Tacit knowledge and the role of the dental educator

Abstract

Given the changing landscape of dentistry, General Dental Practitioners (GDPs) may be increasingly involved in the support and training of dental learners within the workplace. There is a growing facility of access to a large volume of continued professional development (CPD) material, which, can undoubtedly aid the development of a dental learner. However, tacit knowledge is a key proponent of learning and performing a complex skill and clinical decision making, which, is missing in this material. This can, in turn, have consequences for both the learner and the educator, especially in a period of time where clinical experience in learning/training environments may be limited and the time spent in learning/training placements may be shortened. There is limited literature which examines the relationship and relevance of tacit knowledge and dentistry and so, this article seeks to explore the context in which tacit knowledge arises in a practice-based environment. The key theoretical ideologies which underpin the definition of tacit knowledge have been outlined and practical examples are provided to enable conceptualisation of these theoretical ideologies. The role tacit knowledge plays in learning, education and decision making has been explained in further detail.
The second half of the article considers how tacit knowledge can be used to the advantage of both the dental educator and the dental learner suggesting approaches that can be taken to maximise the learning output of learning opportunities, including how it may benefit the learner and educator in reflection. Reflection is a key requirement of ongoing professional development, as per the General Dental Council's guidance and so, the understanding of tacit knowledge can have widespread benefits for the practitioner.

Introduction

In this paper, the concept of 'tacit' or hidden knowledge will be explored in the context of the practice and role of the dental educator. Increasingly, dental educators must possess a wider range of skills to support a varied and increasing number of dental learners within the workplace, such as trainee dental nurses, undergraduate dental and foundation year dental trainees and, fellow dental practitioners.

Dental learners may present with a range of previous experiences, learning styles, special learning differences, attitudes as well as transferable skills. As well as understanding how much the learner already knows[1] It is argued that dental educators should possess an understanding of implicit learning[2] and procedural knowledge acquisition within informal clinical learning environments, in contrast to the formal setting of the lecture theatre or simulation suite, in order for learning to be optimal and the needs of learners to be met. Naturally, the dental educator should already have an awareness of the adult learning theory[3] and the relevance of this when engaging in a teaching role.

Informal learning

The concept of 'informal learning' encompasses everything that is not formalised, in contrast to teaching, instruction, debate, meetings or other organised activities. Informal learning opportunities may be both unintentional and intentional; for example, when a dentist seeks a second opinion from another experienced practitioner, or, when a dental foundation trainee (DFT) discusses approaches to dealing with a situation that has arisen[4]

Learning within the workplace is characterised as being informal even though the learning derived from such opportunities is essential to the acquisition of skills, knowledge and the completion of work-based assessments. If informal learning settings are distinguishable from a formal learning environment, then it follows that the *nature of knowledge* obtainable within practice settings is equally distinct. This has consequences for the needs of the dental learner, who in turn, is dependent on the dental educator to

facilitate learning within a practice-based setting. The name of this knowledge that we refer to is tacit knowledge.

Tacit knowledge

Michael Polanyi[5] developed the idea of *personal knowledge* and challenged the notion that legitimate knowledge was objective, empirical and within the public domain. He argued that knowledge was instead 'indwelt' within individuals who had immersed themselves within practice. Polanyi[6] argued that 'we can know more than we can tell' and that knowing is a skilful action requiring an active comprehension of the known - we know because we can comprehend *how much/what it is* we know. Knowing requires effort, attention, the use of 'indwelling' knowledge and the establishment of a meaningful relationship between previous experience and the present. Consequently, much of what has become known, is known deeply and is tacit and unformulated. For example, a dentist not only practices on the basis of their education, training and current evidence, but draws on *taken-as given* (tacit knowledge) when a patient presents for assessment and/or treatment.

Performance

Skilled performances of procedures, such as the placement of a restoration by dental practitioners, require what Ryle[7] called 'know how'. Learning how to perform procedures requires dental learners to learn from the practice of those who 'know how' to practise clinical dentistry. Polanyi[8] argued that the personal participation of the 'knower', in this case the dental educator, is essential in all acts of understanding, which is vital to the learner achieving competence. Polanyi described the hidden structures, experiences and skills that underpin a learner's competence as 'tacit knowledge'. He argued that subsidiary skills and sense perception become 'tacit' because our attention within specific situations may lie elsewhere; on a different, albeit, active focal point of awareness, where action and response is directed by unconscious habit and propensities, which, play a part in tacitly guiding what we do, and how we develop.

