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Point of View

Reluctance to think: unable or unwilling?

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Submitted 2 Jul 2011; first decision 15 Jul 2011; revision received 21 Jul 2011; accepted and published 21 Jul 2011

Introduction

Students have started to tell me that they do not want or need to think about science. Those concerned were undergraduate and graduate students pursuing degrees in various biomedical sciences. The thinking expected was entirely normal for science, involving the synthesis of information, problem analysis, calculation, the solution and analysis of practical problems and question development, for example. I have not solicited expressions of reluctance, but I have attempted to elicit more information from those students volunteering them.

While this explicit reluctance to think is new to me, there are reports of similar observations [1-3]. Of course, we are all reluctant to think sometimes, but the new willingness of students to express it implies a more profound problem. If education is intended in part to train students how to learn and think for themselves [4], the reluctance of students to practise this compromises the value of education. For those students intending to practise medicine, work as scientists, formulate health policy, teach or engage in any of the many other occupations that might suit biomedical scientists, an ability to think effectively and efficiently is essential [5]. Students must be helped to prevent a reluctance to think becoming a habit.

Effective thinking relies on both the ability and the willingness to think [4]. Moreover, the ability to think necessarily implies a recognition of the possibility of error [6], which is relatively uncommon among students. There is a considerable difference between the thought patterns of practising scientists and clinicians and those of students. It takes time for thought and practice to develop the questioning, analysis, pattern matching, deduction and educated guesswork that contribute to thinking [7-9]. This is reinforced by a Xhosa speaking South African student of speech and hearing therapy who wrote *"... I fail because I have to learn more than the words of your teaching — I have to give back to you the way you think. This is what you are really testing, this is how you assess my 'intelligence'. You test to see whether I have learnt to think like you yet"* [10]. Even if students are willing to think, they may not be as capable as we might hope because they may not have had enough time to develop the necessary thinking skills.

The reluctance of students to think prompts at least four questions. These relate to the significance of the reluctance, the reasons for refusing, the consequences of refusing and how we might encourage students to be more willing to think better. I consider each of these in turn.

What does the reluctance signify?

The reluctance to think could have at least four different interpretations. First, students may believe that they are not required to think or, if it is expected, that it will be done by someone else, such as the teacher [1, 3].

While this may seem unlikely, such a view must have been fostered in class (although it may not have been ours) and it may be that the explicit expectations of the students are insufficient [11]. Second, the student may not really understand what is expected. This may mean that teacher and student do not communicate or that the student does not have a clear understanding of what thinking might be required. Third, the student might understand or have some idea what is expected, but does not know how to go about it. Finally, the student might simply be overwhelmed by work, assessment, personal issues, the demands of holding down a job while studying, for example. This is very common: most of us have had the experience of a student struggling in class simply through lack of sleep resulting from working into the early hours to earn a living.

Why are students reluctant?

The explanations given to me fell into two broad categories: some just wanted 'the' answer, and others claimed to be able to think, but did not want to and did not 'like' being pushed to do so. Assuming that a student demanding 'the' answer is temporarily unable to think, these explanations correspond to deficiencies in Siegel's [4] two requirements for effective thinking.

The first explanation implies that the student considers that there is only one correct 'answer' that is known to the teacher and that all other responses are wrong. Such a view neglects the possibility that there might be several ways of considering a problem [12], that more than one of these might be helpful and that a consideration of an issue from several perspectives might be what the teacher actually wants to elicit. Moreover, it incorrectly presupposes that a 'wrong' answer might not provide an indication as to the nature of a better one or to other questions that might be asked [13: 211]. Of course it may be that no definitive answer is known or it may be that there are several partial 'answers', which is the nature of science.

This explanation reflects the dualistic thinking that is common [6]. This sort of thinking is reinforced by the formulaic nature of most journal articles, of which Richard Feynman [14] said at the start of his Nobel Prize lecture *"[w]e have a habit in writing articles published in scientific journals to make the work as finished as possible, to cover all the tracks, to not worry about the blind alleys or to describe how you had the wrong idea first, and so on. So there isn't any place to publish, in a dignified manner, what you actually did in order to get to do the work …"*. Experienced scientists appreciate how science actually works, but the impression of omniscience conveyed by so much science communication reinforces the dualistic thinking of students.

