Achieve
macmillan learning

Active learning for student engagement

Research-based strategies for all instructors

Macmillan Learning Learning Science team

February 13, 2020

macmillan learning

Dr. Kara McWilliams, Vice President Impact Research

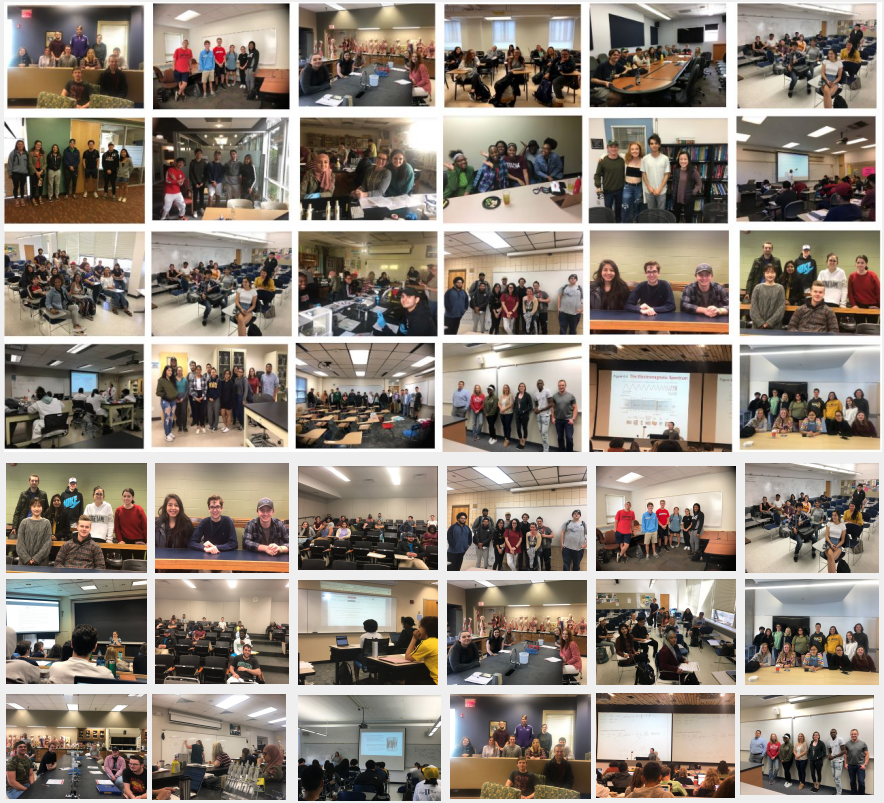
Kara is passionate about researching the impact of digital technologies in higher education, and how insights can inform teaching and learning in the classroom. She brings ten years of experience conducting qualitative and quantitative investigations of how classroom interventions can improve learner outcomes and influence learning gains. She holds a doctorate in Educational Research, Measurement and Evaluation and a master's degree in Curriculum & Instruction from Boston College.

Achieve
macmillan learning

1. The science of active learning

2. Co-design and development of Achieve

3. Research based and empirically validated strategies for all instructors



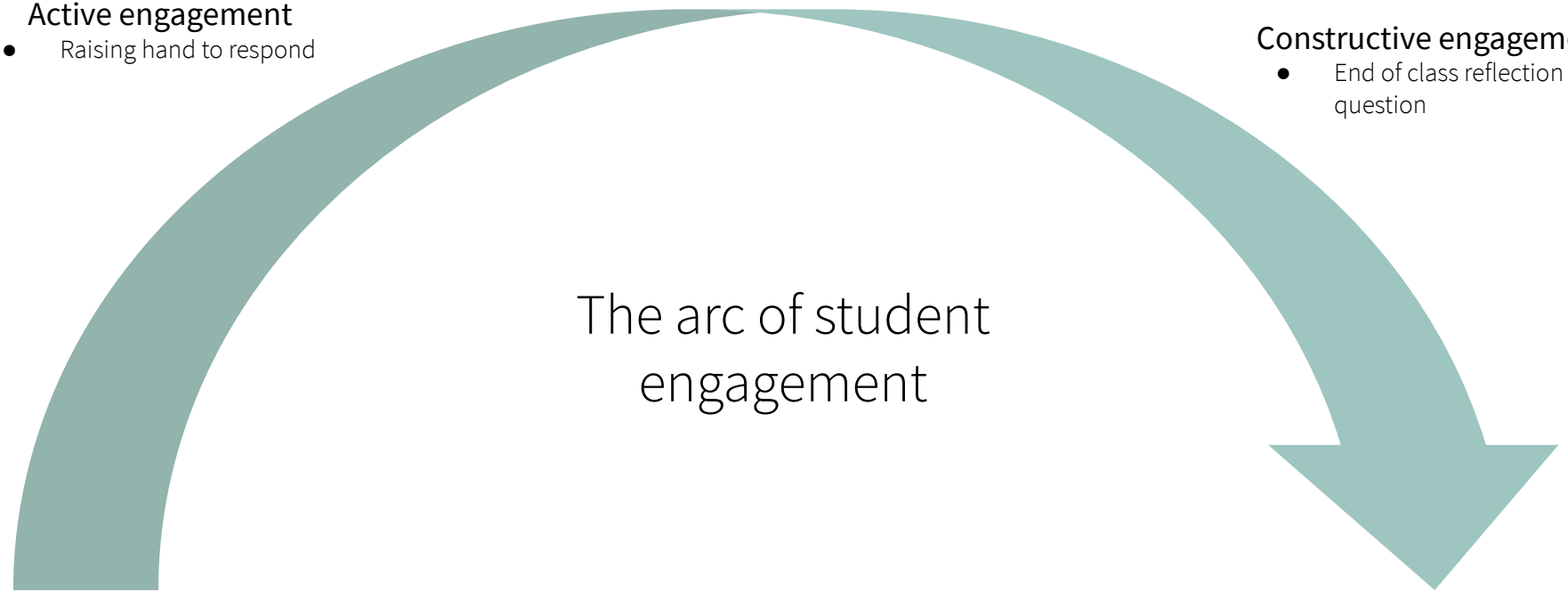
THE SCIENCE OF ACTIVE LEARNING

WHAT IS ACTIVE LEARNING?

