The learning styles of graduating Canadian urology residents

Nicolas Vanin Moreno, Jasmine Dhatt, Naji J. Touma

Queen's University, Kingston, ON, Canada

Cite as: Vanin Moreno N, Dhatt J, Touma NJ. The learning styles of graduating Canadian urology residents. *Can Urol Assoc J* 2026;20(1):E23-8. http://dx.doi.org/10.5489/cuaj.9291

Published online September 23, 2025

ABSTRACT

INTRODUCTION: The Kolb learning theory attributes differences in the way people learn with the way they perceive and process an experience, leading to uniquely different learning styles. Studied in other surgical disciplines, it has yet to be examined in a urology population. Identifying the learning style of urology residents may help in the development of teaching curricula that are best suited to knowledge and skill acquisition. The objective of this study was to characterize the learning styles of graduating Canadian urology residents attending the Queen's Urology Exam Skill Training (QUEST) examination.

METHODS: The Kolb Experiential Learning Profile (KELP) 4.0 questionnaire was administered to all graduating Canadian urological residents attending QUEST for the years 2021–24. Project participation was 100%. All participants received a report at the conclusion of the course. Participants' preferred learning phase (acting, thinking, reflecting, experiencing) and a specific learning style (deciding, analyzing, thinking, acting, initiating, balancing, reflecting, experiencing, imagining) were identified for all residents. Preferred learning phase and learning style were compared among years using the Chi-squared test (α=0.05). Preferred learning phase and learning style were compared among self-identified gender using the Fisher-Freeman-Halton exact test (α=0.05).

RESULTS: Graduates from 2021 (n=35), 2022 (n=29), 2023 (n=37), and 2024 (n=35) were included. In aggregate, the preferred learning phases among urology residents included thinking (38%, n=51), followed closely by acting (32%, n=44). A minority of urology residents preferred the reflecting (21%, n=28) and experiencing phase (10%, n=13). There were no significant differences year to year within an individual learning phase (p>0.05). In aggregate, the most common preferred learning styles included the deciding learning style (21%, n=29), followed by analyzing (15%, n=20), thinking (14%, n=19), acting (13%, n=18), and initiating (13%, n=18). Less common learning styles included balancing (11%, n=15), reflecting (7%, n=10), imagining (3%, n=4), and experiencing (2%, n=3). There were no significant differences year to year within an individual learning style (p>0.05). There were no significant differences between self-identified gender and preferred learning phase or style (p>0.05).

CONCLUSIONS: Graduating Canadian urology residents vary in their preferred learning styles, but the majority seem to learn by acting and thinking. A non-trivial number of learners displayed learning styles underrepresented in surgical specialties. This lays the groundwork for future studies correlating learning style to exam performance and identifying predictors of successful completion of residency.

INTRODUCTION

The cornerstone of surgical education has, for over a century, been anchored in the Halstedian method of "See one, do one, teach one;"[1] however, the breadth of knowledge and skill expected of a contemporary graduating surgical trainee is vast and continues to expand. Therefore, it is critical to find methods that enhance the acquisition of competency, leading some to investigate the optimization of learning environments to further this goal.[2,3]

It may be that the best way to enhance learning is by developing a deep knowledge of the most important substrate in the learning process: the resident. There is a growing body of evidence that tailoring educational environments and curricula to students' learning preferences can facilitate knowledge acquisition and progression of academic endeavours,[4,5] with indirect benefits to wellness.[6]

Many models exist to describe and characterize learning styles and preferences, including the Kolb Experiential Learning Theory, where learning is described as the process by which experience is transformed into knowledge.[7] Learners work through four learning stages (experiencing, reflecting, thinking, acting), exhibiting a preferential stage of knowledge acquisition. A unique learning style is also identified for each learner, representative of how new knowledge and skill tend to be most easily attained for the learner, with nine unique learning styles existing currently.

This theory has been described and studied in multiple vocations, including many medical and surgical specialties, such as internal medicine, anesthesia, and general surgery.[8-15] Despite this, identification of learning

KEY MESSAGES

- The learning styles of Canadian urology residents appear to be more diverse than other surgical specialties.
- Canadian urology residents have unique learning styles that may influence the way we deliver and develop educational curricula.

styles has never been studied in the urology residency population — a diverse group of learners in a specialty that demands the mastery of a breadth of medical knowledge and surgical techniques.

