Medical Science

Perspective

Adult learning principles in the development of an academic half day session

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Abstract: Post-graduate trainees serve a dual role as learner and practitioner, and their clinical education must be supported by an academic curriculum that meets the objectives of their training program. Principles of adult learning that encourage critical thinking and collaboration can enhance the effectiveness of academic sessions for adult learners. This paper will review the practical use of adult learning in the context of an academic half day session for residents in Pediatrics. The specific focus on a single topic models adult learning techniques that can be broadly applied across different branches of medicine and different levels of learners.

Keywords: post-graduate medical education; academic half day; case-based learning; active learning; critical transformational learning

1. Introduction

During residency, recently graduated physicians are in a dual role as both practitioner and student. In addition to learning through the delivery of clinical patient care, every residency program must have a structured academic curriculum with a variety of sessions and formats to provide the core knowledge content of the discipline [1]. In addition to delivering specific instruction, the academic curriculum must "(foster) a culture of reflective practice and lifelong learning among (the) residents" (Indicator 3.2.3.2) [1]. One common teaching modality is the academic half day (AHD).

Considering the value of active learning in resident education, this paper describes the development of a model AHD session to illustrate practical application of these concepts. The goal of

each AHD session is to deliver specialist content at a level relevant to a general Pediatrician, as defined by the Pediatrics Competencies [2]. Each session is three-hours long and meant to be delivered in an interactive manner, providing the residents with the core knowledge of the most common conditions so that they can develop an approach to these patients in their own varied future practices. The techniques and considerations for adult learners described in detail below are broadly applicable beyond the specific topic context used for this model session.

1.1. Critical transformational learning

Transformational servant leadership focuses on the follower and the leader's role in developing their abilities by encouraging intrinsic motivation, role modeling, individualized attention, and intellectual stimulation [3]. This aligns well with self-determination theory, which emphasizes intrinsic motivations and incorporates the values of autonomy, competence, and relatedness as important endpoints to encourage during residents' clinical and academic education [4]. These principles of transformational servant leadership and self-determination theory can foster reflective and lifelong learning in residents and are captured in educational design as critical transformational learning [5].

Critical transformational learning "provides individuals with new ways of thinking about their identity and about how these individual identities are related to the broader social world" (p. 11) [5]. Critical thinking happens in the setting of social learning, where peers present new perspectives and assumptions to challenge each other's beliefs, leading to a "disorienting dilemma" or "moments of dissonance" (p. 37) [6]. The critical learning trajectory of modelling, scenario analysis, and critical conversation is derived from grounding these uncomfortable moments in concrete experiences with careful instructor modelling [6]. This is particularly relevant and valuable in the clinical teaching environment and should be integrated into curricular development for post-graduate medical education.

1.2. Active learning in resident education

Byerly et al. [7] described three lenses to guide educational development: behavioural, or learning by doing; cognitive, or learning by understanding; and sociocultural, or learning by observing others. Sonnenberg et al. [8] applied these lenses to leadership development by advocating that faculty should be alert for "learning that integrates experience, perception, cognition and behaviour" (p. 3). Recognizing the limits to traditional lecture-based teaching, the academic curriculum should include active learning techniques [9,10]. Specific considerations for resident education are described below.

1.2.1. Millennial learners

As members of the millennial generation, residents will benefit from clear expectations, coaching, and teaching modalities that capitalize on their increased comfort with technology [11]. Toohey et al. [12] suggested best practices grounded in theory and active learning principles, including asynchronous and individualized learning with brief but high-yield lectures. They noted that "decreased lecture time, coupled with methods that promote active learning…should improve retention" (p. 339). They suggested providing real-time feedback to learners, which could leverage available teaching technologies. Di Genova et al. [13] also advocated "teaching to the learners' needs,

encouraging independent learning and reflection, and varying the teaching methods in different context" (p. 31).

1.2.2.   Flipped classroom

The flipped classroom (FC) describes a teaching style where learners receive core content prior to the session and use class time to apply the information in a small group, facilitated by expert faculty [14]. Toohey et al. [12] included FC as their top recommendation for millennial learners, to consolidate their independent learning in the small group setting. In their quality improvement curriculum, Bonnes et al. [14] found improved knowledge after FC teaching. Their residents appreciated the value of the FC, although the in-class learning was more highly ranked that the independent online studies.

Team based learning (TBL) is a specific type of FC, where independent individual preparation is assessed by both the individual and a small peer group to assess baseline knowledge, followed by a team application exercise to practice the acquired knowledge and address gaps [15]. "TBL is widely recognized for its ability to effectively facilitate knowledge acquisition in a variety of settings, and the promotion of significant learning through both active discussion and immediate application of complex concepts" (p. 360) [15]. In their bioethics curriculum, Spencer et al. [15], reported that residents were highly engaged and satisfied, and that the adaptability of TBL sessions facilitated inclusion of these topics in an otherwise crowded curriculum. The opportunities for practical application in residents' clinical work also enhanced the effectiveness of the session.