Professor Roland's Biology class in South Mountain Community College engaging in active learning during a research study of Achieve

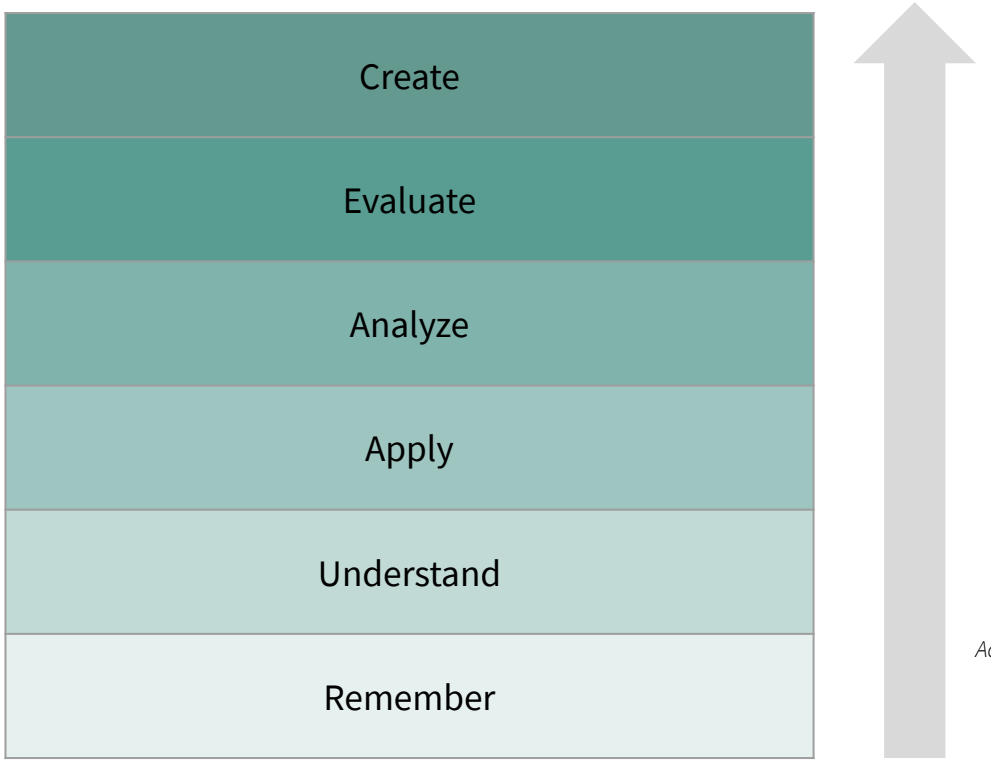
Techniques that involve student participation and engagement during class time in way that enables higher order thinking and cognition.

HOW DOES ACTIVE LEARNING SUPPORT ENGAGEMENT?



Chi, M. T. H., & Wylie, R. (2014). The ICAP Framework: Linking Cognitive Engagement to Active Learning Outcomes. *Educational Psychologist*, *49*(4), 219–243. doi: 10.1080/00461520.2014.965823

WHY IS ACTIVE LEARNING EFFECTIVE?



Research has found that regardless of class size, course level, discipline, or technique implemented, actively learning **improves student outcomes**

Active Learning Increases Student Performance in Science, Engineering and Mathematics Freeman, Eddy, McDonough, Smith, Okoroafor, Jordt, Wenderoth, 2014.

Meta-analysis of 225 studies based on rigorous criteria.

WHAT ARE THE BLOCKERS TO IMPLEMENTING ACTIVE LEARNING?

TIME

Instructors report that there is not enough time during class for direct instruction of core concepts and vocabulary and active learning strategies

CAPACITY

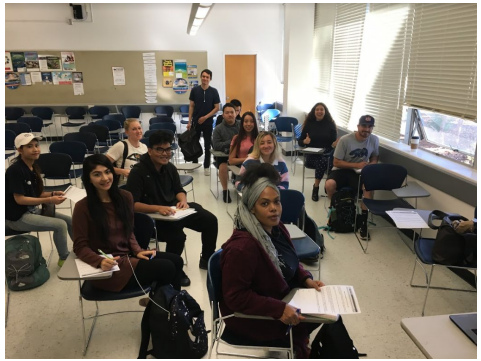
Instructors report lacking the content and/or resources they need to effectively implement active learning, and don't have the capacity to develop them themselves

TRAINING

Instructors report not having the training or guidance they need to implement the strategies effectively; particularly those new to active learning

