

# Impact of metacognition coaching on academic success strategies of undergraduate STEM students

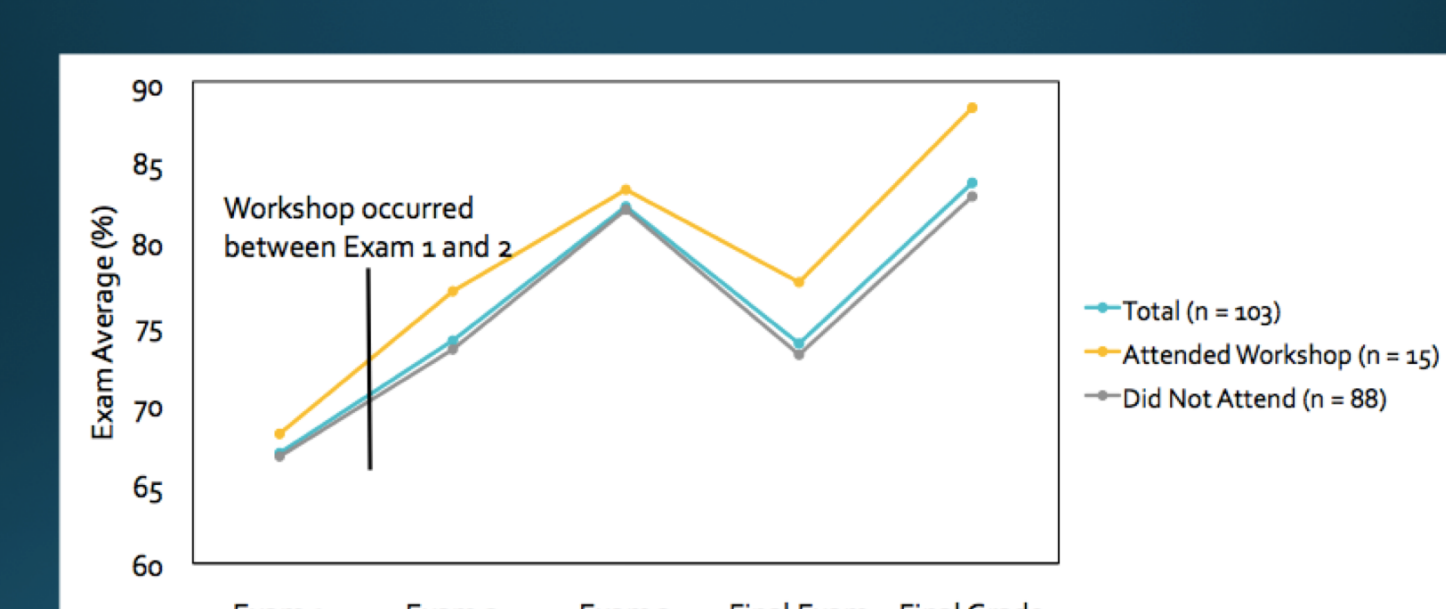
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**Abstract:** The main objective of this study is to teach metacognition and related study and exam-taking strategies to undergraduate students in STEM courses and to determine which strategies students choose to adopt to be successful on exams in these courses.

