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Evidence-Based Simulation Learning Interventions to Improve Diagnostic Reasoning

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Objectives

01

Describe the role and impact of simulation-based education on improving diagnostic competency

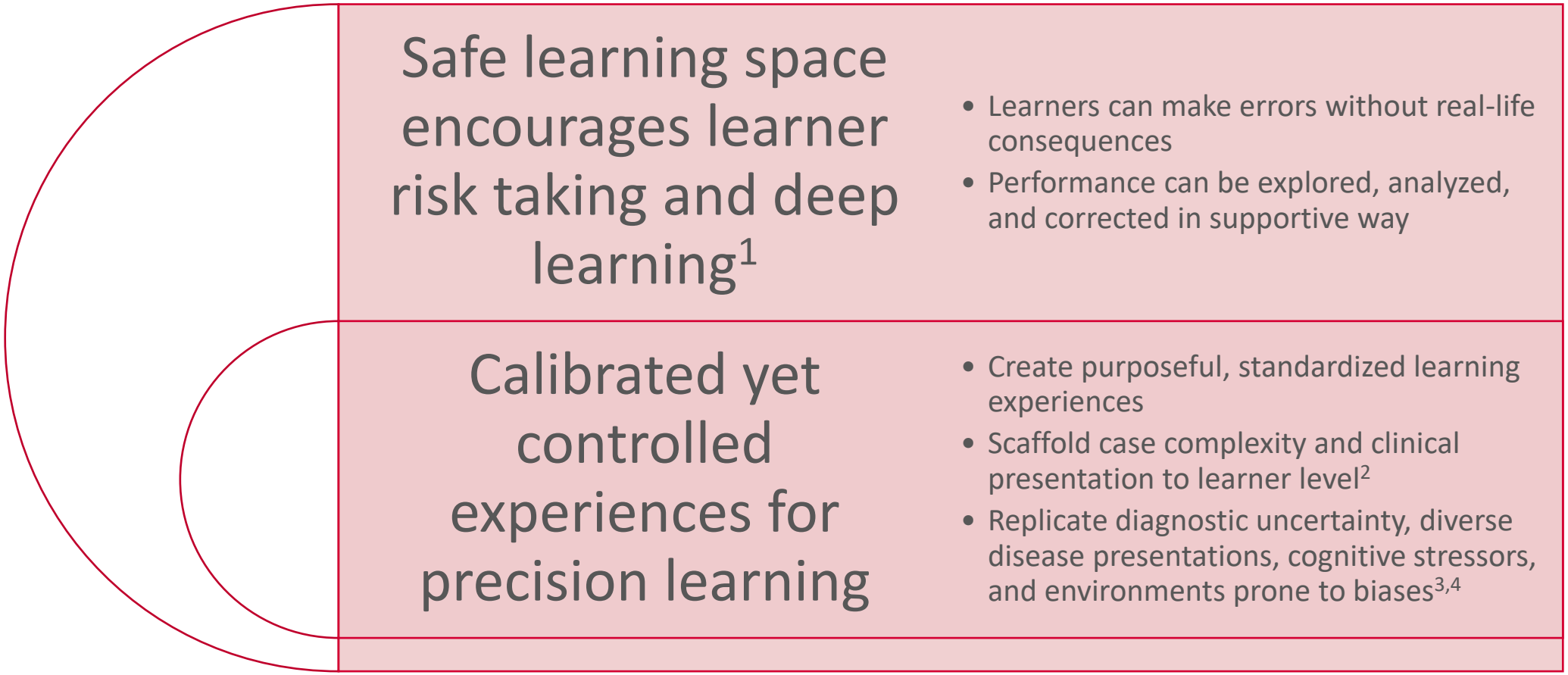
02

Provide insights into the creation and implementation of effective simulation education

03

Discuss approaches to assess and evaluate effectiveness of diagnostic competency simulation programs

Why Simulation?



Why Simulation?