THE CO-DESIGN AND DEVELOPMENT OF ACHIEVE

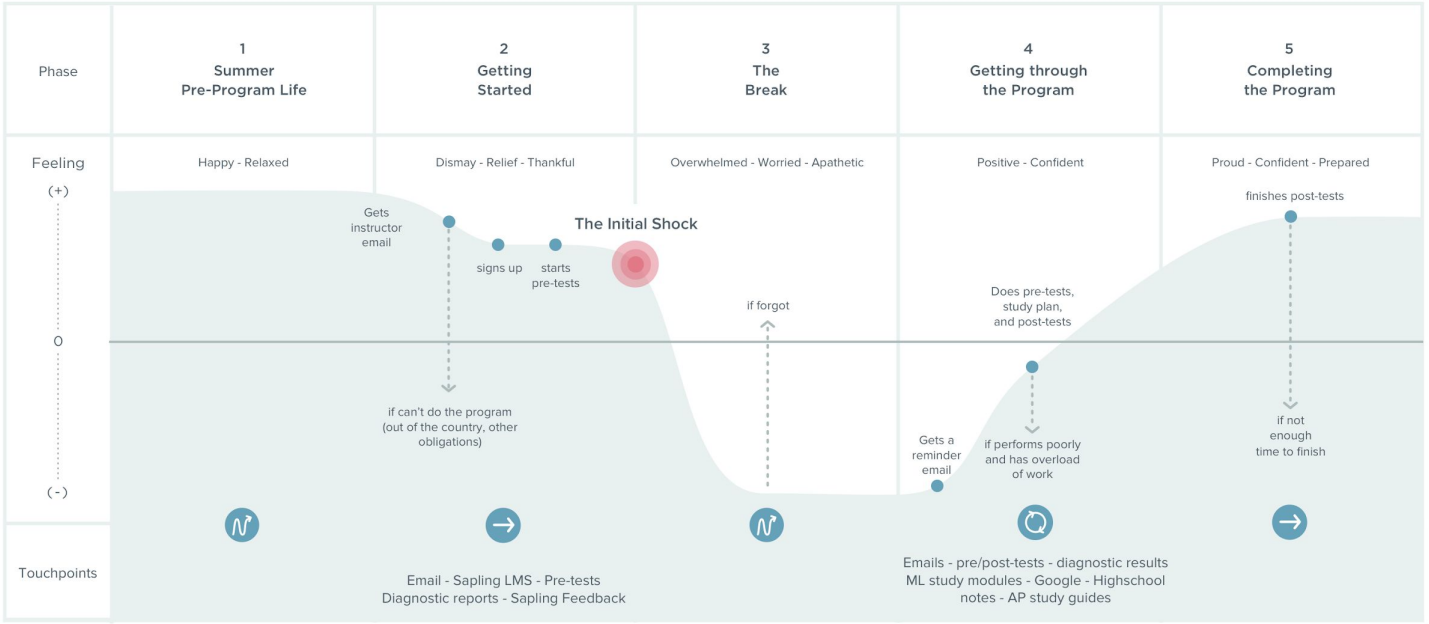
UNDERSTANDING JOURNEYS AND NEEDS



Conducted student focus groups and instructor interviews - and used other methods like surveying, shadowing, observation, diary studies, and workshops to understand who would be using Achieve

UNDERSTANDING JOURNEYS AND NEEDS

Macmillan Learning began the process of developing Achieve by working with instructors and students to understand their semester journeys and where we could most help them



LaunchPad
- Ease of use
- Intuitive design

LearningCurve
- Loved by students
- Uses learning research
- Provides adaptive quizzing to over 10 million students

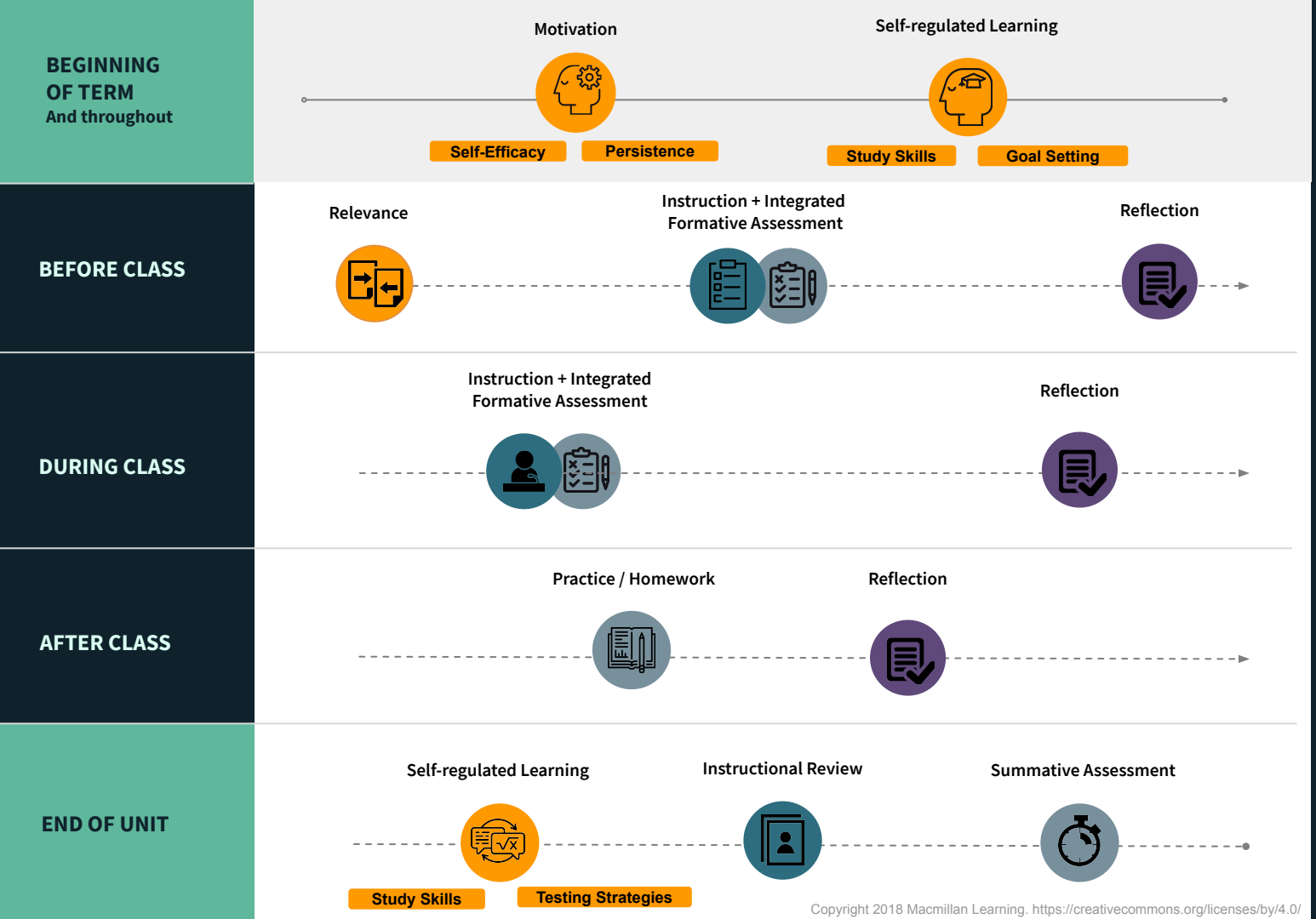
Sapling
- Online homework with feedback
- Excellent support

WriterKey
- Drafting
- Instructor commenting
- Peer review
- Analytics

iClicker
- Market leading student engagement system
- Automated geolocation attendance
- Simple & quick setup

FlipIt
- The most successful flipped class product in the last ten years
- Designed with extensive learning research baked in

Writer's Help
- Writing tools
- Smart search



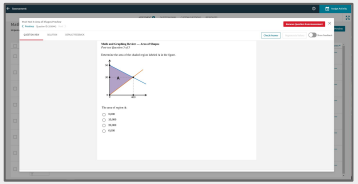
ACTIVE LEARNING

This Learning Model is comprised of four parts: Beginning of term (intended to encompass the first few periods or week), followed by a cycle that continues throughout the term with learning elements happening before, during, and after class.