We set out to identify the learning style of graduating Canadian urology residents through the administration of the latest validated learning style inventory based on Kolb's Experiential Learning Theory, the Kolb Experiential Learning Profile 4.0 (KELP 4.0).

METHODS

The Kolb Experiential Learning Profile (KELP) 4.0 questionnaire was electronically administered to all graduating Canadian urology residents attending the Queen's Urology Exam Skill Training (QUEST) program for the years 2021 (n=35), 2022 (n=29), 2023 (n=37), and 2024 (n=35). The QUEST program involves a review course and mock written and oral examination for 4th-year urology residents intending to write the Royal College Qualifying Exam. Students were informed of a mandatory questionnaire investigating their learning style prior to initiation of the written examination. Results of their learning profile were disclosed individually for review at the conclusion of the course.

The Kolb Learning Inventory is a questionnaire evaluating preferred learning phase and style, noted to have high internal (Chronbach alpha=0.81) and external validity.[7] Test-retest reliability has been noted to be as high as 0.9 in previous inventory iterations.[7]

Learners were asked 20 questions, ranging from specific learning scenarios, approaches to problems, and inquiries into learning preferences, that use a forced-choice format to evaluate their tendency for abstract vs. concrete and active vs. reflective-predominant solutions. Learners are placed on an axis according to how they grasp experience, ranging from thinking to experiencing, and another axis evaluating how they transform experience, ranging from reflecting to acting.

Earlier versions of the Kolb would place learners in one of four distinct quadrants depending on where they fall on the axes: accommodating, diverging, assimilating, and converging (Figure 1); however, the latest version of the learning inventory used in this study (KELP 4.0) further divides the learning cycle into eight different branches to account for overlap in preferred learning phases/flexibility of learning approaches in different scenarios: initiating, experiencing, imagining, reflecting, analyzing, thinking, deciding, and acting. Finally, balancing constitutes the ninth learning style and is consistent with a learner who falls in the middle of both axes (Figure 2).

Inventory results were disclosed at the conclusion of the QUEST course within a report identifying both the participant's preferred learning phase (acting, thinking, reflecting, experiencing) and learning style (deciding, analyzing, thinking, acting, initiating, balancing, reflecting, experiencing, imagining). Preferred learning phase and learning style were compared among exam years (Chi-squared test, $p<0.05$). Preferred learning phase and learning style were compared among self-identified gender using the Fisher-Freeman-Halton Exact Test ($\alpha=0.05$).

Research ethics board approval was obtained prior to the commencement of the study.

RESULTS

Completion of the KELP 4.0 was 100% among residents attending the QUEST program (n=136). Participant demographics are shown in Table 1.

In aggregate, the preferred learning phases among urology residents included thinking (38%, n=51), followed closely by acting (32%, n=44). A minority of urology residents preferred the reflecting (21%, n=28) and experiencing phase (10%, n=13) (Figure 3). There were no significant differences year to year within an individual learning phase ($p>0.05$).

In aggregate, the most common preferred learning styles included the deciding learning style (21%, n=29), follow by analyzing (15%, n=20), thinking (14%, n=19), acting (13%, n=18), and initiating (13%, n=18). Less common learning styles included balancing (11%, n=15), reflecting (7%, n=10), imagining (3%, n=4), and experiencing (2%, n=3) (Figure 4). There were no significant differences year to year within an individual learning style ($p>0.05$).

There were no significant differences between self-identified gender and preferred learning phase ($p=0.145$) (Table 2) or learning style ($p=0.06$) (Table 3).