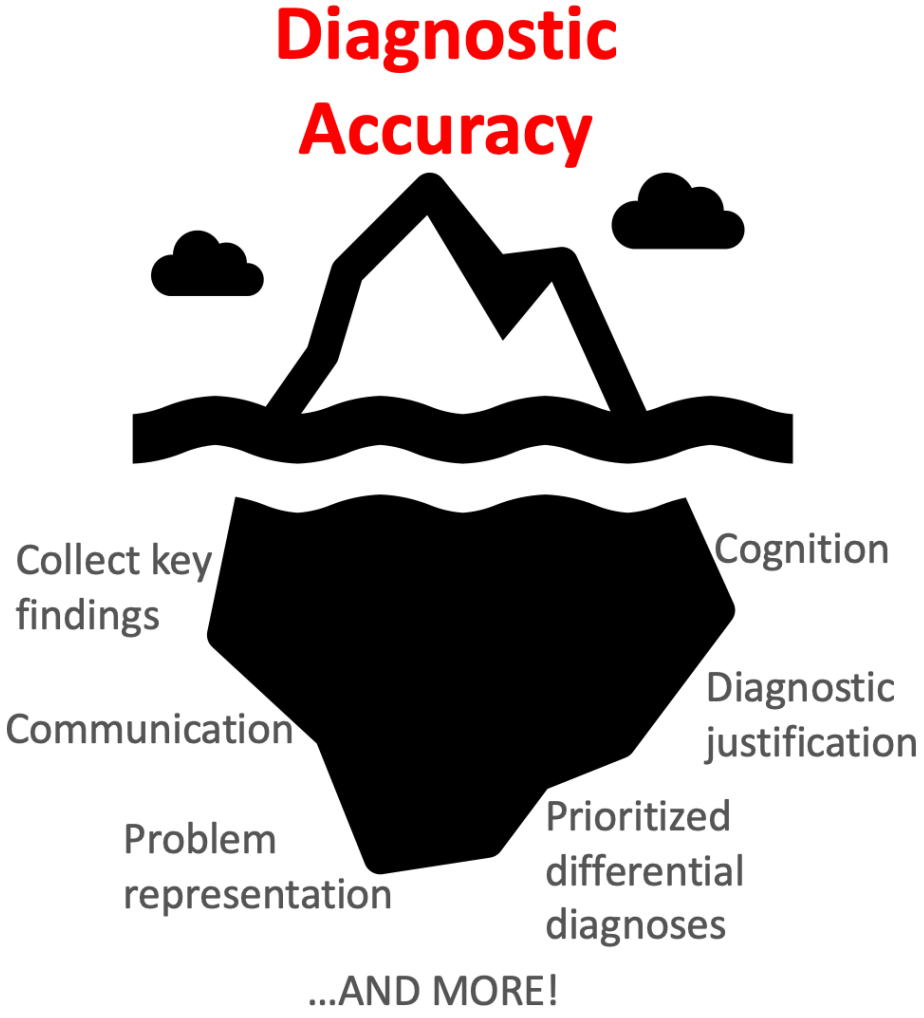
Integrate timely and specific feedback for medium to high effect on learning

- Specific information comparing observed performance and a standard
- Helps learners build cues, check erroneous ideas, develop more effective information processing, deeper understanding.[5,6]

Leverage reflection to increase metacognitive awareness

- Metacognitive processes to enhance self-awareness and situational understanding
- Promotes diagnostic accuracy, reduces errors and biases, increases acceptance of feedback, promotes learner engagement.[7,8,9,10]

Effective simulation design: Targeted experiences



Collect key findings[11]

Example simulation objective

- Learners will demonstrate hypothesis-directed information gathering by collecting key clinical findings during a focused history and physical examination.

Communication of diagnosis[12]

Example simulation objective

- Learners will effectively communicate a diagnosis to a patient using patient-centered communication strategies.

