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Evaluating the Effectiveness of Readiness Assurance Testing as Part of Team-Based Ecology Instruction

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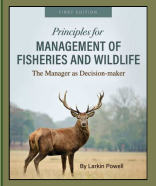
Team-Based Instruction

Team-based learning is an instructional approach designed around units of related content and a three-step process of material exposure and reinforcement.

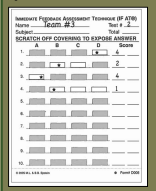
Step 1: Out of Class Preparation



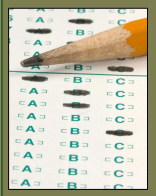
In our course, students were expected to complete short, assigned readings outside of class before each unit.

Step 2: Readiness Assurance Testing

The first class of each unit is devoted to individual (iRAT) and team (tRAT) readiness assurance testing. First, every student takes a ten-question rank-choice multiple choice test (iRAT). Every question has four answer choices and students assign the response they think is most correct a "1" and the least probable answer a "4" with intermediate values for the other two choices. Students then answer the same ten multiple choice questions in a team (tRAT) using an IF-AT scratch card. After reaching a consensus on the correct answer, a group member scratches the corresponding square and this process continues until a star, denoting the correct answer, is uncovered.



Step 3: In-Class Activities and Summative Assessment



In our course, in-class time is split between lecture and hands-on group activities. Students take a summative assessment following every second unit.

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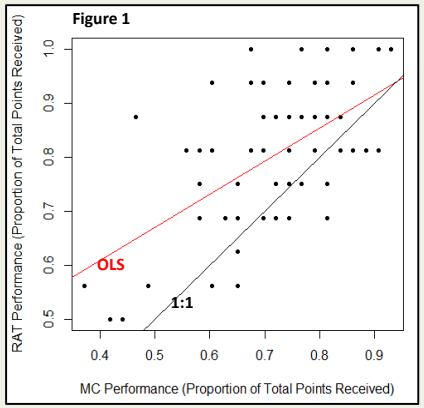
Conclusions

- **Students get a larger proportion of RAT questions correct on exams than other multiple choice questions (Table 1, RAT~MC Intercept),** supporting the claim that this instructional technique provides better content-retention than other in-class activities.
- **There is a stronger correlation between correct multiple choice questions and course performance than RAT questions and course performance (Table 1),** suggesting that all students benefit from RAT participation, but poor-performing students receive additional benefit.
- **All students score worse on multiple choice questions than their course performance would predict (Figure 3),** suggesting these questions are more difficult than other course content and may not accurately reflect student learning.

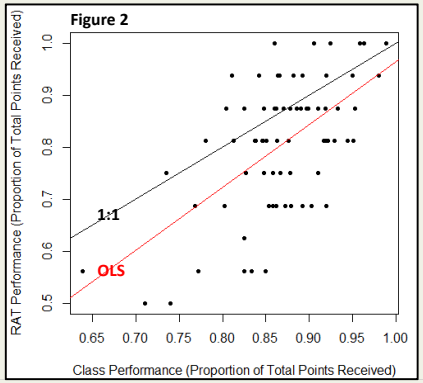
Results

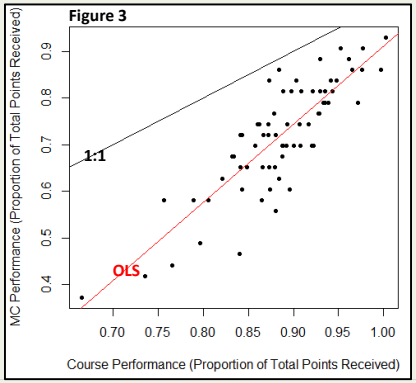


Model	Intercept	Slope	r	r P-value
RAT~MC	0.3638	0.6119	0.5737	>0.0001
RAT~Class	-0.2417	1.2057	0.5943	>0.0001
MC~Class	-0.7630	1.6740	0.8431	>0.0001

Table 1. Parameter estimates and coefficient of correlation from OLS models. Parameters do not appropriately reflect error in x, but may be interpreted to predict change in y.

Figure 1.OLS regression (red) showing the proportion of correct RAT responses predicted by correct multiple choice (MC) responses. 1:1 represents a perfect correlation between the proportion of correct MC and RAT responses. Points represent observed data.
Figure 2. OLS regression (red) showing the proportion of correct RAT responses predicted by the proportion of total points received in the course, adjusted to remove the RAT contribution. 1:1 represents a perfect correlation between the proportion of correct RAT responses and course performance. Points represent observed data.
Figure 3. OLS regression (red) showing the proportion of correct multiple choice (MC) responses predicted by the proportion of total points received in the course, adjusted to remove the MC contribution. 1:1 represents a perfect correlation between the proportion of correct MC responses and course performance. Points represent observed data.





Problem

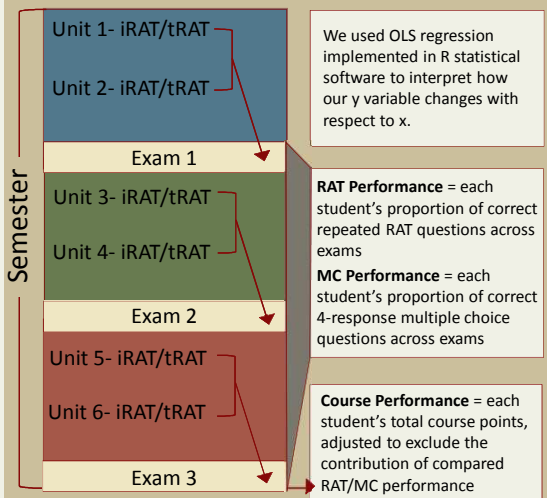
Readiness Assurance Testing (RAT) incorporates content recall[1], immediate feedback[2] and peer instruction[3], three strategies known to enhance student learning, into a single classroom activity. While iRAT and tRAT assessments are promising instructional tools, they are time-intensive to administer.

Questions

1. **Do iRAT/tRAT tests promote student retention of content better than other in-class activities, justifying the investment of instructional time?**
2. **Are iRAT/tRAT tests beneficial across the spectrum of academic performance?**

Methods

Undergraduate Wildlife Ecology Course



We used OLS regression implemented in R statistical software to interpret how our y variable changes with respect to x.

RAT Performance = each student's proportion of correct repeated RAT questions across exams

MC Performance = each student's proportion of correct 4-response multiple choice questions across exams

Course Performance = each student's total course points, adjusted to exclude the contribution of compared RAT/MC performance

References

[1]Roediger, H.L. III., and A.C. Butler. 2011. The critical role of retrieval practice in long-term retention. Trends in Cognitive Sciences 15: 20-27.
[2]Kulik, J.A., and C.C. Kulik. 1988. Timing of feedback and verbal learning. Review of Educational Research 58: 79-97.
[3]Tessier, J. 2004. Using peer teaching to promote learning in biology. Journal of College Science Teaching 33: 16-19.