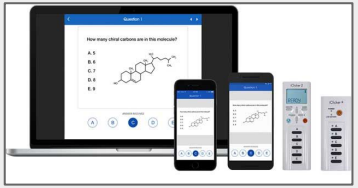
In this model, “class” can be face-to-face, blended, or online. This model can be applied to a class that meets once a week or multiple times per week.

RESEARCH-BASED AND EMPIRICALLY VALIDATED STRATEGIES FOR ALL INSTRUCTORS

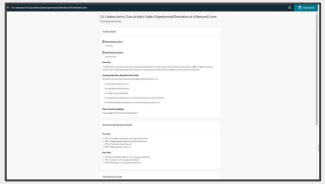
ACTIVE LEARNING TECHNIQUES FOR ALL COMFORT LEVELS



PRE-CLASS ACTIVITIES



iCLICKER INTEGRATION



IN-CLASS ACTIVITY GUIDES

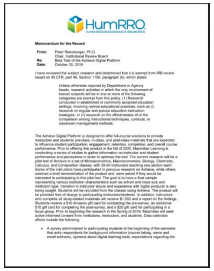
Removes the time blocker

Removes the resource blocker

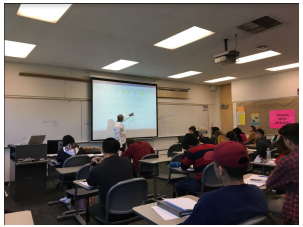
Removes the training blocker

ETHICAL RESEARCH PARTNERSHIPS WITH INSTRUCTORS

Institutional Review Board approval



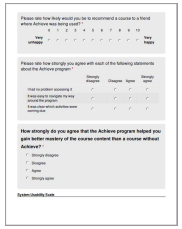
Representative sample of instructors



Institutional Review Board approval and longitudinal data collection to optimize the product and build a solid evidence base of effectiveness and learning gains

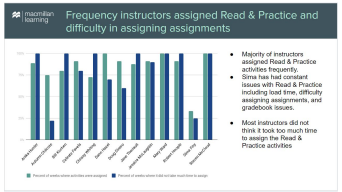
Background, demographics, experience

Student and instructor baseline surveys



Instructor usage

Weekly instructor implementation logs

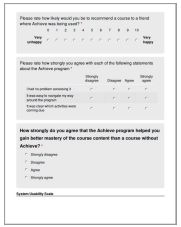


Educational context

Site visits (in-class observations of students, interviews, focus groups)

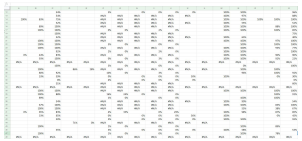
Student perceptions and changes in behavior

Student and instructor post-surveys



Student usage

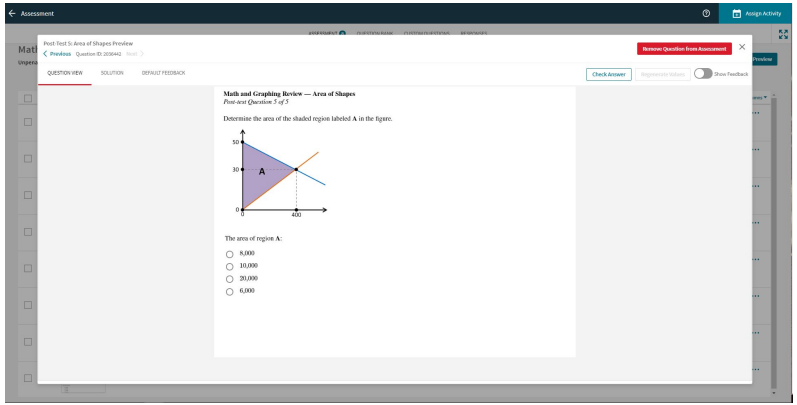
Student platform data

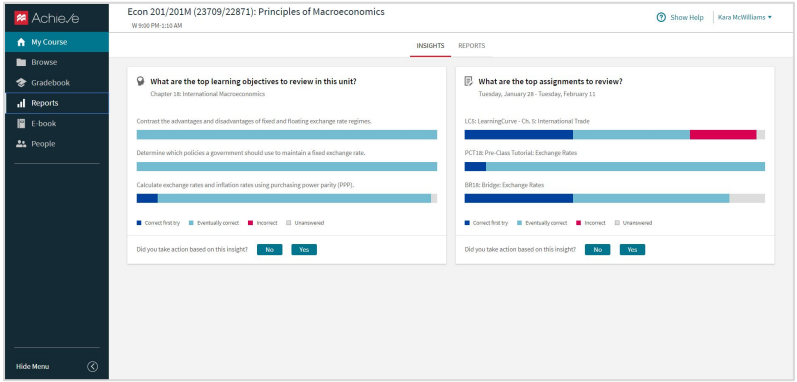


Student performance

Student course records (exam scores, final grades)

PRE-CLASS ACTIVITIES



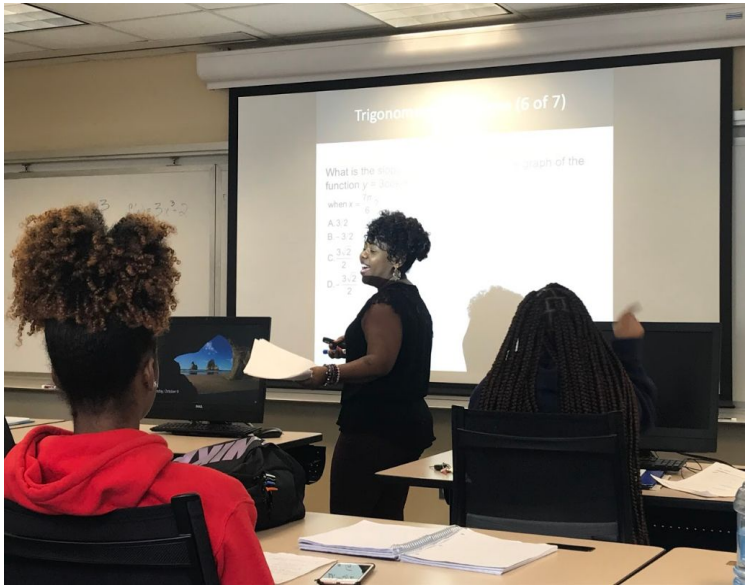


INSTRUCTOR CHALLENGE. Instructors have to spend class time on direct instruction, teaching core concepts and vocabulary leave very little time for higher order thinking discussions or activities