Effective simulation design: Scaffolded learning[2]

Acquire foundational skills

- *Example: Hypothesis-driven history*
- Faculty role: Directive teacher

Practice contextual application

- *Example: Hypothesis-driven histories in patients presenting with typical and atypical symptoms.*
- Faculty role: Individualized coach

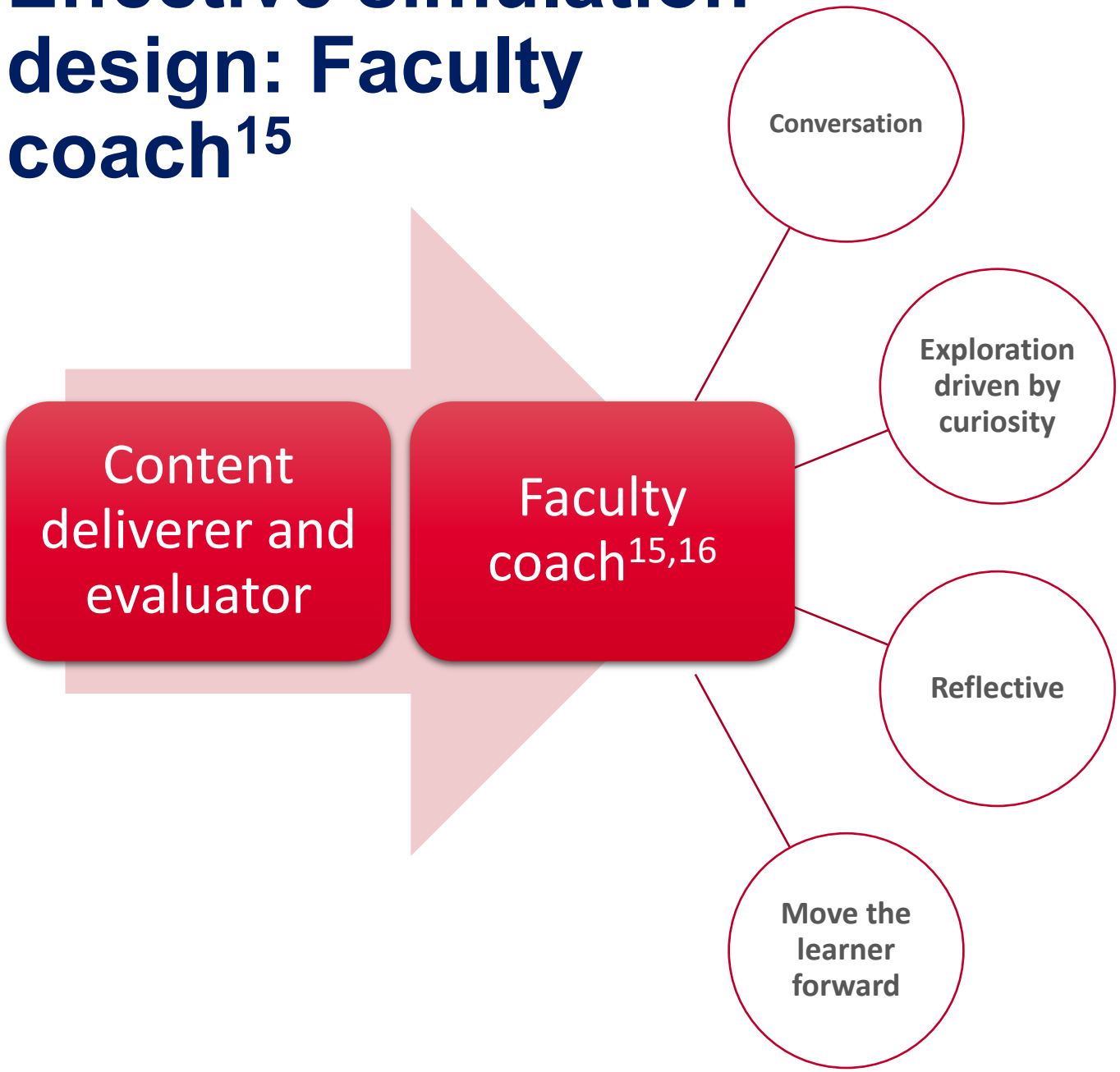
Strengthen critical thinking

Improve teams and systems

- *Example: Hypothesis driven history in a patient presenting with atypical symptoms during an encounter with multiple interruptions.*
- Faculty role: Facilitator of learner driven reflection

Competency!

