

## A Qualitative Study Exploring the Relationship of Curricular Models to the Development of Clinical Reasoning Skills Among Medical Students

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### Abstract

Current literature shows mixed evidence on the impact of curricular models on the development of Clinical Reasoning (CR) among medical students. The University of Nottingham (UoN) has two curricular groups: Graduate Entry Medical (GEM) students who have Problem based Learning (PBL) curriculum and Undergraduate entry medical students who have integrated curriculum for the first few years and they all join together later for clinical years from Clinical Phase (CP) 1 to final year CP3. The present research project aims to add to the body of knowledge within this field of research by exploring the effect of the different curricula used at UoN on the development of awareness of CR. The qualitative study was conducted to get a deep understanding of the students' point of view.

The students were interviewed at the start of their CP1 and CP3 after gaining consent. Total numbers of participants after meeting the point of data saturation were 28 students. Inductive data analysis was conducted to the manifest, semantic or explicit level.

Results of the analysis revealed that all integrated CP3 students recalled PBL students had better CR skills at the start of their first clinical year. This view was also echoed by almost all PBL CP3 students agreeing that their CR was better. Among the integrated CP1 students, 50% said that PBL students had better CR. However, all CP3 students uniformly accepted that there was no discrepancy in CR between the two groups later such as at the end of CP1 or the entry of CP3 or during CP3.

Some students think that the difference in curricular model translates into difference in CR. Besides the curricular models, other factors that affect CR also emerged, such as the difference between undergraduate and graduate students' confidence, motivation, background, life experience, timing of the clinical phase and exposure to clinical practice.

In conclusion, there is a discrepancy between CR skills between undergraduate integrated students and graduate PBL students at the beginning of CP1 which gradually decreases as the course progresses. The discrepancy in CR can be explained by differences in the curriculum model as well as other factors.

## Abbreviations (if used)

CR: Clinical reasoning

CP1: Clinical phase 1, the first clinical phase for University of Nottingham medical students, in third year of the undergraduate course and in the second year of the graduate course.

CP3: Clinical phase 3, the third and final clinical phase for University of Nottingham medical students, in fifth year of the undergraduate course and in the fourth year of the graduate course.

GEM: Graduate Entry Medicine, or the graduate entry course for medical students at the University of Nottingham

UoN: The University of Nottingham

PBL: Problem-based learning

## Introduction

CR is an essential skill to successfully navigate the everyday world of medicine. CR has been defined as the ability to incorporate different types of knowledge, assess critical evidence and gain insight on the process for arriving at a diagnosis [1]. What exactly underpins and affects the development of CR skills in students has been a subject of debate. For one, the structure of medical school curriculum may influence the learning and cognitive processes of students. It has been suggested that the way students learn may be an important influence on the development of CR [2-6].

PBL has been described to contribute more to the development of CR compared to other models [7-15]. Moreover, PBL seemed to increase motivation, interest and self-directed learning skills in medical students [16].

However, numerous studies describe conflicting evidence on the positive effects of PBL on CR [5,17-24]. Both CR and problem-solving skills were only weakly associated with the PBL curriculum [25,26].

Interestingly, despite studies proving the superiority one curriculum over others, there would still be other factors influencing the development of CR [27]. The nature of these factors has been widely debated. For instance, proving the superiority of the PBL model is complicated by the wide variety of PBL styles within the model itself [17]. These authors emphasize that the research agenda should analyse specific aspects of PBL on defined variables rather than only focusing on the curriculum as a whole. Such studies would then contribute to a better understanding of the complex interactions and dynamics taking place within the PBL model that influences CR skills of students.

Furthermore, many of these studies were focused on comparing the traditional curriculum with PBL [14,28-31]. Only a few studies considered the other widely used type of curriculum, the integrated model, in addition to the problem-based and traditional curricula. The two main curriculum models discussed in this study are the PBL model and the integrated model. Moreover, many of these studies comparing the effect of different curricular by comparing the students' performance on different CR tests. In contrast to existing literature, this novel study would purely explore the students' opinion, beliefs and experiences without testing or observing their CR skills and performance.

## Materials and Methods

During the pre-clinical stage at the UoN, undergraduate students learn via an integrated curriculum while graduate entry students undergo problem-based learning (PBL). While the two groups start the pre-clinical course on the two separate curriculum models, they then combine to enter the same course at the clinical stage from CP1 to the point of graduation. The researcher met the CP1 and CP3 students face-to-face, explained the aim of the study and distributed volunteer information sheets and an informed consent form. Those who consented to participating in the study were invited to be interviewed.