An example of this unconscious habit is the process of how an individual integrates knowledge. Polyani[8] formulated his conception of tacit knowledge integration by describing how stereoscopic vision evolved as a visual system used by animals to integrate pictures from both eyes which were used as subsidiaries to create a three-dimensional focal awareness. He suggested that a boundary existed between the two levels of perceptual competence and argued that:

'…we may describe the situation by saying that we are focally aware of the stereo-image by being subsidiarily aware of the two separate pictures. We may observe that the focal image into which the two subsidiary pictures are fused bring out their joint meaning and that this fusion brings out a quality not present in the appearance of the subsidiaries' [9]

Within general dental practice, a practitioner may encounter a white lesion on the buccal mucosa (focal target) of a new patient. The dentist (the knower) may carry out a visual inspection of the oral mucosa (visual appearance of lesion - subsidiary particular) whilst simultaneously palpating the lesion (feel of the lesion - subsidiary particular) in order to check for a suspected malignancy whilst being mindful of the history (patient smokes 40 a day; a subsidiary particular) and presentation (patient presents acutely with a rapidly growing lesion, a subsidiary particular). This information is collated within the mind of the practitioner by a process known as tacit integration which occurs in a somewhat unconscious manner. In both examples, it is suggested that 'tacit integration' is something that humans do all the time without being aware of a process that has functional, semantic and phenomenal aspects when a decision is being made or a skill is being practiced- the result of which can be extremely beneficial to clinicians in forming a base of tacit knowledge.

Procedural knowledge

The excavation of caries using a spoon excavator can further be used to illustrate this process. The functional aspect of this procedure is the subsidiary awareness of the tangible feel of the spoon excavator in the

clinician's hand and the sensation of the excavator as it cuts through caries infected dentine. The focal awareness is the effect of the excavator stroke where the clinician using the instrument has an awareness of the environment. The semantic aspect of this example relates to the meaning of the effect. For example, the effect of the spoon excavator removing caries in an atraumatic, conservative, pain free and effective manner, leading to knowing/interpretation of the experience on the part of the practitioner. The unconscious integration of the above aspects helps to create further tacit knowledge that will inform the clinician's decision as to; firstly, whether to use a spoon excavator when next faced with a carious lesion and if so, what type of spoon excavator to next use. As the clinician is faced with similar experiences, this information is continually integrated leading to an increasingly wider base of knowledge.

Polanyi[9] concluded that there are three centres of tacit knowledge: first the subsidiary particulars; second the focal target; and third the knower who links the first to the second. When all three areas are triangulated and controlled by a person, the knower causes the subsidiaries to bear on the focus of his attention. In other words, the knower integrates the subsidiaries to a focal target whilst knowing that the subsidiaries have a meaning which fills the centre of their focal attention.

Knowing that subsidiaries have a meaning is a key product of tacit knowledge; in action, tacit knowledge can contribute to a practitioner with two kinds of awareness; a "*from* awareness" and a "*focal* awareness". If we re-consider the example provided above of a dentist examining a white patch; the dental practitioner's *from* awareness enables them to see an object as having meaning or clinical significance (the patient's social habits of smoking and drinking alcohol), but the clinical significance is wiped out when the practitioner focuses their attention on the object which only has a *from* awareness (the dentist chooses to focus solely on the social history, ignoring the feel, for example, of the lesion).

Decision-making

Having understood better the meaning and nature of tacit knowledge, it is prudent to appreciate the important role that tacit knowledge plays in diagnosis, decision making[10] and the performance of a complex skill. Naturally, the role of the contemporary dental educator is not only to contribute to a dental learner developing safe, effective and efficient clinical skills who can demonstrate sound knowledge but, continue to enable the individual to practice independently. Whilst there exists a substantial body of tacit knowledge within the mind of the experienced dental practitioner, there are both challenges and benefits when attempts are made at teaching it to the learner.

The challenges and opportunities of developing tacit knowledge

Michel Eraut[11] regarded tacit knowledge as the component of knowledge that was not typically reportable since it was deeply rooted in action and involvement within a specific context. In other words, although dental educators may be knowledgeable in what they do, they may not have the facility to say what it is they know[12]. An educational supervisor (ES) may know to recommend that the DFT use Cowhorn forceps to extract the tricky Lower Left 7 (LL7) which has been extensively restored but may lack the ability to describe *why* it is that they recommend the use of Cowhorn forceps.

Where an attempt is made to describe the knowledge that is involved in the performance of a complex skill, the tendency is to communicate the more explicit components of knowledge and neglect the tacit aspects. In relation to the example that has been described, the ES, may describe *how* the beaks of the Cowhorn engage the furcation of the LL7 but may not describe the awareness of what the sensation of engagement of the forceps and the furcation *feels* like and the *feeling* of the movement that is initiated. Considering the deeper layers of tacit knowledge, the ES may not be able to articulate the instinctive decisions that are made when movement of the tooth is initiated, for example, when to further support the patient's mandible or when to switch to another pair of forceps or when to consider a surgical approach to extraction. These instinctive decisions are implicitly guided by tacit knowledge- and therefore may be difficult to articulate when a dental learner has 'less' experience in comparison to the dental educator.