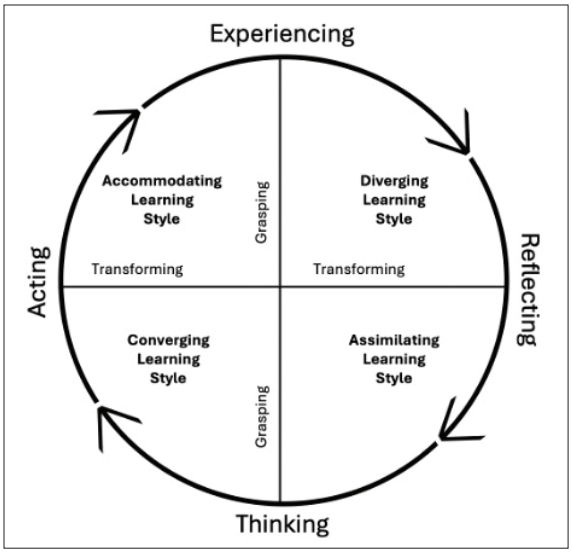

Figure 1. Older Kolb models with the learning cycle and learning styles.[7]

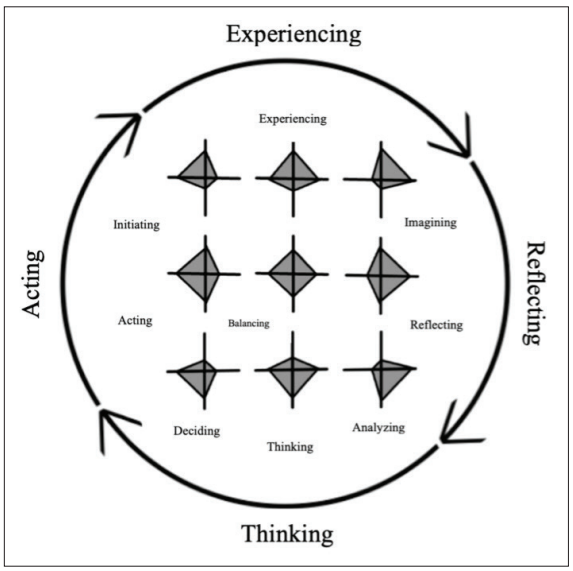

Figure 2. Kolb learning cycle (version 4), illustrated to include the four phases of the learning cycle, and individual learning styles. Nine unique learning styles are described.[7] Initiating style: Initiates actions to deal with experiences and situations. Experiencing style: Finds meaning in deep involvement. Imagining: Imagines possibilities by observing and reflecting on experiences. Analyzing: Integrates ideas into concise models and systems through reflection. Thinking: Disciplined involvement in abstract reasoning and logical reasoning. Deciding: Uses theories and models to decide on problem solution and courses of action. Acting: Strong motivation for goal-directed action that integrates people and tasks. Balancing: Adapts by weighing the pros and cons of acting vs. reflecting and experiencing vs. thinking.

Table 1. Demographic data of urology residents attending the QUEST program and completing the KELP 4.0 per year

Year	Female	Male	Total
2021	8	27	35
2022	5	24	29
2023	9	28	37
2024	8	27	35
Total	30	106	136

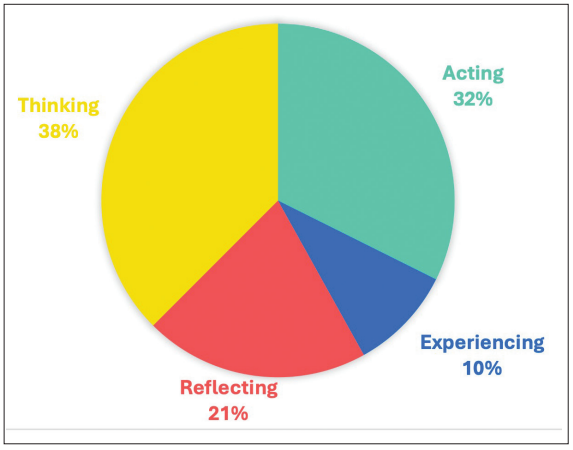

Figure 3. Preferred learning phase of graduating Canadian urology graduates attending QUEST (2021–24).