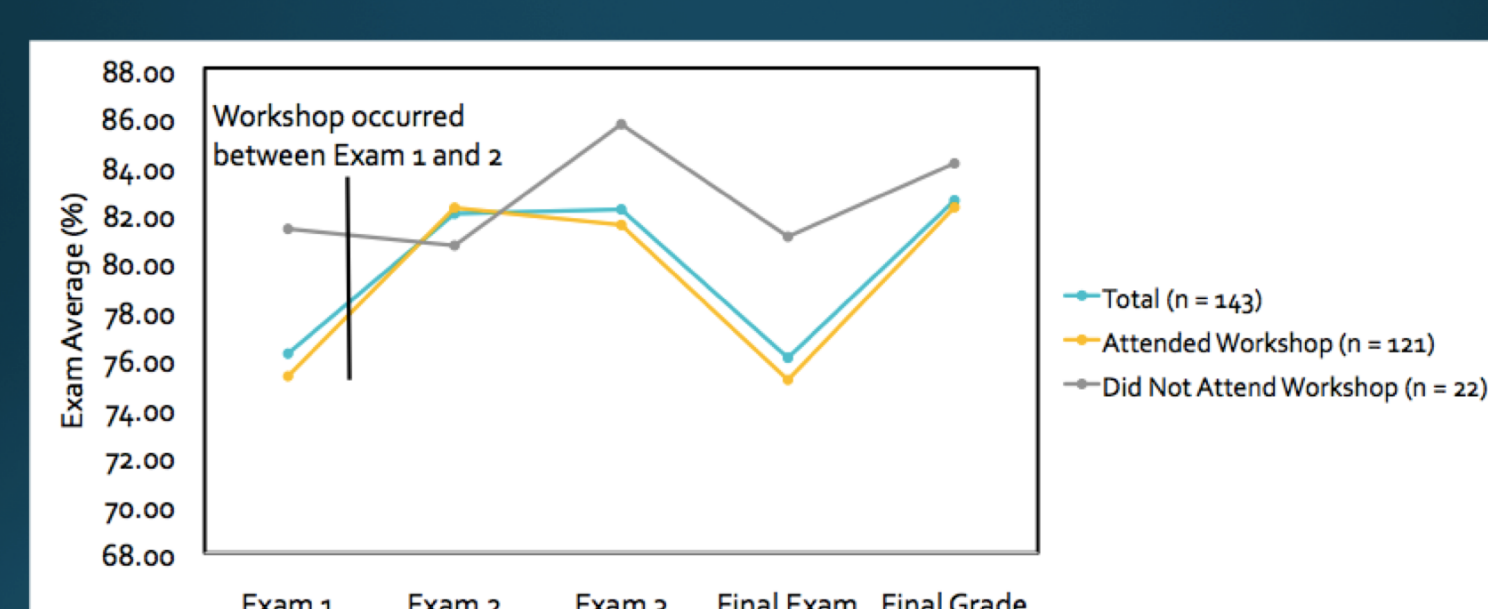
**Method:** We administered a validated survey, MCAI, and correlated the results with course grades and exam averages. The metacognitive intervention involved the collection of student reflections regarding confusion during class, their exam performances, their goals in the course, their mindset about chemistry.