PRE-CLASS ACTIVITIES. Assigning brief tutorials with associated reinforcement questions before a student comes to class can promote reading, transfer core concepts, prepare students to actively participate in class, and support focused learning

IMPLEMENTATION. This technique is easily implemented by instructors of all comfort levels with active learning, because it does not fundamentally change the pedagogical approach in class, but frees up time for higher order thinking questions or discussion

PRE-CLASS ACTIVITIES



Pre-class activities	Student average	Instructor average
Pre-class activities helped me stay on track with the reading Pre-class activities helped my students stay on track with the reading	2.96	3.00
Pre-class activities helped me achieve a basic understanding of concepts Pre-class activities gave my students a basic understanding of concepts	3.08	3.03
Pre-class activities gave me a basic understanding of what we would be covering in class Pre-class activities gave my students a basic understanding of what we would be covering in class	3.11	3.00
Pre-class activities helped me actively learn in the classroom Pre-class activities enabled actively learn in the classroom	2.95	2.81
Pre-class activities helped me participate more in class than I normally do Pre-class activities promoted more classroom participation than there typically is in this course	2.74	2.81

"I love the pre-class activities, my students came to class more prepared so we could use time in class for iclicker quizzes - which they loved"

- Kiandra Johnson, Spelman College

PRE-CLASS ACTIVITIES

Hierarchical linear model to investigate whether engagement in pre-class activities predicts exam scores

- For every ten percentage increase in engagement with pre-class activities, students can expect an increase of 9.5 points on their final exam score, on average. (R^2 =.06, F(1,674)=46.64, p<.0001)
- Model statistically significant when controlling for prior academic performance (p=<.001), motivation not significant

		Model 1	Model2	Model 3	Model 4
	Fixed effects				
Intercept		72.403* (2.36)	35.33* (4.85)	35.33* (4.84)	23.48* (5.62)
HSGPA			8.14* (1.14)	8.14* (1.14)	8.03* (1.13)
Motivation			1.16 (1.32)	1.16 (1.32)	1.09 (1.30)
Pre-class					19.47* (3.61)
	Error variance				
Level-1		369.51* (13.82)	352.98* (14.35)	352.98* (14.35)	341.24* (13.95)
Level-2intercept		116.89* (35.54)	120.47* (37.04)	120.52* (37.06)	229.77* (79.62)
HSGPA				0	0
Motivation				0	0
	Model fit				
AIC		12839	10850.7	10850.7	10828.2
BIC		12844.2	10859.2	10859.2	10838.5

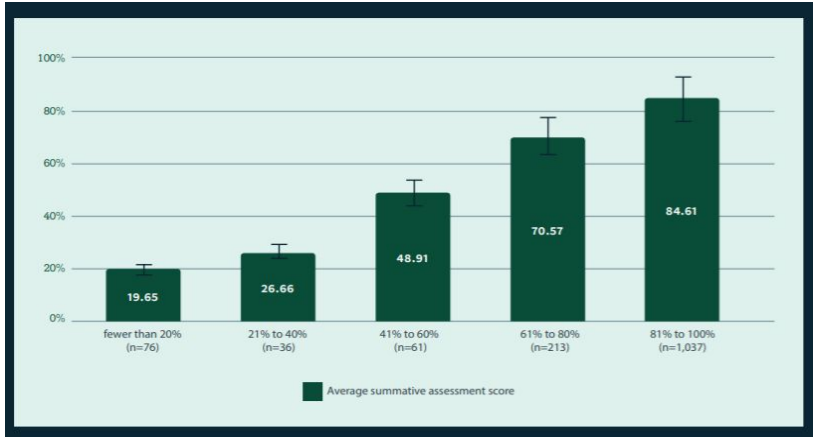
Note: * denotes statistical significances, p<.05; ICC= .25, error variances reported in Table 2
Values based on SAS PROC MIXED. Entires show parameter estimates with standard errors in parentheses
Estimation Method = ML; Satterthwaite degrees of freedom

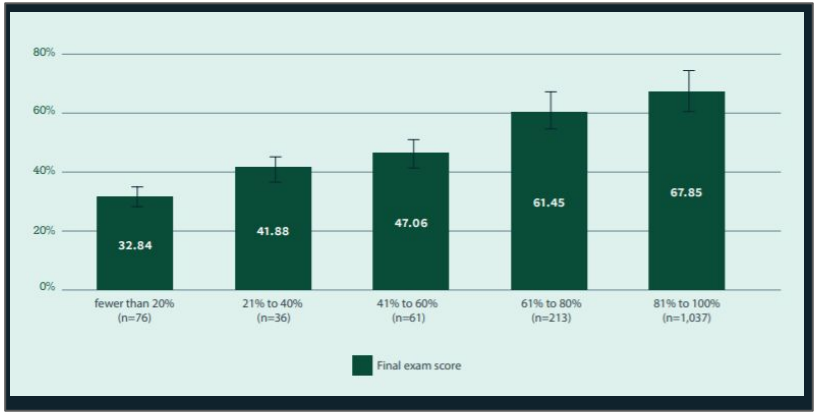
PRE-CLASS ACTIVITIES

"I had never used pre-class activities before but it really changed the way my classes engaged. I was able to tell before class where they were struggling and what we could skip going over because they already comprehended it.

There was much more active engagement in class discussion and I didn't even have to change much."

