "Why you asked this?", and you (student) just (reflect), "Do I (student themselves) asked because I need to ask or am I asking for specific reason?" (Year 2, P15)*

Teachers did not explicitly encourage or discuss **reflection**, but students naturally reflected while watching their peers perform or when the teacher provided feedback. In their minds, students assess and compare performances and reflect on what they could do better.

> *"I feel, we usually do it. Every student does it naturally, right, after they perform and the lecturers give their comments, they do a self-reflection and be like "Okay I need to be better" (Year 3, P13).*

Exploration was encouraged by some tutors during skills sessions, but many students admitted they did not explore learning beyond the session. This is because they were uncertain of the role or value of exploration of further learning. Nevertheless, some students said they would act to study after multiple tutor encouragements or when encountering similar tasks/scenarios.

> *"If I happen to come to the same scenario again, I will be like, "Oh, the lecturer mentioned this last time, so I should search about this now." (Year 4, P16)*

Influences of teaching methods and learning

Students described various factors influencing the teaching methods and their learning. The **group size and instructional time** were a barrier to feedback provision. Students shared that, on occasions, there was insufficient class time for individual feedback, support or extended explanation. Some students suggested group sizes of two to six and felt that students would feel more comfortable expressing themselves in smaller groups.

> *"For this kind of support (scaffolding), the lecturer has to be on the side of the student all the time to observe the mistake and the difficulties of the students." (Year 2, P2)*

> *"Sometimes when the students have performed all the history-taking (task) and just nice (enough time) for the general feedback and time is up." (Year 4, P4)*

Students also recognised **differences in teachers' feedback** practices and their expectations of professional communication. Most tutors provided generalised, non-specific or non-elaborated feedback to their group. Students were uncertain how to

improve when feedback was generalised or not detailed. Some students also felt that tutors were not completely truthful with specific feedback, possibly because of sensitivity to students' feelings. The lack of specific feedback also led to misleading expectations.

> *"X (teacher) talked about using open-ended questions when you don't have enough information and then using close-ended, let say, if you want to rule out some red flag symptoms. But just now Y (another tutor) said that, we should use more open-ended, because if you use too much close-ended questions, you might miss out something. I mean both have made a good point, but just now my friend was asking me, "then what should we use? open-ended or close-ended?" (Year 3, P1)*

Articulation was stressful and difficult for students. Students explained that many **students were passive** during PSD, not unwilling to speak or ask, and preferred to sit back and learn from others' mistakes. For junior students, the challenge is to articulate their actions primarily because of the heavy reliance on checklists of skills or a textbook approach. Other factors attributed to students' passivity include teacher dominance, students' shyness, lack of confidence, and fear of making mistakes. In addition, some students perceived that the teacher questioned them because of mistakes, which created more fear.

> *"I will feel what is going on? Am I doing wrong? I will feel scared (when asked to articulate)." (Year 2, P10)*

Students recognised that articulation was valuable in stimulating critical thinking. However, students suggested tutors should be more encouraging and less judgemental to promote articulation. Tutors also needed more realistic or pragmatic expectations of student participation, in that it would take time to transform passive learners into active ones, especially when "*passive learners*" were individuals who had never been expected to be active.

Authenticity of learning

Senior students who had undergone clinical placements described few concerns with the authenticity of learning, particularly with teaching modelling and scaffolding, i.e. chunking. Senior students felt tutors are likely to "*act*" out of the script when modelling. A pharmacist is expected to work with unexpected and unknown circumstances. Therefore, teaching modelling of a scripted case may limit students' exploration of different approaches to interacting with patients.

> *"If (tutor) already know the case, they might behave differently. So, I feel that way, it wouldn't add so much value to our learning experience. Because we*

> *want to learn the most because we (students) know nothing about the patient under the circumstances." (Year 4, P3)*

A student also recalled that a tutor has broken down a task (prescription medication counselling involving multiple medications for a patient) into individual chunks. In reality, a pharmacist is expected to be able to counsel a patient on multiple medications. Therefore, students may miss learning when the task (counselling) is broken.

> *"In a real setting, we cannot just only counsel (on) one medication. So, (the task) trains us how to sort of time management and manage the time to counsel the patient." (Year 4, P5).*

Discussion

In this qualitative study, pharmacy students described their experience of CA teaching methods in skills classes. Participants' descriptions indicated that coaching predominated; modelling, articulation and scaffolding were inconsistently applied; and reflection and exploration occurred intentionally or incidentally without direct teacher input. Nevertheless, students reported positive knowledge, skills and judgement developments over time and recognised the value of thought processes (cognition) in interaction and communication. These findings thus support using cognitive apprenticeship teaching strategies in pharmacy skills instruction.

CA teaching strategies fit well into simulation education, utilising purposeful practice (Ericsson, 2004; McGaghie, 2008; McGaghie *et al*., 2011). This study identified factors to consider to effectively apply CA teaching strategies to the development of students from the early years of study. To provide safe and supportive learning environments, students needed to participate in various tasks confidently under the supervision of tutors. Consistent with previous studies, group size affects students' learning experiences (Ofei-Dodoo *et al*., 2018). Groups ranging in size from two, three, or four students were reported to provide no difference in the students' learning experiences (Rezmer *et al*., 2011). Smaller groups of four for earlier-year students would potentially allow focused time on modelling, coaching, individualised feedback and structured scaffolding.