The predominance of dualistic thinking prompts one to ask what might have happened to students in their previous education that might explain it. Young children ask many questions and clearly do not believe that there is only one answer [15]. By the time a student enters university those skills are largely lost, so questioning may be educated out of young people [16]. There is some evidence that science teachers tend to misrepresent the nature of science to their students [17] which may contribute to the development of the dualistic thinking that can take many years to reverse [6]. Some forms of assessment may also reinforce dualistic thinking because of the implication that there is only one 'right' way of considering any problem [18]. Certainly, some students concentrate on what it is necessary to know in order to pass the examination. Consequently, it may be unreasonable to expect students to think like a scientist [19] because most students can only think dualistically [6]. Of course, an important aim of teaching is to foster the development of the ability to think in a more sophisticated manner.

The second explanation is a lack of a desire to think. This represents a greater problem because it may reflect an underlying intellectual laziness that can become a dangerous habit for a biomedical scientist [5]. Of course, it is demanding to think and we all have moments when it is beyond us or subjects about which we are reluctant to think on occasion. If the unwillingness is due to a lack of interest, exhaustion or being over worked it can be difficult to assist. However, more can be done to help if the lack of a desire to think arises from a fear of failure.

Some consequences of not thinking

It is important to have a body of knowledge on which to rely, but the ability to manipulate the information and consider a problem in various ways is essential. The volume and complexity of technical material that students have to come to terms with is enormous and represents a considerable burden. Despite this, students often attempt to memorise almost everything [19]. If they were willing and able to think well, so that they could identify patterns and work things out from a few important pieces of information, students would be empowered, their burden would be reduced and unnecessary stress alleviated. Gagné [20] distinguishes between concepts and principles. A concept can often be encapsulated in a name, whereas a principle involves combinations of or actions on concepts [20]. For example, the concept 'three' enables one to identify a group of three objects and distinguish it from groups of different sizes. However, the higher order principles that 2 + 1 = 3, 5 – 2 = 3 or 6/2 = 3 imply a deeper understanding of 'threeness'. Obviously, an attempt to memorise every instance involving 'three' would be futile and misses the point that the principles are transferrable (to 'four', for example).

What can be done to encourage a willingness to think?

Several simple techniques can encourage a willingness to think, but their success depends on the establishment of a supportive environment in the classroom. First, demonstrate the appropriate thinking skills, perhaps by including the reasoning in lectures not just detail, even if this must be at the expense of content. Second, admit your own ignorance, because the first step in learning is to learn to identify an absence of knowledge and because it provides an opportunity to involve students in an exploration of the problem. Third, explicitly require that every student think and provide regular opportunities for each of them to practise. Fourth, encourage students to discuss problems with each other in person rather than just electronically. Fifth, assess thinking, having warned your students that you will do so, and accept that this may require recognition of more than one 'right' answer.

Conclusions

Some students are reluctant to think, either because of a lack of ability or unwillingness. Irrespective of the reason, students must be persuaded that the ability to think is at least as important as the body of knowledge on which they usually focus. While we may expect too much of some students, it is necessary to help all of them to develop the necessary skills. Thinking strategies should be demonstrated and practised in class and students should be expected to show that they are able to think at an appropriate level.

Funding – none; **Conflict of Interests** – none declared.

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Hyperlinks in this manuscript were last accessed 21 Jul 2011.

Reviewers: The original submitted version was reviewed by Dr Frank Starmer, Duke-NUS Graduate Medical School, Singapore; Dr Balint Kacsoh, Mercer University School of Medicine, USA, and the editor E.S.Prakash. The reviewers and the editor have no conflict of interests related to this submission.

Prepublication Record: The Prepublication record containing the original version of the manuscript, reviewers comments, editor's comments, the authors' response can be accessed at http://medicalphysiologyonline.wordpress.com/home/archive/

Please cite this article as: **Brown S.** Reluctance to think: unable or unwilling? *Medical Physiology Online* 2011; available from http://medicalphysiologyonline.wordpress.com *(page numbers are not for citation purposes)*