After identifying the point of data saturation, the total number of participants eventually included 28 students. From the integrated group, there were eleven CP3 and ten CP1 students. From the PBL group, there were seven CP3 students. Inductive thematic data analysis was conducted up to the manifest, semantic or explicit level. In reporting of results, each participating student was identified by code and a number. The code represented what phase they were in and whether they were in the PBL or integrated group. The number referred to the order in which the student was interviewed. For example, "CP3 I 1" represents the first interviewee from the integrated curriculum from CP3 and so on.

## Results

In terms of difference in CR between integrated and PBL students, there was a range of responses leaning towards higher CR identified in PBL students. Students' answers to the question "Do you notice any difference in the CR between PBL students and Integrated students?"

a. All final year integrated student believed that PBL students are better in CR at early clinical phase. An example quote from CP3 I 11 stated about PBL students:

"I think in that respect their knowledge is probably slightly better. Like coming up with differentials and things like that, they were a lot quicker. I remember on CP1 thinking some of the words they were using, I'd never heard them before, but as I read, then they were coming to me."

b. Similarly, almost all CP3 PBL students agreed that their CR is better. One of them, CP3 P 6 was quoted as stating, about the integrated students:

"The knowledge of basic pathology and how it presents is not there really in a lot of cases. So they're very scientific and have very little clinical, which I found quite surprising"

c. Among the CP1 students, half of the integrated students said that PBL students have better knowledge and application, for example from CP1 6:

d. However, one important caveat exists about the superiority of CR in PBL students over integrated students: the difference in CR only existed at the beginning of CP1. All CP3 students across both groups uniformly accepted that there was no discrepancy at all in CR skills at different points as the course progressed such as at the end of CP1, the entry of CP3 or during CP3. A student, CP3 I 10 was quoted as saying:

"By the end we were much a par with each other. I think it didn't actually take that long to be honest. So I think it was only a couple of months--- you couldn't tell anymore. I think we were all at a similar level then."

### **The Effect of Curricular Model/ Educational Strategies they Use in PBL Curriculum**

CP1 8 was quoted as saying:

"They're used to not being spoon-fed and actually having to go and do it themselves whereas we've - learning what's in the lecture slides."

Many students deduced that GEM (PBL) students have better CR because of the curriculum model. The undergraduate (integrated) students concluded that their curriculum had more emphasis on basic sciences while the GEM course was more clinically-based. CP3 I 9 stated:

"I find it really helpful to have the solid systematic approach - they were already thinking in that directions, whereas we were still thinking in the opposite direction where if you told us, 'How does a heart attack present?' then we could tell you, 'Oh yes. Chest pain' - but if you said, 'You've got a patient with chest pain', we wouldn't have necessarily have thought of a heart attack."

The PBL environment was envisioned as grounding for CR and made the PBL students far ahead of the integrated group. On the integrated group, a PBL student CP3 P 2 said: "I think they learnt in the traditional way of lectures and workshops and things whereas we always had a clinical perspective - and how you move forwards as a doctor to deal with it, which helped us learn a lot of information very quickly."

Among the CP1 students, the PBL students were better in CR possibly because they were more comfortable with a case approach learning. CP3 integrated students also reaffirmed that PBL students have had earlier exposure to clinical cases and could pick out clinical signs more quickly.

## The Other Factors that Affect CR

While there was a clear difference in CR between the undergraduate integrated students and the graduate PBL students at the start of clinical placement 1, this may not all be attributed to the difference in curriculum model. Several themes emerged from the students that may also contribute to the difference in CR.

Firstly, PBL students were said to have more confidence than the integrated students, said a student, CP1 3:

“I think they’ve got the confidence to just keep attempting, whereas we’re more shy maybe.” The students believed that the superior CR skills of the GEM students were due to their confidence that came with age. One undergraduate student, CP3 I 10 said: “It might just be a confidence thing and the fact that a lot of the GEM students are a lot older than the undergrads.”

A second theme that emerged as possibly contributing to the difference in CR was timing. The integrated students had spent one semester on their research projects before starting clinical phase. PBL students believed that the timing of the start of clinical phase contributed to a drop in their CR skills. For instance, one PBL student stated:

“I think part of it was because we’d (PBL) come straight from exams. So we were already sort of primed and sort of in running mode, whereas they’d (integrated) had like a few weeks off – and their projects. So they’d just come back from a break.” (CP3 P 3)

Motivation was also mentioned to be a factor in the superiority of the GEMs’ CR skills. One integrated student, CP3 I 9 spoke of the enthusiasm of the GEM students:

“They wanted it a lot more, you know, you’re a GEM (PBL) student. You’ve gone through a lot more to get into medical school in the first place and I think they worked a lot harder than we did to make themselves ready for CP1.”