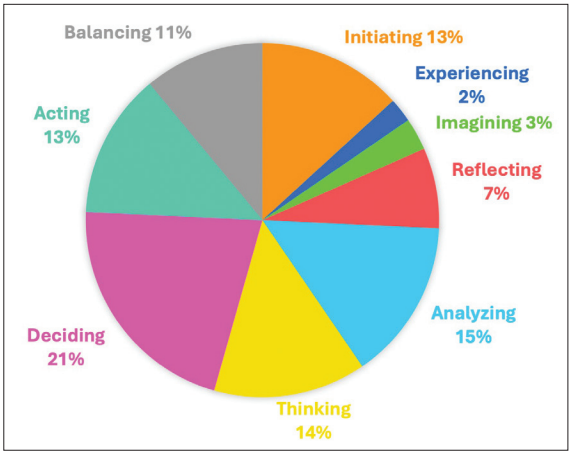

Figure 4. Preferred learning style of graduating Canadian urology graduates attending QUEST (2021–24).

DISCUSSION

For the first time, we report the learning styles of Canadian graduating urology residents. Overall, our findings suggest that the majority of urology residents demonstrate a preference for the thinking and acting phases of the learning cycle, with the deciding learning style being the most common. These findings appear more similar to other surgical specialties than to medical specialties, with some exceptions.

Our findings are consistent with a study by Lensing et al demonstrating that orthopedic surgery residents preferred the deciding learning style (26.5%) in a simi-

Table 2. Preferred learning phase by self-identified gender

Gender	Acting (% total)	Experiencing (% total)	Reflecting (% total)	Thinking (% total)	Total
Male	30 (28.30)	9 (8.49)	23 (21.69)	44 (41.51)	106
Female	14 (46.67)	4 (13.33)	5 (16.67)	7 (23.33)	30

Preferred learning phases were compared between self-identified gender using the Fisher-Freeman-Halton Exact Test (α=0.05). There were no significant differences between self-identified gender and preferred learning phase (p=0.145).

Table 3. Preferred learning style by self-identified gender

Preferred learning style	Percent of total gender (%)	
	Male	Female
Deciding	23.10	13.80
Analyzing	17.60	3.40
Thinking	14.80	10.30
Acting	12.00	17.20
Initiating	8.30	31.00
Balancing	12.00	10.30
Reflecting	6.50	10.30
Imagining	2.80	3.40
Experiencing	2.80	–
Total	100.00	100.00

Preferred learning styles were compared between self-identified gender using the Fisher-Freeman-Halton Exact Test (α=0.05). There were no significant differences between self-identified gender and preferred learning style (p=0.06).

lar proportion as was seen in our study (21%).[5] Their second and third most common learning styles, thinking (17.6%) and acting (17.6%), were also predominant learning styles in our study (thinking =14%, acting = 13%). Similar findings were demonstrated in other studies using older versions of Kolb's Experiential Learning Theory, where otolaryngology,[14] general surgery,[11,12,15] and orthopedic surgery residents[10] were noted to have a preference for the converging learning style, which exists between the thinking and acting phases in the learning cycle, akin to the deciding style in the newer Kolb model.

Additionally, the accommodator learning style, now replaced with the initiating learning style in the KELP 4.0, has also been described as a preferred learning style for general surgery residents, though to a lesser degree.[11,12] This learning style was the fourth most dominant learning style in our study (13%), with the difference between the second, third, and fourth most common styles being slim (each separated by a 1%).

There were also notable differences between our findings and previous reports in other specialties. In previous work, the proportion of orthopedic surgery residents with the initiating learning style (i.e., initiating action to deal with experiences and situations) was among the least common (2.9%),[5] compared to a larger proportion within our study (13%). This may highlight a need for urology residents to receive greater repetition in a task for optimal learning.

The analyzing learning style, (i.e., integrating ideas into concise models and systems through reflection), which has replaced the assimilating learning style from previous Kolb models, was the second most common learning style in our study. This learning style has been more closely associated with internal medicine residents in the past.[8] To our knowledge, only one other group identified a predominance of this learning style within surgical residents, focused particularly on laparoscopic skill learning. These findings differ from the majority of research in this field.[16]

Understanding an individual's learning style is crucial to optimizing educational opportunities and enhancing learning effectiveness. It has been demonstrated that tailoring curriculum development to specific learning styles improves learning efficiency. Individuals with a deciding learning style, the most common in our study, tend to thrive in a space where they can experiment with simulations and practical applications. These individuals evaluate problems, set appropriate goals, and then decide on the best path to achieve those goals. They benefit from a work environment with high caseloads of diverse patient-care decisions and being in environments that encourage critical analysis of current literature.[7,12]