Intuitive understanding

Furthermore, according to Eraut[11] a distinction can be made between intuitive understanding, where individuals possess familiarity with some aspects of a situation, in contrast to procedural knowledge, which is generally explicit knowledge. Intuitive understanding is not fully understood until an individual is required to deliberate between two or more options and then express a strong preference for one option because it fits the situation better than the alternatives. Eraut[11] argued that this example demonstrated a key characteristic of tacit knowledge – even when it is used it is not always articulated. If we reconsider the example of a lower molar extraction, the dental educator may elect to use lower Cowhorns over lower molar forceps once they have assessed the patient clinically and radiographically but may not describe clearly the reasons for choosing Cowhorns over lower molars. Attempts may be made to justify their decision by explaining how the tooth is heavily restored or maybe how some horizontal bone lends to the favourable use of the Cowhorns. However, a large influencing factor behind the choice undeniably is tacit knowledge.

It is apparent that there are difficulties encountered with making tacit knowledge explicit; this may be due, in part, to a difficulty in a failure in defining what body of knowledge tacit knowledge refers to. Interestingly, Molander[13] argues that there is a tacit aspect to all knowledge and that no knowledge can be regarded as being completely tacit. Despite this however, possible approaches to tacit knowledge elicitation have been suggested[14]; common to these approaches are attempting to facilitate the 'telling' of tacit knowledge, or, to elucidate sufficient information from which the nature of the knowledge being discussed can be inferred.

Teaching tacit knowledge

Once the body of tacit knowledge has been established, it can be used to the dental educator's and the dental learner's advantage. If tacit knowledge is identified and transmitted to the learner in a coherent and understandable fashion it may expedite the learning curve of a taught skill; Gobbi[15] from her research into clinical nursing practice argued that where skill is predominantly tacit, it requires transmission from master to apprentice. It is worthwhile to understand that tacit knowledge *can* be written down[12]; If we consider the earlier example regarding the use of the spoon excavator, transmitting the tacit knowledge surrounding this procedure in a written fashion could potentially provide the learner with knowledge in a 'shorter' time frame that may have otherwise taken the learner multiple attempts at caries excavation to gain. Not only does this enable the dental learner to accelerate the refinement of learning a skill, but also contribute to the development of a 'safe' practitioner. In settings where exposure to experience may be limited, this approach could prove to be particularly useful as it maximises the educational and developmental value of such experience. Using frameworks common to developmental portfolios, tacit knowledge could form the basis of learning points for case-based discussions (CBDs) and/or useful points to consider prior to/ following on from the completion of a direct observation of a procedure (DOPS). By utilising these frameworks, the dental teacher will be able to 'unpack' the tacit knowledge in a case by case basis, an approach that has been suggested by Fugil[12].

Additionally, by having an awareness of what tacit knowledge is, the dental educator can enhance the manner in which the dental learner reflects on their learning experience. Reflection features as an increasingly popular component part of electronic portfolios, often being used by assessors to measure progression. Whilst there are numerous ways in which reflection can be carried out, a popular method is reflection-in-action[16] which is often used as a means of engaging the learner in the process of continuous learning[17] However, learner driven reflection tends to focus on explicit learning rather than implicit learning[18]; learners may capture what they *think* they have learnt but not actually *what* they have learnt. By having an awareness of tacit knowledge, its nature and its component parts, both the dental educator and the dental learner can better delineate the beneficial, implicit learning that has taken place as opposed to the explicit learning. This in turn can serve as a useful scaffold for reflective documentation as well as come in use when considering session design for any future, emergent[19] learning sessions. Furthermore, considering the many pathologies associated with providing feedback[20] identifying the learnt tacit knowledge may provide some insight into unknown areas of development for the learner, occasionally referred to the 'blind' square within the Johari window[21]. Not only will this enable the dental educator to give targeted, specific and beneficial feedback but will allow for the development of learner focused learning aims and objectives in a precise manner.

In addition to the role tacit knowledge plays in clinical learning, it is vital to consider the relevance of it to learning organisational norms; Eraut[19] commented that a person could be socialised into the norms of an organisation without being aware of those norms. In a dental practice setting, this may be commonly encountered when a new member of staff joins the practice, regardless of the role they are up taking. Common to clinical settings across the profession, dental professionals share a large body of cultural practices and beliefs that exist as 'unwritten rules'[12]. Where a newcomer into the practice-based setting may come into 'error' is when their actions may be in/lead to conflict of these 'rules'. There may not be a problem in the 'telling' once awareness has been established as implicit learning may eventually lead to explicit knowledge. In contrast, explicit learning may lead to tacit knowledge as a person may be able to ride a bicycle and describe how they learnt to do it without being able to describe critical aspects of the knowledge gained such as what do when becoming imbalanced. A dental educator, therefore, should not only consider the benefit that tacit knowledge could have in the clinical development of a learner, but should further employ the use of it in assisting the learner in learning organisational norms, which, undoubtedly will be a 'new' concept to learners who are joining a workplace environment for the first time.