## Results from previous research

CHEM 1400 Exam Scores



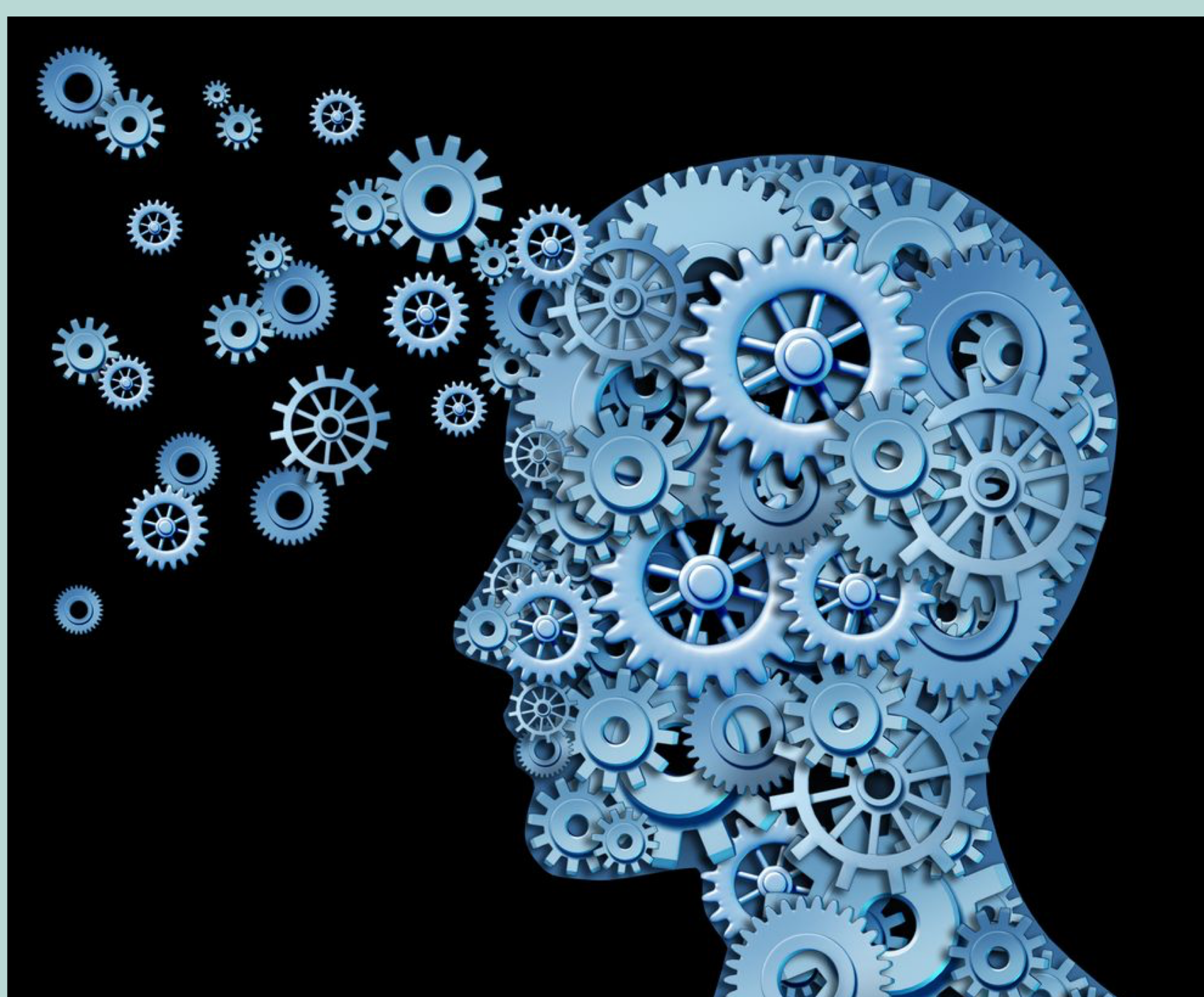
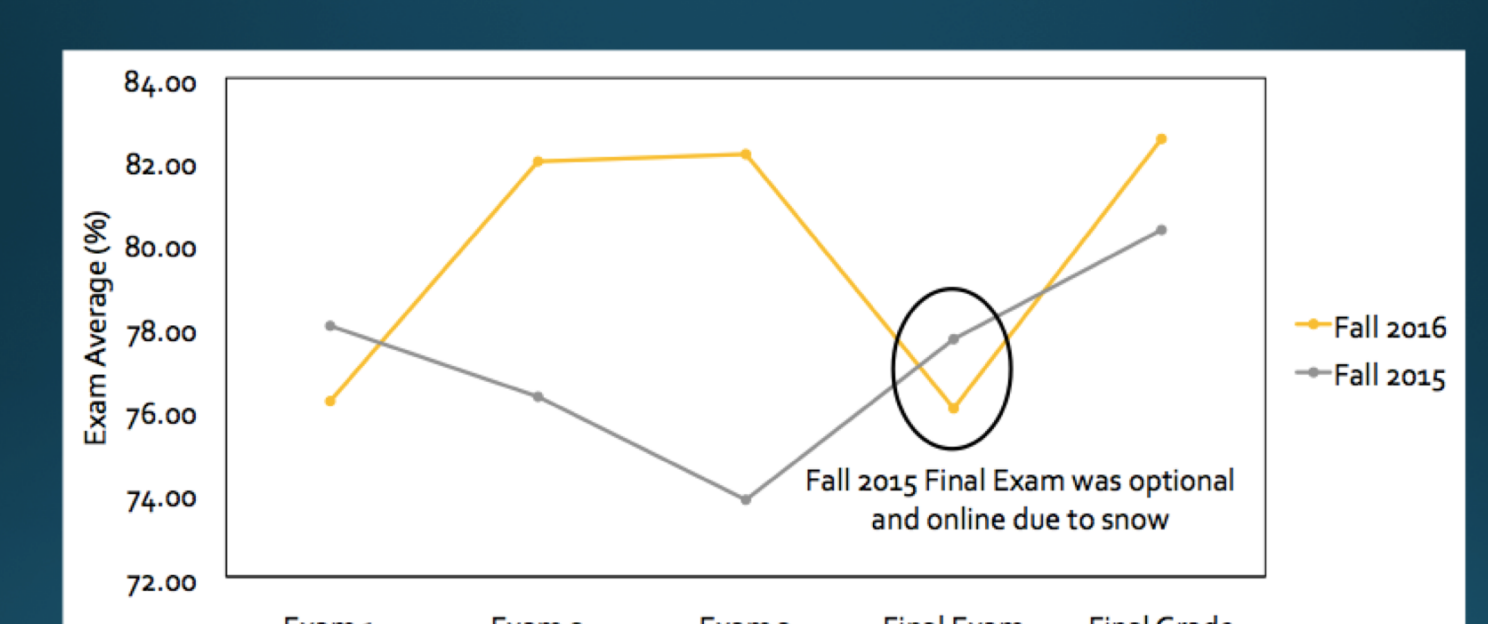
CHEM 1011 Exam Scores (2016)