1.2.3.   Self-directed learning

Self-directed learning (SDL) is "a process that involves diagnosing one's (own) learning needs, formulating learning goals, identifying resources for learning, implementing appropriate learning strategies and evaluating learning outcomes" (p. 33) [13]. When combined with self-assessment, SDL contributes to the lifelong learning identified as critical for professional development [16]. Inclusion of SDL in academic sessions can improve immediate learning and future performance [13]. Some programs have mandated this in the form of individualized learning plans, which are developed by the resident to guide their own SDL. Li et al. [17] found that residents were less confident in their ability to develop a plan and accomplish their goals. Two positive influences on their confidence were a system in place to monitor their progress and a personal belief in lifelong learning, leading the authors to suggest that programs should develop a curriculum to support SDL.

1.2.4.   Simulation

Simulation, the controlled emulation of a real clinical situation, is an active learning technique where residents acquire knowledge in preparing for the session and continue to learn through focused and guided application [9]. Di Genova et al. [13] included monthly simulation sessions in their AHD with a focus on non-medical skills such as communication, leadership, collaboration, and crisis resource management. Binstad et al. [9] integrated simulation into their Emergency Medicine curriculum by mapping the modular sessions to core objectives, and they demonstrated value of including this teaching strategy as a core element of the academic program.

Simulation is a team-based, practical, and emotionally engaging active learning strategy, which has been shown to lead to improved knowledge retention and quality of care [12]. The process of debriefing after the simulation provides performance feedback but also engages the resident in further learning around the scenario [9]. Simulation can require a significant investment of both time and resources in developing and conducting the sessions, but shared resources and smaller scale scenarios can improve accessibility [9,12].

2. Methods

This model AHD session will illustrate the practical use of active learning principles to encourage the development of the skills and knowledge that the residents will need in general Pediatric practice when they encounter a child with a known or suspected bleeding disorder. The specific information provided is also valuable in the management of a child with abnormal bleeding for any cause and the core knowledge is relevant for children with other chronic medical conditions. This broader applicability of the specific topic captures the concepts of reflective practice and lifelong learning in critical transformational learning, as described above.

2.1. Learner analysis

All AHD participants are residents in Pediatrics ranging from their first to third year of postgraduate training. The diversity of the group is important in designing and delivering the teaching activities, since they represent a variety of stages of comfort with the specific material and issues in clinical care in general. It is be important to utilize appropriate discussion tools and facilitation to ensure that all voices are heard, and that active listening is as valued as speaking [6].

2.2. Session design

This exemplar session will teach on the Pediatric competency: "Apply knowledge of the clinical and biomedical sciences relevant to Pediatrics/Conditions/Bleeding and clotting disorders, congenital and acquired" (Section 1.3.25.9.2.3) [2], with specific goals and objectives listed in Appendix A. Identifying key topics within each objective allows selection of the most relevant activities to encourage active learning according to the principles described earlier for millennial learners and critical transformational learning. The competencies [2] are intentionally broad, so a needs assessment can be useful. A short quiz (Appendix B) distributed ahead of the session with the required pre-reading will reinforce the knowledge that residents already have and provide an opportunity for the residents to uncover existing misconceptions that need to be addressed during the session [18]. This allows the learners to engage in guided learning ahead of the session itself [11], consistent with the concepts of self-assessment and SDL [13]. As a formative needs assessment, the questions need to uncover basic knowledge gaps but do not require discriminative validity.

The overall approach to the session should follow the principles of the democratic classroom as described by Brookfield [6]. The wide range of experiences and aspirations of the learners described above provides the diversity of voices to present unfamiliar perspectives and creates the collaborative networking opportunities well suited to millennial learners [11]. To maintain interest over the course of the session, it is important to vary the formats and delivery of learning activities, and the thoughtful

incorporation of technological options will be valuable [11]. A patient case study (Appendix C) can be used to illustrate the concepts of each objective. To accomplish the objectives, this case study must be grounded in authentic details and accompanied by a compelling family story for the role-playing activity described below.

2.3. Proposed learning activities

Table 1 summarizes the session activities, starting from the needs assessment, describing the active learning principles associated with each activity and relating them to established techniques in medical education.

Table 1. Active learning in AHD activities.