Conclusion

Tacit knowledge is a key element to learning in the workplace which permeates the practice of clinical dentistry widely; although GDPs may not be involved in 'formal' teaching roles, supporting dental learners within a practice based environment is something that a GDP will be expected to do at some stage within their career. GDPs will undoubtedly encounter 'informal' learning experiences within a practice-based environment on a regular basis- in the form of a colleague asking for a second opinion, for example. Tacit knowledge plays a substantial role in decision making and performing a procedure, representing a large body of knowledge that exists implicitly within the mind of the practitioner. Although the process of making tacit knowledge explicit can be challenging initially, having an awareness and understanding of the nature of tacit knowledge, it can be used and applied in an advantageous manner from both an educational perspective as well as a personal developmental perspective, especially where GDPs are involved in a formal, recognised teaching role.

References

1. Ausubel D, Novak J, Hanesian H (1978). Educational Psychology: A Cognitive View. 2nd Edition. New York: Holt, Rinehart & Winston. pp163

2. Reber A S. Implicit learning and tacit knowledge: an essay on the cognitive unconscious. Oxford: Oxford University Press, 1993.

3. Knowles, M. S. (1984). Andragogy in Action. Applying Modern Principles of Adult Education. San Francisco, CA: Jossey Bass.

4. Illeris K (2011) *The Fundamentals of Workplace Learning – understanding how people learn in working life,* London, Routledge.

5. Polanyi, M. (1962). *Tacit Knowing: Its Bearing on Some Problems of Philosophy. Reviews of Modern Physics, 34(4), 601–616.* doi:10.1103/revmodphys.34.601

6. Polanyi M (1967) *The Tacit Dimension,* London, Routledge & Keegan Paul Ltd.

7. Ryle G (1946) "Knowing how and knowing that", *Proceedings of the Aristolean Society,* 46, pp 1-16.

8. Polanyi M. Personal knowledge: toward a post-critical philosophy. London: Routledge, 1958.

9. Polanyi M (1969) Knowing and Being – essays by Michael Polanyi (Ed M,Grene), London, Routledge & Keegan Paul Ltd.

10. Patel VL, Arocha JF, Kaufman DR. Expertise and tacit knowledge in medicine. In: Sternberg RJ, Horvath JA, eds. Tacit knowledge in professional practice. Mahwah, NJ: Lawrence Erlbaum Associates, 1999: 75–99.

11. Eraut M (2004) Informal learning in the workplace, *Studies in Continuing Education,* 26 (2), pp 247-273.
12. Fugill, M. (2011). *Tacit knowledge in dental clinical teaching. European Journal of Dental Education, 16(1), 2–5.* doi:10.1111/j.1600-0579.2011.00716.x

13. Molander, B. (1992). Tacit knowledge and silenced knowledge: Fundamental problems andcontroversies. In B. Göranzon & M. Florin (Eds.), Skill and education: Reflection and experience (pp. 9–31). New York: Springer-Verlag.

14. Kinchin IM, Cabot LB, Hay DB. Using concept mapping to locate the tacit dimension of clinical expertise: towards a theoretical framework to support critical reflection on teaching. Learning in Health and Social Care 2008: 71: 93–104

15. Gobbi M Chapter 6 'The hidden curriculum' learning the tacit and embodies nature of nursing practice. In: Cook V, Daly C, Newman M (ed) (2012) *Work-based Learning in Clinical Settings*, London, Radcliffe Publishing.

16. Schön, D. A. (1991) *The Reflective Turn: Case Studies In and On Educational Practice*, New York: Teachers Press, Columbia University.

17. Bolton, G. (2010). *Writing and professional development*. London: SAGE Publications Ltd.

18. Eraut M (2000) Non-formal learning and tacit knowledge in professional work, *British Journal of Educational Psychology,* 70, pp 113-136
19. Megginson, D. (1996). Planned and emergent learning: Consequences for development. Management Learning, 27(4), 411–428.

20. Pitts, J., (1996). Pathologies of one-to-one teaching. *Education for General Practice*, *7*, pp.118-122

21. Halpern, H. (2009) Supervision and the Johari window: a framework for asking questions. *Education for Primary Care,* 20, 10-14.

Raelin JA (2008) *Work-Based Learning – Bridging knowledge and action in the workplace,* San Francisco, Jossey-Bass?