Assessing Changes in Metacognitive Awareness among Pharmacy Students Enrolled in a Longitudinal Personal and Professional Development Course Series

Carrie Graham, DHSc, MEd, Valerie Coppenrath, PharmD, Colleen Massey, DHSc, MS, Paul Belliveau, PharmD, Anthony Pollano, MHS, BS Pharm, RPh, Matt Silva, PharmD, RPh, BCPS

Massachusetts College of Pharmacy and Health Sciences

Background

Learning strategies that increase metacognition are often used to improve academic achievement in higher education.[1,2,3,5,6,7,10,13] With the rapid increase in knowledge and technology, students need more opportunities to learn how to obtain new skills and be able to develop concepts and solutions to be successful workers. This is particularly important for healthcare students, as metacognitive thinking can help reduce medical errors and improve patient safety.[8] In a study assessing learner metacognition in pharmacy students, the authors conclude that future studies should include assessing learner metacognition in a longitudinal course.[10]

Purpose

To assess whether involving pharmacy students in metacognitive strategies over a five-semester longitudinal course series enhances their metacognitive activity.

Methods

The class of 2023 participated in Student Personal & Professional Development course series.

Revised Metacognitive Awareness Inventory (MAI) was administered at start of their P1, P2, and P3 years (intervention)

Revised MAI was administered to the Class of 2022 in their P3 year (control)

Analysis of covariance (ANCOVA) was utilized to determine results

Course Series Topics

- Self-Awareness
- Metacognition
- Health Literacy
- Leadership
- Mindful Communication
- Professionalism

Administration of the MAI

Class of 2023 (intervention)

- P1 Year Fall 2020
- P2 Year Fall 2021
- P3 Year Fall 2022

Class of 2022 (control)

- P3 Year Spring 2022

Methods Continued

The metacognitive awareness inventory (MAI) is a 52 item self-report questionnaire designed to assess self-regulated learning skills. The MAI is a valid and reliable tool.[8] A criticism of the MAI is that the dichotomous answers force participants to choose an extreme yes or no, which does not allow for necessarily true answers or feelings with regards to the question.[3,4,12,13] Therefore, this study utilized the revised MAI (5-point Likert scale in place of true/false) to allow for a broader range of answers.

Link to the MAI tool

Results

Demographic Information

	Total	Gender	Age	Education		English as Primary Language		Exposure to Metacognition prior to MCPHS	
Intervention	48	Female Male	37 11	28.8 (Mean SD)	Doctorate Graduate/Masters Undergraduate High School	5 6 34 3	Yes No Prefer not to answer	9 37 1	Yes No Maybe	20 11 17
Control	140	Female Male	88 51	28 (Mean SD)	Doctorate Graduate/Masters Undergraduate High School None of these	23 25 74 16 1	Yes No	95 44	Yes No Maybe	18 120 1

Mean Responses of Intervention Group at P1, P2, and P3 Years

Domain	First Survey		Second Survey		P-value
	Year	Mean (SD)	Year	Mean (SD)	
Evaluation	P1	21.1 (4.24)	P3	23.3 (3.29)	0.037
Planning	P2	26.7 (4.38)	P3	24.4 (3.5)	0.006
Information Management	P2	39.1 (4.92)	P3	36.7 (4.54)	0.03

Discussion

Incorporating meta-awareness skills and practices in professional development pharmacy courses was associated with improved learner identified self-awareness and learning outcomes in evaluative, planning and information management domains. Our experiences and data indicate the structure and process are formative and additive while allowing for additional meta-awareness from other experiences including advanced practice site and experiential learning in the curriculum.

Conclusion

The greatest change in metacognition occurred between the P2 to P3 years. It is difficult to determine if this change was due to the intervention or transformative effect of rotations. Further research is needed to determine if other interventions can further influence changes in metacognition.

References

1. Allan, E. G., & Driscoll, D. L. (2014). The three-fold benefit of reflective writing: Improving program assessment, student learning, and faculty professional development. Assessing Writing, 21, 37–55. https://doi.org/10.1016/j.asw.2014.03.001
2. Callender, A. A., Franco-Watkins, A. M., & Roberts, A. S. (2016). Improving metacognition in the classroom through instruction, training, and feedback. Metacognition and Learning, 11(2), 215–235. https://doi.org/10.1007/s11409-015-9142-6
3. Gholami, M., Moghadam, P. K., Mohammadipoor, F., Tarahi, M. J., Sak, M., Toulabi, T., & Pour, A. H. H. (2016). Comparing the effects of problem-based learning and the traditional lecture method on critical thinking skills and metacognitive awareness in nursing students in a critical care nursing course. Nurse Education Today, 45, 16–21. https://doi.org/10.1016/j.nedt.2016.06.007
4. Gonullu I, Artar M. Metacognition in medical education. Educ Health (Abingdon). 2014 May-Aug;27(2):225-6. doi: 10.4103/1357-6283.143784. PMID: 25420992.
5. Hudesman, J., Crosby, S., Flugman, B., Issac, S., Everson, H., & Clay, D. B. (2013). Using formative assessment and metacognition to improve student achievement. Journal of Developmental Education, 37(1), 12. Retrieved from https://files.eric.ed.gov/fulltext/EJ1067283.pdf
6. Lee, H.W., Lim, K.Y., & Grabowski, B.L. (2010). Improving self-regulation, learning strategy use, and achievement with metacognitive feedback. Educational Technology Research and Development, 58, 629-648. https://doi.org/10.1007/s11423-010-9153-6
7. Mynlieff, M., Manogaran, A. L., St Maurice, M., & Eddinger, T. J. (2014). Writing assignments with a metacognitive component enhance learning in a large introductory biology course. CBE Life Sciences Education, 13(2), 311–321. https://doi.org/10.1187/cbe.13-05-0097
8. Pintrich, P. (2000). Issues in self-regulation theory and research. *Journal of Mind and Behavior*, 21, 213-220.
9. Royce, C. S., Hayes, M. M., & Schwartzstein, R. M. (2019). Teaching critical thinking: A case for instruction in cognitive biases to reduce diagnostic errors and improve patient safety. Academic Medicine: Journal of the Association of American Medical Colleges, 94(2), 187–194. https://doi.org/10.1097/ACM.0000000000002518
10. Siegesmund, A. (2016). Increasing student metacognition and learning through classroom-based learning communities and self-assessment. Journal of Microbiology & Biology Education, 17(2), 204–214. https://doi.org/10.1128/jmbe.v17i2.954
11. Steuber, T. D., Janzen, K. M., Walton, A. M., & Nisly, S. A. (2017). Assessment of learner metacognition in a professional pharmacy elective course. American Journal of Pharmaceutical Education, 81(10), 6034. https://doi.org/10.5688/ajpe6034
12. Terlecki, M. S., & McMahon, A. (2018). A call for metacognitive intervention: Improvements due to curricular programming in leadership. Journal of Leadership Education,17(4). https://doi.org/ 10.12806/V17/I4/R8
13. Tosun, C., & Senocak, E. (2013). The effects of problem-based learning on metacognitive awareness and attitudes toward chemistry of prospective teachers with different academic backgrounds. Australian Journal of Teacher Education, 38(3). http://dx.doi.org/10.14221/ajte.2103v38n3.2

MCPHS UNIVERSITY