Objective	Activity	Active learning principle	Medical education technique
Pre-session needs assessment	Readings and a quiz	Baseline knowledge assessment, exposure of inherent misconception	Self-directed learning with self-assessment
(1) Describe the normal coagulation pathway and the pathophysiology of congenital bleeding disorders	(1) Domino game	Independent exploration of concepts	Simulation
	(2) Didactic lecture with illustrative case and spot exercises	Real world application of concepts	Flipped classroom
(2) Propose a management plan for a patient with Hemophilia presenting with an acute bleeding event	Jigsaw exercise: diagnostics, treatment, prevention, rehabilitation	Different perspectives to encourage critical thinking	Flipped classroom, self-directed learning
(3) Explain the psychosocial impact of living with a congenital bleeding disorder on patients and families	Role playing in a fishbowl/forum theater exercise, using the case study from Objective 1	Experiential learning, with opportunities for reflection on different perspectives	Simulation
Post-session review	Online quiz with additional questions drawn from objectives	Review of material, practical reinforcement	Self-assessment for further self-directed learning

The first objective in this model AHD is factual and suited to presentation but can be introduced in the opening of the session with an interactive game. The clotting cascade is analogous to a domino run, where each component triggers the one that follow in sequence; a bleeding disorder results when

one of the components is missing. Playing with dominos without first explaining the connection will illustrate the key concepts in a fun way and encourage the residents to uncover the link. This will achieve an immediate learning connection and a quick assessment of their knowledge and understanding of clotting [11].

During the presentation that follows, a case will be presented with authentic details, that will be managed by the residents over the course of the session. The presentation will be interrupted with occasional spot exercises where the residents will evaluate laboratory results that link to the clotting pathways being discussed. These activities should gain and maintain interest and make connections to the real-world application of the knowledge [11].

For the second objective, the residents will discuss the management of the case using a jigsaw learning activity [11]: Management will be divided in the specific elements ("jigsaw pieces") of diagnostics, treatment, prevention, and rehabilitation. Using the assigned readings and their own research, four groups will explore each of these topics and then regroup to teach each other, with a progressive synthesis and analysis of the problem at hand [18]. The final groupings in the jigsaw will proceed to consolidate and present their comprehensive management plan for the case study of the bleeding disorder patient. While there will be similar elements, the variety of approaches will encourage critical thinking by illustrating the different perspectives which are possible with the same clinical problem [6].

The final objective lends itself to experiential learning, and role play will expose residents to the psychosocial experience of living with a chronic bleeding disorder. Volunteers will simulate a conversation between a patient, parent, and doctor, facilitated by the instructor using the same case from the earlier parts of the lesson. The fishbowl layout [11] will allow the audience to observe and reflect on the interactions and explore the different perspectives on display. In this larger group, several role plays can be run simultaneously with a split class.

To properly conclude the session, it is important to provide both a review of the material and a practical reinforcement of the clinical application [11]. An online quiz platform is a useful tool to ask formative questions, encouraging self-reflection in an entertaining and non-threatening way. The quiz (Appendix D) will be constructed with questions that address each of the three objectives, anchored in the patient case explored over the course of the session. The case study therefore provides both a consistent reference for the content of the session and a direct link to the practical clinical considerations.

3. Assessment

The return on expectations model of evaluation described by Silberman and Biech [11] is a very helpful approach to assessing the effectiveness of adult learning design for AHD. The immediate reaction (Level 1) is captured in the session and preceptor assessments that the residents are asked to complete following the teaching event. At the University of Manitoba, these are standardized AHD evaluations of resident satisfaction with the content of the session, its perceived relevance, and the performance of the presenter, including opportunities provided for facilitated interaction. Residents complete these on the electronic platform shortly after each AHD session. This encourages a developmental approach to assessment, with a focus on quality improvement of the learner, the teacher, and the session [19].

For a robust assessment of their learning (Level 2) [11], multiple choice review questions are delivered 48 hours after each AHD session as an assessment of early recall of the specific contents of the session. Selected questions from all AHD sessions are included in a cumulative formative quiz every three months to assess retention. These questions provide learning-focused assessment to motivate and engage the residents while building confidence in their learning abilities and performance [19]. All residents also write three national in-training examinations each year. The results on these exams can be broken down by subject area to provide an analysis of individual strengths and weaknesses in reference to the national average and the mean results for the specific year of training.

The residents' clinical activities and performance captures their assessment for behaviour (Level 3) and results (Level 4) [11]. It is important to determine whether their academic learning is translated into clinical behaviours, as measured in the observations filled out by their preceptors during clinical rotations. The results of the residents' learning would be evident in their clinical patient care, with appreciation of the nuances of defining appropriate care in a chronic disease without the dichotomous outcome of cure [20]. Even beyond the focus of bleeding disorders in this session, the residents should apply this learning in their care of patients with other chronic disorders, as the residents make the connection between the content of this session and the other patients they will encounter [18]. Of course, drawing a direct connection between specific care and a single educational session is improbable, although adult learning principles should foster the lifelong learning practices that impact patient care [1].

4. Conclusions

The concepts of critical transformational learning are valuable considerations for medical educators. This practical example of an adult learning session is intended to illustrate important principles of adult learning which are applicable to other domains of academic medicine. The deliberate inclusion of active learning and critical thinking techniques in the academic curriculum is an important innovation that can be implemented in other residency programs and continuing professional development.

Use of AI tools declaration

The authors declare that they have not used Artificial Intelligence (AI) tools in the creation of this article.

Conflict of interest

All authors declare no conflicts of interest in this paper.

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