Metacognition Education and Exam Wrapper Reflections to Stimulate Pharmacy Student Self-Awareness Development

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Background

Metacognition: The knowledge and control one has over one's own thinking and learning activities[1]
Self-awareness: Plays a role in professional development, providing quality patient care, and avoiding burnout.[2]

There is **no all-encompassing solution for** purposeful **self-awareness instruction** in students over time.

Exam wrappers are one tool to promote self-directed reflection and life-long personal development and learning.[3]

Objective: Explore self-awareness, self-confidence, and exam performance following a metacognitive intervention

Methods

Pearson correlation coefficients to assess predicted and actual exam scores
Spearman correlation coefficients to assess student-reported confidence and performance on topics
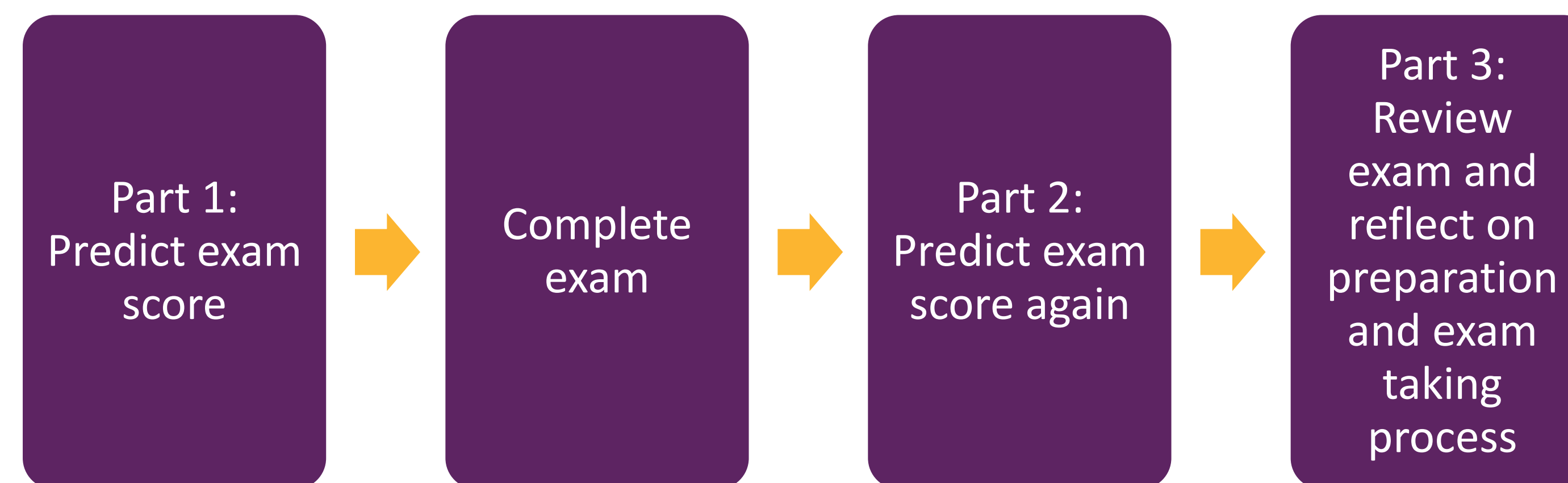
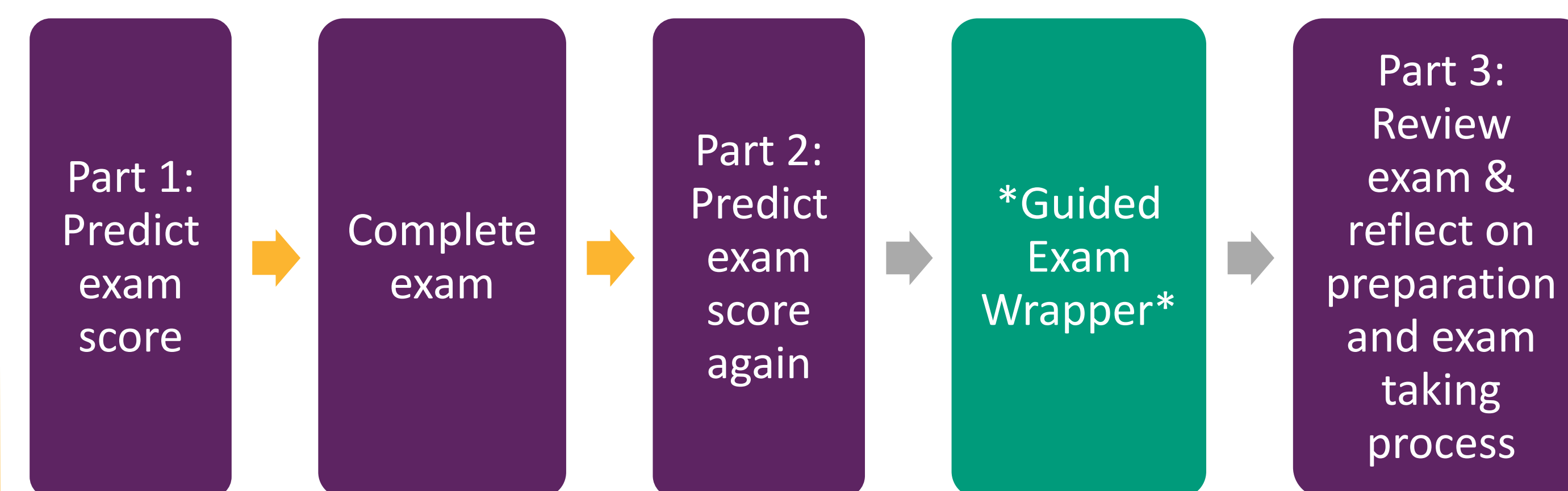**Subjects**: PharmD students enrolled in P2 Pharmacotherapy course