The backgrounds of the GEM students were also touched on to affect CR skills. One PBL student recalled the fact that integrated students had less exposure to patients prior to clinical phase. A lot of the PBL students claimed to have come from clinical backgrounds so they were more used to think from a clinical perspective. As stated by a PBL student, CP3 P 6:

“I’ve been a paramedic for many years before being a medical student. So I’ve – an amount of clinical acumen before (and) some CR and this has sort of added to it.”

Finally, related to age, the increased life experience of the PBL students were said to contribute to their increased CR skills. A PBL student, CP3 P 6 stated about the integrated students:

“Their experience of talking to patients is not as good as the GEMS (PBL) I would say. A lot shyer, which is obviously an age thing as well and experience.”

Another student, CP3 9 said:



“I think it’s more about where you’ve ended up for training, your placement at CP3 stage rather than whether you started out as a GEM (PBL) or an undergrad (integrated).”

## Discussion

In this study, more than 90% participants declared that PBL students were better at CR and CP3 PBL students stressed that experience on the GEM course consolidated their experience in reality. For example, in the integrated curriculum, the students attended lectures on many diseases whereas the PBL course was more symptom-focused with a symptom-to-diagnosis approach. There are many causes of abdominal pain but the patient must have one definite diagnosis in order to receive the right management which must all be worked out by the clinician.

Another factor brought up by students that influenced CR acquisition was the ‘research year’ underwent by integrated students before starting their clinical phase. Even in other PBL courses, such a feature can affect the development of CR. Goss et al conducted a study in 2011 to examine the effectiveness of the PBL curriculum on the development of diagnostic reasoning skills in medical students. They found that students on a traditional curriculum had higher flexibility in thinking and memory structure, and consequently had a higher level of diagnostic reasoning than students on the PBL curriculum [32]. The reason for these results may be explained by the PBL curriculum model where there was a research year before the clinical years. In our study, the integrated students had a research module before CP1 while the PBL students did not.

Other possible factors mentioned that influenced the difference between the PBL and integrated group was not only the curriculum model and the educational strategies used in PBL but also the timing of research year, confidence, life experience, motivation, as well as clinical background. CR takes account of patient and environmental factors, as well as motivation, emotional state, knowledge, experience, communication, confidence and personality. All these factors shape and modify a clinician’s thinking in conscious and unconscious ways, resulting in variable clinical performance.

One key finding of this study was that all CP3 groups uniformly accepted that there was no discrepancy at all in CR after CP1 has progressed and exposure to clinical practice may have an impact on CR development. Da Silva (2013) studied such aspects in a traditional medical school (Coimbra, Portugal), and more contemporary integrated curriculum as well as a problem-based curriculum (UoN) [33]. The authors found that although there were significant differences in CR ability of PBL students compared to traditional students, the difference diminishes when students progressed to their final year suggesting that towards graduation there were no differences in CR based on the type of pre-clinical curriculum. The similar results are noted by Groves, O’rourke, & Alexander, 2003 [34]. The finding that the discrepancy in CR skills diminish in the later stages of the course contributes to the evidence that progression in the clinical course and exposure to clinical practice may enhance CR development.

Although multiple studies have examined the effect of curriculum model on CR, its role in enhancing the development of CR is still not well understood [7,19,32,35,36]. Most findings were contradictory and there was no consensus on a single best curriculum model to enhance CR skills.

## Conclusions

Our study found that PBL students were described by themselves and their peers to have better CR skills than students in the integrated course. However, this difference only existed at the start of CP1 and disappears as the course progressed. There was evidence for the difference in educational strategies and exposure to clinical practice influencing the discrepancy in CR skills. The lack of difference in CR skills between the two groups in the later stages of the course suggests the positive effects of progression in the clinical course and exposure to clinical practice on the development of CR. Similarly, there were emergent themes of factors outside the curriculum model that affected the greater CR skills of PBL students such as difference in confidence levels, timing of clinical phase, motivation, background and life experience. More research is needed into the role of pre-clinical curriculum models in developing the CR skills of future clinicians.

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