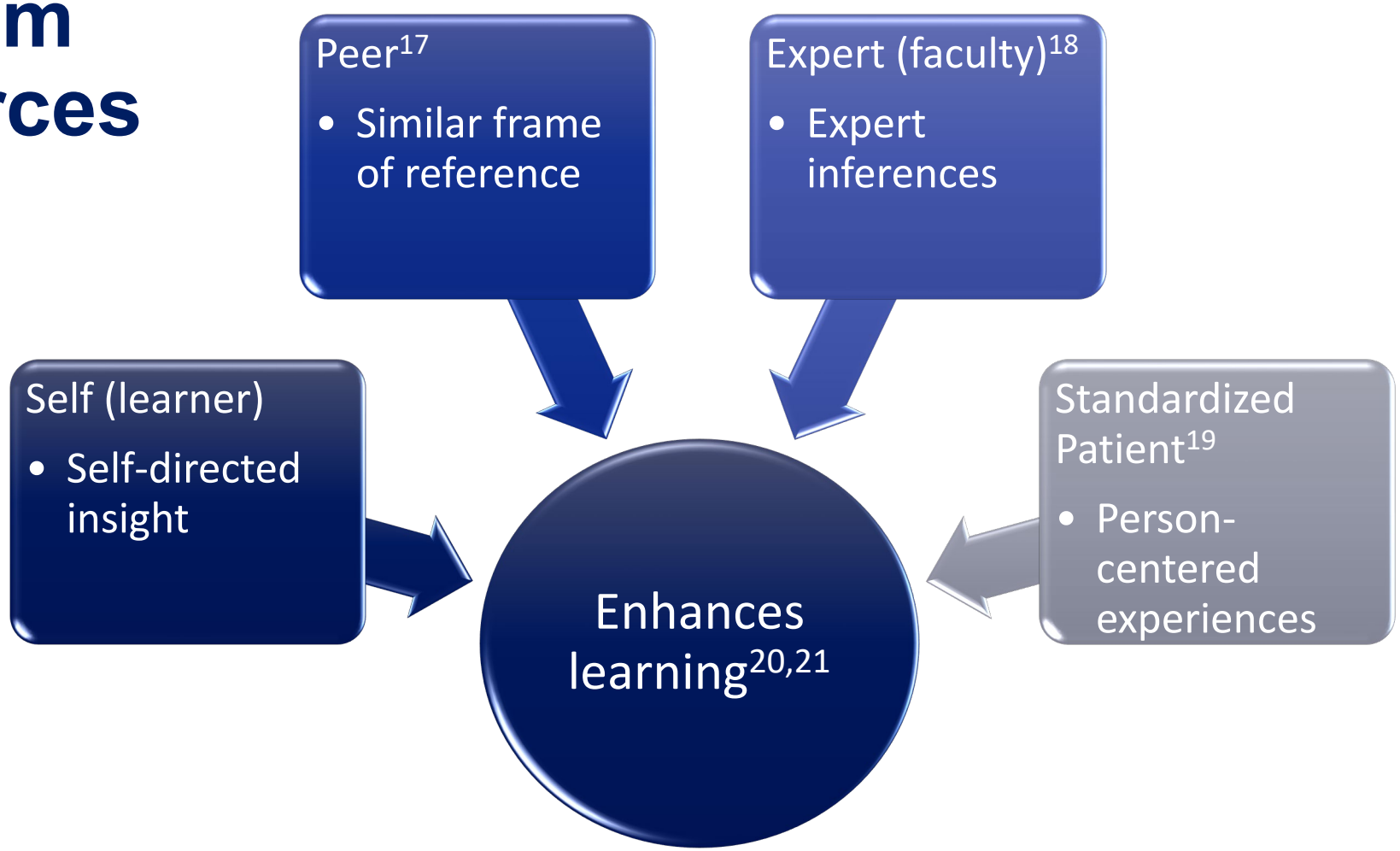
Effective simulation design: Faculty coach[15]