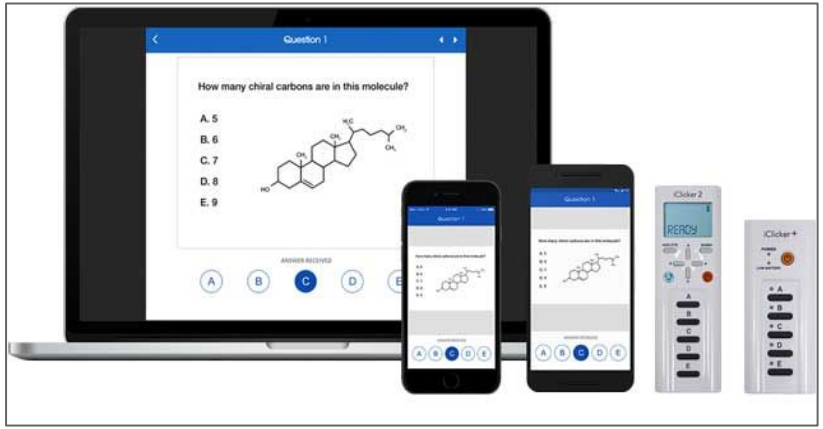
- Tony Hascall, Northern Arizona University

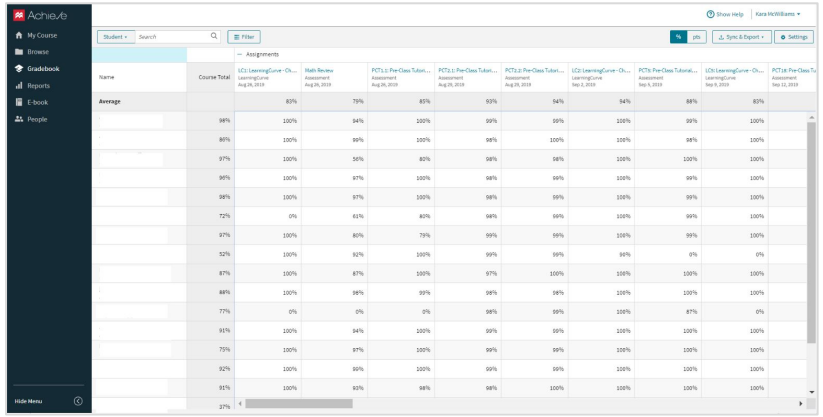




*Please find the full study and all technical details at https://www.macmillanlearning.com/college/us/learning-science/results

iCLICKER INTEGRATION





INSTRUCTOR CHALLENGE. Instructors don't have the capacity to develop resources to use in class or the time to manage student engagement activities

iCLICKER INTEGRATION. iClicker is a simple way to effectively engage students, and iClicker questions developed by subject matter experts are included with every discipline in Achieve, and seamlessly integrate with the Achieve experience

IMPLEMENTATION. While implementing student response systems in class is a change in pedagogy, our research has shown that instructors find them very easy to use and that they enhance teaching

iCLICKER INTEGRATION

*Please find the full study and all technical details at https://www.macmillanlearning.com/college/us/learning-science/results

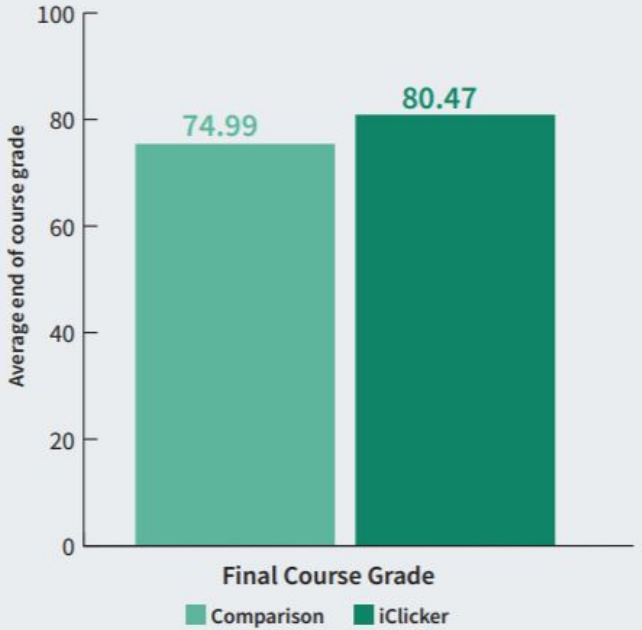
iCLICKER INTEGRATION

iClicker significantly increases end of course grades

Average final course grades were compared between all iClicker students and non-iClicker students. Students who had used iClicker had statistically significantly higher end of course grades (average end of course grade = 80.47) by almost 10 percentage points than students who did not use iClicker (average end of course grade = 74.44).

To account for non-randomization and differences in average level of prior academic performance and baseline level of motivation, both variables were statistically controlled for ($R^2 = .19$, Adj. $R^2 = .17$, $*p < .05$).

Figure 1. Comparison of average end of course grades between all iClicker and non-iClicker students