Typical Guided Exam Wrapper Process in Therapeutics Course Series

Exam wrapper completed with each exam

Part 1: Predict exam score → Complete exam → Part 2: Predict exam score again → Part 3: Review exam and reflect on preparation and exam taking process

One-time guided exam wrapper with Exam 1 of Therapeutics 2 Fall 2023 Quarter

Fall 2023 Therapeutics 2 Exam 1 Guided Exam Wrapper Process

Part 1: Predict exam score → Complete exam → Part 2: Predict exam score again → *Guided Exam Wrapper* → Part 3: Review exam & reflect on preparation and exam taking process

Return to typical exam wrapper process* with each exam

For exam wrapper questions:

Guided Exam Wrapper

Included:
Presentation to teach students about metacognition
Instruction on exam wrapper completion with reflection decision-tree, examples, and intervention suggestion handouts

Results

Table 1. Exam Score Predictions and Actual Scores in Therapeutics 1 Summer Quarter 2023 (n=30)

	T1E1 (%)	Diff (%)	R	T1E2 (%)	Diff (%)	R	T1E3 (%)	Diff (%)	R	T1Final (%)	Diff (%)	R
Exam Score (avg.)	87.6			86.6			79.77			87.33		
#1 Predicted Score (avg.)	76.28	11.32	**0.583**	77.41	9.19	0.438	75.2	4.57	0.455	76.79	10.53	0.378
#2 Predicted Score (avg.)	76.03	11.56	**0.826**	75.76	10.84	**0.639**	69.53	10.24	**0.564**	76.34	10.98	**0.529**

T1=Therapeutics 1 E1=Exam 1 E2=Exam 2 E3=Exam 3 Diff= Difference between prediction and actual score

Table 2. Exam Score Predictions and Actual Scores in Therapeutics 2 Fall Quarter 2023 (n=30)

	T2E1 (%)	Diff (%)	R	T2E2 (%)	Diff (%)	R	T2E3 (%)	Diff (%)	R	T2E4 (%)	Diff (%)	R	T2Final (%)	Diff (%)	R
Exam Score (avg)	86.47			88.07			85.4			79.93			79.24		
#1 Predicted Score (avg.)	76.13	10.33	**0.616**	75.62	12.45	**0.583**	76.6	8.8	**0.578**	75.93	4.00	**0.666**	74.2	5.04	**0.621**
#2 Predicted Score (avg.)	77.14	9.33	**0.798**	76.83	11.24	**0.744**	75.07	10.33	**0.676**	74.30	5.63	**0.696**	73.8	5.44	**0.543**