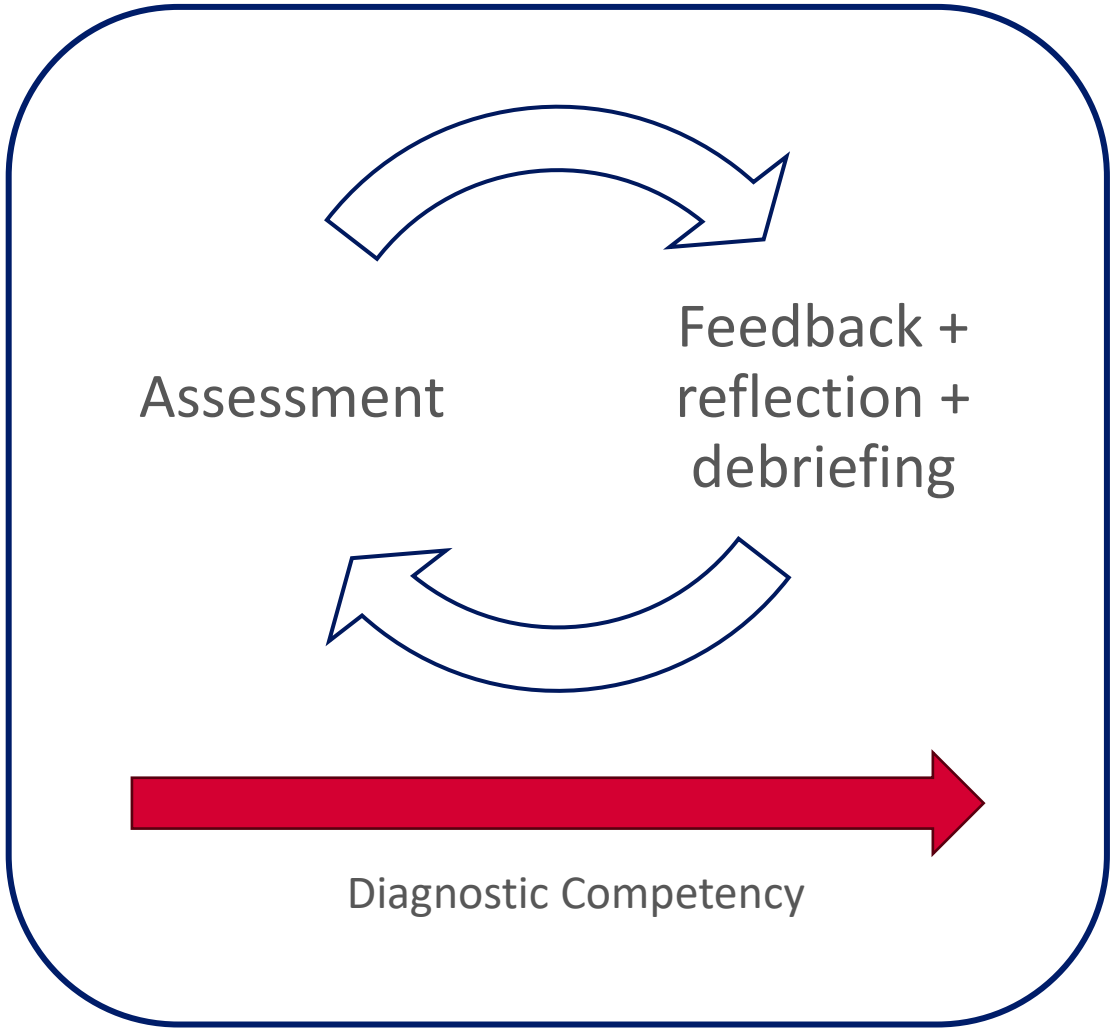
1) Observe
2) Express
3) Ask

"I noticed you didn't respond to the patient when they asked you a question. I am concerned that the patient may feel unheard or ignored. I'm curious about why you didn't respond."

Effective simulation design: Feedback from multiple sources



Performance assessment: Evaluating effectiveness[22]



Scan QR code for list of valid/reliable diagnostic competency assessment tools

- Verbal handover between clinicians
- Admission history and physical note
- Written progress note
- Diagnostic work-up
- Verbal case presentations
- Written diagnostic justification statement

Effective simulation design: Learning cycles

Deliberate practice[23]

- Targets specific skill
- Refine performance through cycle of immediate feedback and repetitive practice
- Performance objectives evolve with learner progression
- *Example: Deliberate practice of dizziness cases with virtual patients increases diagnostic accuracy and testing appropriateness.[24]*

Mastery learning[24]

- Targets skill to pre-established level of proficiency
- Learners continually practice (time variable) until reach minimum passing standard.
- Regular assessments followed by feedback and remediation
- *Example: Deliberate practice of communicating diagnostic uncertainty including telehealth simulation increased mastery. [25]*

Looking to the future

AI generated assessment and feedback[26,27]

- Evaluate learners' decision-making
- Learners can “try out” diagnostic decisions and observe real-time physiological responses
- Track metrics such as time, diagnostic accuracy, and error rates
- Provide customized feedback and identify specific areas for improvement

Citations

1. Rudolph JW, Raemer DB, Simon R. Establishing a safe container for learning in simulation: the role of the presimulation briefing. Simulation in healthcare : journal of the Society for Simulation in Healthcare. 2014;9(6):339-49.