The findings also indicated that teachers need awareness of factors that threaten to create a safe learning environment to interact freely. For early-year students, i.e. year 1 and year 2, strategies potentially beneficial to provide a psychologically safe learning

environment for students include providing structured questions before class for discussions, encouraging students' collaboration, and focusing more on cognitive development rather than answers or performances (Hardie *et al.*, 2022). In a Southeast Asian context, promoting student articulation will likely require deliberate, purposeful practice and improved English. Teachers should focus on encouraging, supporting and developing articulation in the early years. Techniques include think-aloud exercises, encouraging speaking without being judgemental about the quality of language, and think-pair-share activity, in which paired learners learn and support each other. The latter approach has been shown to encourage participation and increase the efficiency of discussion, communication and decision-making (Sumekto, 2018).

Modelling, coaching and scaffolding are at the core of cognitive apprenticeship because they enable learners to acquire integrated skills through observation and guided practice. Teacher modelling, however, is viewed by students as unauthentic as students progress and may limit their learning. This reflects the notion of fading support as students progressed into later years of study, in which students requested more time to reflect and explore learning. Self-assessment and peer

assessment can enhance students learning and counselling skill development (Bartlett *et al.*, 2022) and should be encouraged by teachers.

Exploration aims to develop self-direction and regulation in learning, characterised by taking the initiative and identifying and addressing gaps or deficiencies. In this study, students were only motivated to direct their learning when they recognised the value of that learning. To encourage exploration, teachers needed to set achievable expectations on what to explore.

Based on the findings, a clinical teaching framework was also developed (Figure 1). The framework recognises the importance of a safe, supportive learning climate, requiring teachers to set and maintain such a climate from the outset purposefully. Most skills tutors in this study have little theoretical understanding of the CA model. Hence, tutors may have used CA methods intuitively. The teaching framework teaching could potentially be useful to guide faculty training. Further work should include an evaluation of the robustness, effectiveness, acceptability and utility of the teaching framework in instruction, faculty development and evaluation.
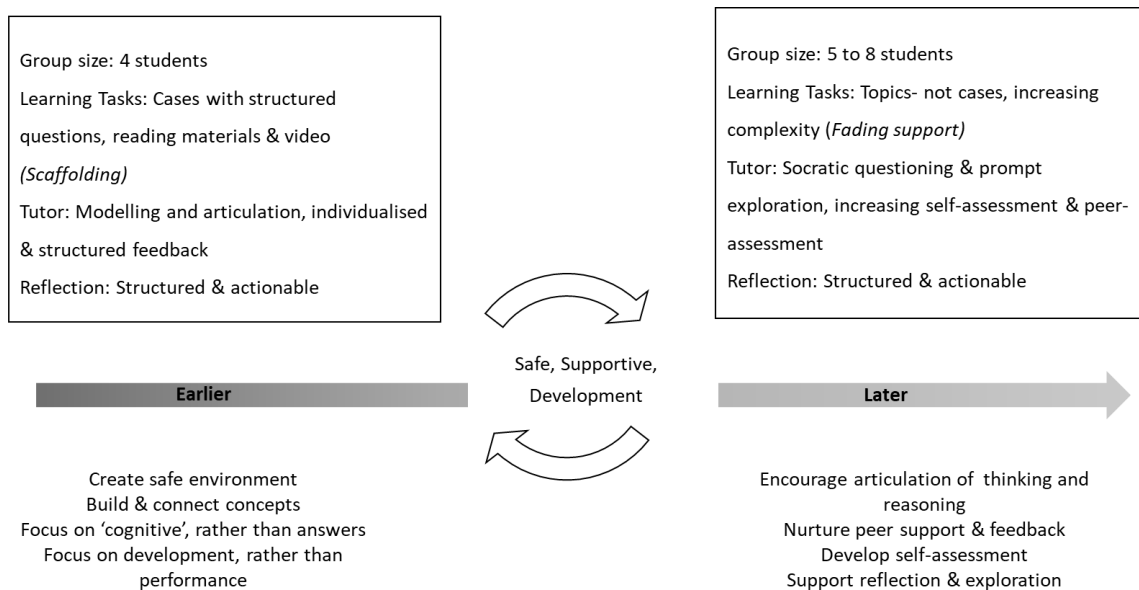

Figure 1: Cognitive apprenticeship teaching framework for pharmacy skills teaching

This study achieved credibility, transferability, dependability and confirmability by conducting unbiased and honest interviews and employing multiple researchers in the data analyses. Twenty students participated in this study. This small sample size is not unusual for qualitative studies. The data obtained may

not represent all the students, e.g. those who decided not to be interviewed. However, the study has involved students from different phases of the study to capture the perceptions of the diverse student populations. The study was conducted in a single institution; thus, the potential transferability of the findings may be limited.

Conclusion

The CA strategies align effectively with the simulation training of pharmacy skills. Thoughtful application of these CA strategies could enable clinical teachers to enhance the quality of teaching and motivate students learning. The clinical teaching framework, developed based on findings from this study, could be presented as a pivotal cornerstone for clinical teachers to guide the application of strategies within a safe and nurturing learning environment. The framework could also be a guiding beacon for faculty development, enhancing clinical teaching practices.

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Conflict of interest

The authors declare no conflict of interest.

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