CHEM 1113 Exam Scores



CHEM 1011: Comparison to Last Year



SASC course  
CHEM 1021 ~20 students

CHEM courses  
CHEM 1113 ~1100 students  
CHEM 1011 ~200 students  
CHEM 1400 ~110 students

## MCAI survey data

MCAI % pre	MCAI %	Δ	Exam %	Grade
77.04	75.38	-1.66	75.40	78.56
77.04	72.31	-4.73	76.52	84.08
69.63	66.92	-2.71	95.40	94.53
80	62.31	-17.69	86.34	86.98
63.7	66.92	3.22	87.88	87.40
75.56	69.23	-6.33	87.68	86.98
94.07	73.85	-20.22	94.87	83.51
72.59	66.15	-6.44	90.30	87.29
62.22	58.46	-3.76	96.21	92.26
67.41	69.23	1.82	92.89	78.58
69.63	66.92	-2.71	69.90	76.83
91.11	67.69	-23.42	96.60	82.00
68.15	61.54	-6.61	89.30	81.26
<b>74.47</b>	<b>67.46</b>	<b>-7.02</b>		

## Study strategies challenge in SASC

Offered a metacognition workshop during the power hour session in week 8

Send reminder emails on Mondays and surveys on Fridays for four weeks

If they finished the challenge, they earned an Amazon gift certificate for \$25.

Which strategy was most beneficial?



## Metacognitive activities

Muddiest Point

Ask the students to write down what was most confusing in lecture today.  
Ask one or two students to share their ideas. (No reflection)

Growth Mindset

Take a moment to rate yourself from 1 (unprepared) to 5 (completely prepared) on the following topics

What is your goal for this exam?

What actions will you take to achieve that goal?

Describe a time when you overcame a struggle to learn something.

What advice would you give to another student who encountered the same struggle?

What type of mindset do you have regarding chemistry? Explain your answer.

Exam Wrappers

Did you meet your goal? Why or why not?

Did you actually represent your knowledge with this exam? Did your exam grade reflect what you know?  
Now that you have taken two exams, what are your most successful study strategies?

The biggest challenge was **taking my free time** after class to sit down and review what I learned. I'm used to just going to class taking the notes and going home, then doing it again for next class.

Yes, I keep finding it easier to take notes during class while absorbing what we are covering because **I am already prepared**.

Once I knew already what the teacher was talking about, **I was hooked in** and I could be able to see connections that I didn't before.

I do believe that **being more positive makes it easier** to sit down and accomplish those really tough tasks.

I remember telling my friends how knowledge is something you can consistently acquire and it's not predetermined. I'm actually starting to **believe and preach** what I've come to understand.

Keeping a calendar was very beneficial to my learning because I **can keep track** of certain assignments and plan time for larger assignments that require more time.

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