The second most common learning style in our cohort was an analyzing type. Notably, both the deciding and analyzing learning are heavily intertwined with the thinking phase of the learning cycle. Individuals with an analyzing learning style are skilled at taking large amounts of information and organizing it into logical, concise concepts. They tend to analyze each step of a process to understand its consequences and, therefore, are able to minimize mistakes and foresee potential complications. These learners thrive in learning spaces that explore analytical models and provide time to think things through. Residents with this learning style thrive in a lecture-based setting with discussions of patient-

care decisions; attending conferences may be beneficial to such a learner.[7,17]

Being aware of these different learning preferences in a cohort can help faculty optimize learning opportunities for their residents and help residents refine their learning approach in areas where they are less proficient.

It is equally important to note that while the majority of urology residents in the study preferred the thinking and acting parts of the learning cycle, a non-trivial minority preferred the experiencing and reflecting parts of the learning cycle and related learning styles. Studies have shown that learning styles among learners and faculty within a particular specialty tend to be aligned,[8,9,12,15] and those who have a less common learning style tend to face more stress in the workplace and may be viewed less favorably by faculty than their colleagues who prefer the most common learning style.[9,11] This may be because faculty tend to teach in ways that align with their own learning style, making communication easier with those who share a similar learning style. Downstream effects of this may include not just negative impacts on resident wellness, but the omission of different personality types into our field, limiting the influx of creativity, innovation, and diversity that can drive patient care forward.

The effect of learning preferences on exam performance has been inconsistent in the literature, with some studies finding the academic performance of residents with the predominant learning style is better than those with a less common learning style,[11] with the majority citing no difference in knowledge[18] or procedural examinations.[16] Future work is required in this field to ascertain the relationship between learning style, individual exam, and procedural performance with urology residency cohorts.

Our study did not note any differences between self-identified gender and preferred learning phase, or learning style, consistent with the majority of the literature.[5,8,16] One cohort of American general surgery residents stood as the exception, with male junior residents demonstrating a higher preference for the "assimilating" phase and a lower preference for the "accommodating" phase compared to their female counterparts.[15]

Limitations

Our study is not without limitations. Firstly, there are inherent limitations of the Kolb model itself. There have been criticisms of its limited integration of culturally diverse learning experiences, the inappropriate minimization of the role of reflection throughout the learning process, and concerns about its applicability in all scenarios.[19]

Additionally, since learning styles are flexible and can change over time, some studies have shown surgical residents' learning style evolve during their training to become more aligned with the dominant learning style.[15] It is possible that in assessing residents only in the QUEST program, we did not capture the entire range of learning styles in urology residents.

We also did not assess the learning styles of graduated urologists, limiting our assessment of learning styles in the broader field of urology.

Furthermore, not assessing faculty limits our understanding of the influence teachers and the general learning environment can have on resident learning styles.

CONCLUSIONS

To our knowledge, our study is the first to describe learning style and learning phase preferences in urology residents. Through the use of the Kolb model, we were able to determine that the majority of urology residents prefer a deciding learning style and prefer the thinking and acting parts of the learning cycle, consistent with other surgical specialties. Importantly, a predominant subsection of urology residents reside within "non-conventional" learning styles and learning phases. These differences in learning profiles are important for faculty to be mindful of when they are teaching a diverse group and for learners' self-awareness. Our study acts as a foundation for future research to explore connections between learning style and exam performance, identifying predictors of success in residency, and assessing how to optimize curricula to best fit resident learning styles in urology.

COMPETING INTERESTS: The authors do not report any competing personal or financial interests related to this work.