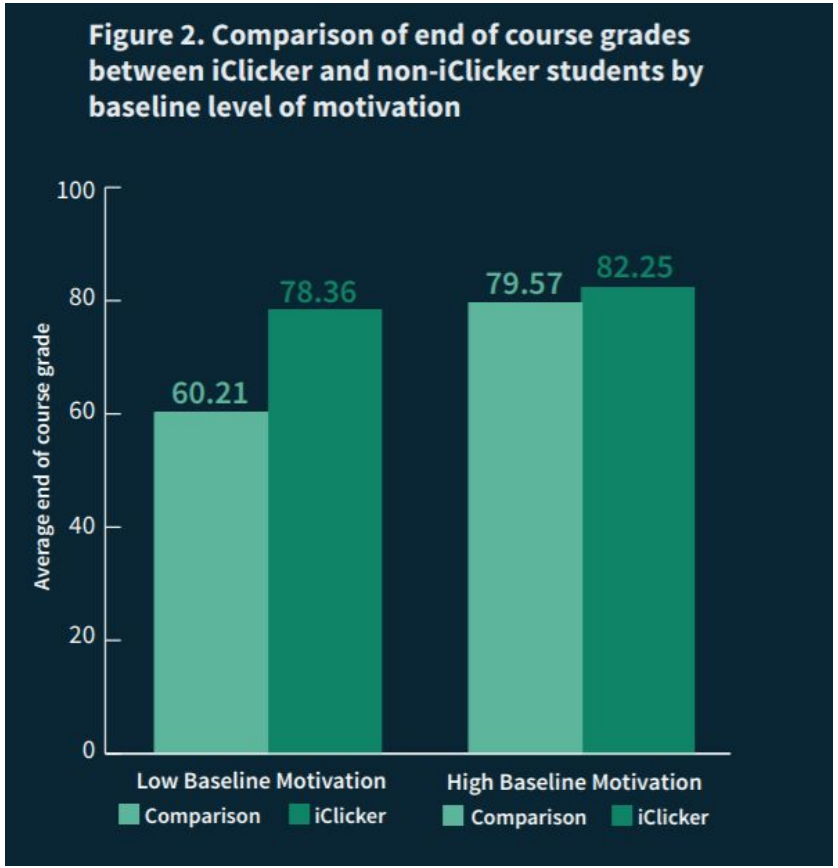


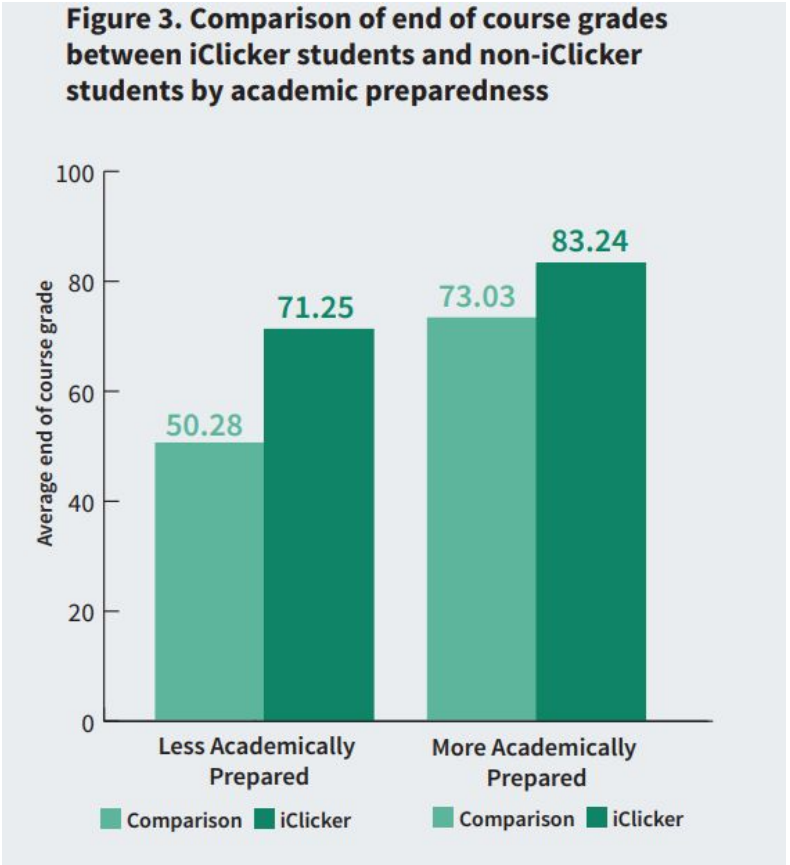
"Integrating iClicker was a simple way to increase student engagement, it definitely keeps the students engaged but I also see it increasing interaction between them.

It's also a really great way to review with exams, I can tell that the clicker review helps increase course grades."

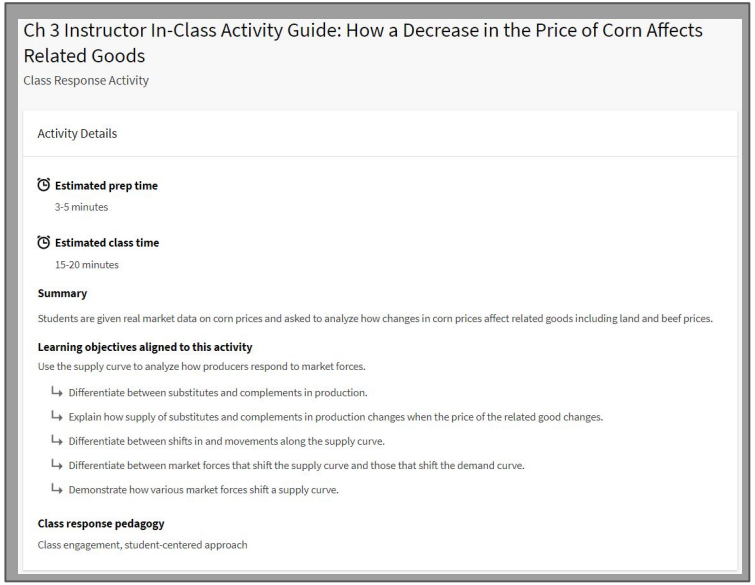
- Solina Lindahl, California Polytechnic University

iCLICKER INTEGRATION





IN-CLASS ACTIVITY GUIDES



Ch 3 Instructor In-Class Activity Guide: How a Decrease in the Price of Corn Affects Related Goods

Class Response Activity

Activity Details

Estimated prep time

3-5 minutes

Estimated class time

15-20 minutes

Summary

Students are given real market data on corn prices and asked to analyze how changes in corn prices affect related goods including land and beef prices.

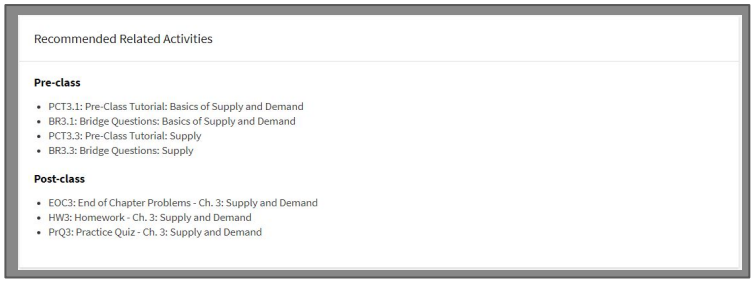
Learning objectives aligned to this activity

Use the supply curve to analyze how producers respond to market forces.

- Differentiate between substitutes and complements in production.
- Explain how supply of substitutes and complements in production changes when the price of the related good changes.
- Differentiate between shifts in and movements along the supply curve.
- Differentiate between market forces that shift the supply curve and those that shift the demand curve.
- Demonstrate how various market forces shift a supply curve.