T2=Therapeutics 2 E1=Exam 1 E2=Exam 2 E3=Exam 3 E4=Exam 4 Diff= Difference between prediction and actual score

Table 3. Student-Reported Confidence and Performance on Topics in Therapeutics 1 Summer Quarter 2023 (n=30)

Topic	Questions Correct (%)	Confident (%)	R
Allergic reactions	82.43	79.3	0.484
COPD	87.96	96.6	0.251
Pulmonary meds	87.22	75.9	0.414
Asthma	84.32	93.1	0.375
Thyroid disorders	92.08	96.6	0.346
BPH, ED	84	93.1	0.312
Contraception, pregnancy	**85.76**	**55.2**	**0.685**
Infertility, PCOS, menopause	**84.67**	**51.7**	**0.644**
IBD/IBS	83.89	70	0.227
Ulcer diseases	87.33	60	0.438
Pancreatitis	79.33	63.3	0.043
Cirrhosis	76.67	60	0.053
Dermatology	71.48	43.3	0.58
Osteoporosis	78.52	46.7	0.325
Peds pharmacology	87.92	89.7	0.263
Peds building blocks	90.28	93.1	0.061

Table 4. Student-Reported Confidence and Performance on Topics in Therapeutics 2 Fall Quarter 2023 (n=30)

Topic	Questions Correct (%)	Confident (%)	R
AKI	87	96.6	-0.012
Dialysis	**78.89**	**86.2**	**0.649**
Hypertension	81.94	93.1	0.249
Chronic renal failure	77.33	55.2	0.488
PAD	89.67	82.8	0.361
ACS	90.56	89.7	0.244
Lipids	**85.37**	**72.4**	**0.603**
Ischemic heart disease	88.52	86.2	0.369
Heart failure	86.81	96.7	0.185
Arrhythmias	84.08	75	0.456
Atrial Fibrillation	71.21	80	0.416
Diabetes	74.86	80	0.388
Diabetes Complications	83.71	73.3	0.307
Inpatient hyperglycemia	77.78	63.3	0.409
VTE	78.17	83.3	0.334
Anemias	80.37	93.3	-0.048
Stroke	75.56	66.7	0.313
Fluid & Electrolytes	**77.78**	**76.7**	**0.611**

Takeaways

- On average, students consistently under predict their exam scores.
- Most R values, when comparing predicted and actual scores, are 0.5 or above, indicating a positive correlation between the scores. Therefore, students displayed a level of self-awareness with regard to what exam score they expected to achieve
- R values increased with the 2nd prediction score, indicating student score prediction after they completed their exam was more closely correlated with their actual score than their prediction prior to starting their exam.
- Most confidence R values indicate positive correlation between the student's confidence assessment and their topic performance
- Two topics in Therapeutics 1 and three topics in Therapeutics 2 had a significant positive correlation (r>0.5). For contraception/pregnancy, 55.2% indicated they were confident (vs. not confident), therefore those who assessed confidence performed well while those who were not confident performed accordingly.
- Topics like AKI and anemias had a negative correlation, therefore, student ability to assess confidence depends on topic and there is potential for more development in self-confidence and self-awareness

References:
1. Baker L, Brown AL. Metacognitive skills and reading. Handbook of Reading Research. *New York: Longman*, 1984;3:353-394.
2. Weichel C, Lee JS, Lee JY. Burnout among Hospital Pharmacists: Prevalence, Self-Awareness, and Preventive Programs in Pharmacy School Curricula. *Can J Hosp Pharm*. 2021;74(4):309-316.
3. Pate ALafitte EM, Ramachandran S, Caldwell DJ. The use of exam wrappers to promote metacognition. *Curr Pharm Teach Learn*. 2019;11:492-498.