2. Fey MK, Roussin CJ, Rudolph JW, Morse KJ, Palaganas JC, Szyld D. Teaching, coaching, or debriefing With Good Judgment: a roadmap for implementing "With Good Judgment" across the SimZones. Adv Simul (Lond). 2022;7(1):39.
3. Gonzalez CM, Ark TK, Fisher MR, Marantz PR, Burgess DJ, Milan F, et al. Racial Implicit Bias and Communication Among Physicians in a Simulated Environment. JAMA Netw Open. 2024;7(3):e242181.
4. Park CS, Stojiljkovic L, Milicic B, Lin BF, Dror IE. Training induces cognitive bias: the case of a simulation-based emergency airway curriculum. Simulation in healthcare : journal of the Society for Simulation in Healthcare. 2014;9(2):85-93.
5. Hattie J, Timperley H. The Power of Feedback. Review of Educational Research. 2007;77(1):81-112.
6. Wisniewski B, Zierer K, Hattie J. The Power of Feedback Revisited: A Meta-Analysis of Educational Feedback Research. Front Psychol. 2019;10:3087.
7. Mamede S, Schmidt HG. Deliberate reflection and clinical reasoning: Founding ideas and empirical findings. Med Educ. 2023;57(1):76-85.
8. Ribeiro LMC, Mamede S, de Brito EM, Moura AS, de Faria RMD, Schmidt HG. Effects of deliberate reflection on students' engagement in learning and learning outcomes. Med Educ. 2019;53(4):390-7.
9. Sargeant JM, Mann KV, van der Vleuten CP, Metsemakers JF. Reflection: a link between receiving and using assessment feedback. Advances in health sciences education : theory and practice. 2009;14(3):399-410.
10. Mamede S, van Gog T, Moura AS, de Faria RM, Peixoto JM, Rikers RM, et al. Reflection as a strategy to foster medical students' acquisition of diagnostic competence. Med Educ. 2012;46(5):464-72.
11. Olson A, Rencic J, Cosby K, Rusz D, Papa F, Croskerry P, et al. Competencies for improving diagnosis: an interprofessional framework for education and training in health care. Diagnosis (Berlin, Germany). 2019;6(4):335-41.
12. Daniel M, Rencic J, Durning SJ, Holmboe E, Santen SA, Lang V, et al. Clinical Reasoning Assessment Methods: A Scoping Review and Practical Guidance. Acad Med. 2019;94(6):902-12.