REFERENCES

1. Wanzel KR, Ward M, Reznick RK. Teaching the surgical craft: From selection to certification. *Curr Probl Surg* 2002;39:573-659. https://doi.org/10.1067/mog.2002.123481
2. Quillin RC 3rd, Cortez AR, Pritts TA, et al. Surgical resident learning styles have changed with work hours. *J Surg Res* 2016;200:39-45. https://doi.org/10.1016/j.jss.2015.06.046
3. Harris KA, Nousiainen MT, Reznick R. Competency-based resident education: The Canadian perspective. *Surgery* 2020;167:681-4. https://doi.org/10.1016/j.surg.2019.06.033
4. Saldanha FYL, Levites HA, Staffa SJ, et al. Maximizing plastic surgery education impact: Lessons from resident learning styles and experiential learning theory. *Plast Reconstr Surg Glob Open* 2019;7:e2252. https://doi.org/10.1097/GOX.0000000000002252
5. Lensing G, Fortin T, McCandless M, et al. A multi-center comparison of orthopaedic attending and resident learning styles. *J Surg Educ* 2022;79:957-63. https://doi.org/10.1016/j.jsurg.2022.02.005
6. Mukhalalati BA, Taylor A. Adult learning theories in context: A quick guide for healthcare professional educators. *J Med Educ Curric Dev* 2019;6:2382120519840332. https://doi.org/10.1177/2382120519840332

7. Kolb AY, Kolb DA. Experience based learning systems: The Kolb learning style inventory 4.0. 2013. Available at: Https://learningfromexperience.com/downloads/research-library/the-kolb-learning-style-inventory-4-0.pdf (accessed Sept. 23, 2025)
8. Adesunloye BA, Aladesanmi O, Henriques-Forsythe M, Ivonye C. The preferred learning style among residents and faculty members of an internal medicine residency program. *J Natl Med Assoc* 2008;100:172-5. https://doi.org/10.1016/S0027-968431205-0
9. Baker JD 3rd, Cooke JE, Conroy JM, et al. Beyond career choice: The role of learning style analysis in residency training. *Med Educ* 1988;22:527-32. https://doi.org/10.1111/j.1365-2923.1988.tb00798.x
10. Caulley L, Wadey V, Freeman R. Learning styles of first-year orthopedic surgical residents at 1 accredited institution. *J Surg Educ* 2012;69:196-200. https://doi.org/10.1016/j.jsurg.2011.09.002
11. Contessa J, Ciardiello KA, Perlman S. Surgery resident learning styles and academic achievement. *Curr Surg* 2005;62:344-7. https://doi.org/10.1016/j.cursur.2004.09.012
12. Engels PT, De Gara C. Learning styles of medical students, general surgery residents, and general surgeons: Implications for surgical education. *BMC Med Educ* 2010;10:51. https://doi.org/10.1186/1472-6920-10-51
13. Kosower E, Berman N. Comparison of pediatric resident and faculty learning styles: Implications for medical education. *Am J Med Sci* 1996;312:214-8. https://doi.org/10.1097/00000441-199611000-00004
14. Laeeq K, Weatherly RA, Carrott A, et al. Learning styles in two otolaryngology residency programs. *Laryngoscope* 2009;119:2360-5. https://doi.org/10.1002/lary.20655
15. Mammen JM, Fischer DR, Anderson A, et al. Learning styles vary among general surgery residents: Analysis of 12 years of data. *J Surg Educ* 2007;64:386-9. https://doi.org/10.1016/j.jsurg.2007.08.005
16. Martín Parra JI, Toledo Martínez E, Martínez Pérez P, et al. Analysis of learning styles in a laparoscopic technical skills course: Implications for surgical training. *Cir Esp (Engl Ed)* 2021;99:730-6. https://doi.org/10.1016/j.cireng.2021.10.011
17. Kolb AY. The Kolb learning style inventory-version 3.1 2005 technical specifications. *Hay Resource Direct* 2005:166-71.
18. Ghaffari R, Ranjbarzadeh FS, Azar EF, et al. The analysis of learning styles and their relationship to academic achievement in medical students of basic sciences program. *Res Dev Med Educ* 2013;2:73-6.
19. Smith MK. David A. Kolb on experiential learning. *The Encyclopedia of Pedagogy and Informal Education*. 2001. Updated 2010. Available at: Https://infed.org/mobi/david-a-kolb-on-experiential-learning/ (accessed January 27, 2025).

CORRESPONDENCE: Dr. Nicolas Vanin Moreno, Queen's University, Kingston, ON, Canada; nvaninmoreno2021@meds.uwo.ca