Class response pedagogy

Class engagement, student-centered approach



Recommended Related Activities

Pre-class

- PCT3.1: Pre-Class Tutorial: Basics of Supply and Demand
- BR3.1: Bridge Questions: Basics of Supply and Demand
- PCT3.3: Pre-Class Tutorial: Supply
- BR3.3: Bridge Questions: Supply

Post-class

- EOC3: End of Chapter Problems - Ch. 3: Supply and Demand
- HW3: Homework - Ch. 3: Supply and Demand
- PrQ3: Practice Quiz - Ch. 3: Supply and Demand

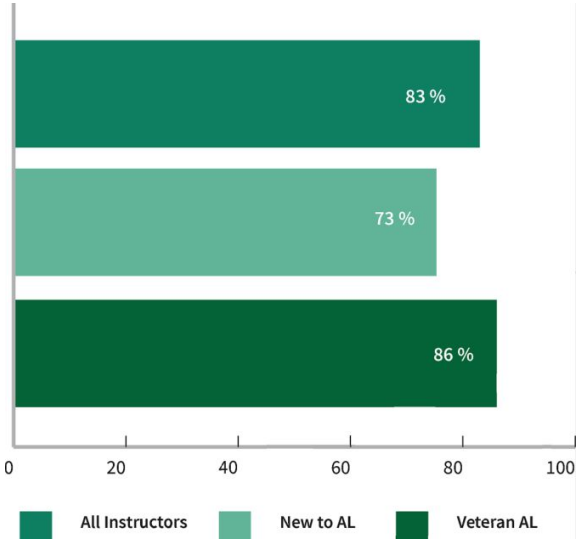
INSTRUCTOR CHALLENGE. Instructors tell us they don't have the training and/or guidance to implement active learning techniques in their courses

IN-CLASS ACTIVITY GUIDES. in-class activity guides offer step-by-step guidance on activities that instructors can implement in class to increase engagement. They also offer suggested resources for pre-class activities and suggested after class resources to reinforce learning.

IMPLEMENTATION. Guides offer a comprehensive active learning pedagogy, but the simple and clear instructions make them effectively implemented by both instructors new to active learning and veterans of the techniques

IN-CLASS ACTIVITY GUIDES

% Instructors who implemented active learning in their course this semester



How typical that amount of active learning was for their course

	Less AL than typical	Typical amount of AL	More AL than typical
All instructors	6.82	34.09	56.82
New to AL	0	8.33	91.67
Veteran AL	6.45	48.39	41.94

% of instructors selecting that response option

IN-CLASS ACTIVITY GUIDES

95%

Implemented active learning techniques

65%

Did not implement active learning techniques

How typical is this level of engagement in this course

	All instructors	Biology	Calculus	Chemistry	Composition	Economics
First time teaching	1.89	0.00	0.00	0.00	0.00	5.88
Less engaged than typical	11.32	10.00	12.50	14.29	27.27	0.00
Typical	47.17	20.00	62.50	28.57	63.64	52.94
More engaged than typical	39.62	70.00	25.00	57.14	9.09	41.18

> “ ...these students worked together far more than is common. Like a lot more. They have long meetings in the library several times a week, and a significant portion of the class goes. It is, in one word, amazing.
>
> - William Griffiths

IN-CLASS ACTIVITY GUIDES

How typical is this level of engagement in this course

	All instructors	Biology	Calculus	Chemistry	Composition	Economics
First time teaching	1.89	0.00	0.00	0.00	0.00	5.88
Less engaged than typical	11.32	10.00	12.50	14.29	27.27	0.00
Typical	47.17	20.00	62.50	28.57	63.64	52.94
More engaged than typical	39.62	70.00	25.00	57.14	9.09	41.18

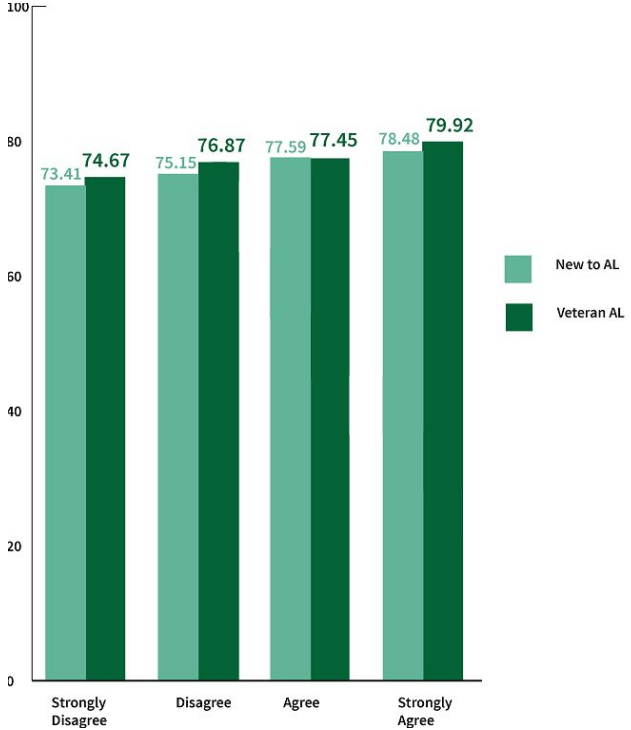
> “...these students worked together far more than is common. Like a lot more. They have long meetings in the library several times a week, and a significant portion of the class goes. It is, in one word, amazing.
>
> - William Griffiths

Instructor tips

- Have a clear plan for your activities
- Have all resources organized and ready to deploy
- A clear sense of where the class is in terms of preparation will help
- Monitor group activities providing support when needed

IN-CLASS ACTIVITY GUIDES

Final exam score by perception of active learning



The stronger a student's perception of active learning in the course, the higher their final exam scores tended to be

Instructor tips

- Have a clear plan for your activities
- Have all resources organized and ready to deploy
- A clear sense of where the class is in terms of preparation will help
- Monitor group activities providing support when needed

"

Student interactions appeared to result in better test scores for the students involved

- Kenneth Roland, South Mountain Community College

This is where Achieve was more helpful than my normal protocol. I would have students work together and learn from one another as they completed the Achieve assignments.

- Jonathan Lamb, Pellissippi State Community College

CONCLUSION

Whether you are new to active learning or have used engagement techniques before, our research shows active learning with iClicker and Achieve will support your students.

Professor Wenzel's Economics class at San Francisco State University

NEXT STEPS

- To request access to Achieve or learn more, visit macmillanlearning.com/achieve or contact your rep.
- To try iClicker or sign up for a demo, visit iclicker.com.
- To partner on a research study please contact: Kara McWilliams at kara.mcwilliams@macmillan.com