Citations

13. Decker S, Alinier G, Crawford SB, Gordon RM, Jenkins D, Wilson C. Healthcare Simulation Standards of Best Practice^{TM} The Debriefing Process. Clinical Simulation In Nursing. 2021;58:27-32.
14. Eppich WJ, Hunt EA, Duval-Arnould JM, Siddall VJ, Cheng A. Structuring feedback and debriefing to achieve mastery learning goals. Acad Med. 2015;90(11):1501-8.
15. Fey MK, Morse KJ. The Transformative Teaching Framework: A roadmap for 21st century teaching. J Prof Nurs. 2024;55:90-6.
16. Burt L, Kiser, B., Fitz, S., Bavis, M.,, editor Integrating High Impact Feedback into Simulation for Diagnostic Excellence DEX24: Diagnostic Excellence 2024 Meeting; 2024 October 14, 2024; Minneapolis, MN.
17. Nunnink L, Thompson A, Alsaba N, Brazil V. Peer-assisted learning in simulation-based medical education: a mixed-methods exploratory study. BMJ simulation & technology enhanced learning. 2021;7(5):366-71.
18. Burt L, Fitz, S., & Kiser B. Evidenced-based Simulation: Fostering Competency through Structured and Multisource Feedback. JAANP. 2024;Submitted.
19. Lewis KL, Bohnert CA, Gammon WL, Hölzer H, Lyman L, Smith C, et al. The Association of Standardized Patient Educators (ASPE) Standards of Best Practice (SOBP). Adv Simul (Lond). 2017;2:10.
20. Hatala R, Cook DA, Zendejas B, Hamstra SJ, Brydges R. Feedback for simulation-based procedural skills training: a meta-analysis and critical narrative synthesis. Advances in health sciences education : theory and practice. 2014;19(2):251-72.
21. Engerer C, Berberat PO, Dinkel A, Rudolph B, Sattel H, Wuensch A. Integrating 360° behavior-orientated feedback in communication skills training for medical undergraduates: concept, acceptance and students' self-ratings of communication competence. BMC Med Educ. 2016;16(1):271.
22. Burt L, Griffith, P., Bavis, M., Raszewski, R. Diagnostic Reasoning Competency Assessment Tools: An Integrative Review. AACN Adv Crit Care. In-press.
23. Ericsson KA. Deliberate practice and acquisition of expert performance: a general overview. Acad Emerg Med. 2008;15(11):988-94.
24. Kotwal S, Fanai M, Fu W, Wang Z, Bery AK, Omron R, et al. Real-world virtual patient simulation to improve diagnostic performance through deliberate practice: a prospective quasi-experimental study. Diagnosis (Berlin, Germany). 2021;8(4):489-96.
25. Rising KL, Cameron KA, Salzman DH, Papanagnou D, Doty AMB, Piserchia K, et al. Communicating Diagnostic Uncertainty at Emergency Department Discharge: A Simulation-Based Mastery Learning Randomized Trial. Acad Med. 2023;98(3):384-93.
26. HealthySimulation.com. AI in HealthCare Simulation 2025 [Available from: https://www.healthysimulation.com/artificial-intelligence-healthcare-simulation/.
27. Hamilton A. Artificial Intelligence and Healthcare Simulation: The Shifting Landscape of Medical Education. Cureus. 2024;16(5):e59747.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