



Effects of Graded versus Ungraded Individual Readiness Assurance Scores in Team-Based Learning: A Quasi-experimental Study

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INTRODUCTION

Team-based learning (TBL) is the predominant pedagogy employed in the preclinical years 1 and 2 at the Lee Kong Chian School of Medicine (LKCSOM). The two main phases of TBL include the **pre-class preparation** phase, where students read up on the preparation materials provided prior to the lesson, and the **individual readiness assurance test (iRAT)** phase, where students individually attempt a quiz at the start of TBL to test aforementioned preparation.

iRAT is considered the backbone of TBL (Michaelson and Sweet, 2008) and Burgess et al. (2008) proposed that an appropriate structure, such as making iRAT scores part of the final summative grade, should be in place to stimulate student preparation for iRAT. However, McLachlan (2006) argued that grading the iRA may inhibit learning by causing students to feel anxious over assessments.

In 2015, LKCSOM changed the iRAT which was previously graded to ungraded. Hence, this gave rise to the following research questions that the study aimed to answer:

- 1. Does making the iRA graded affect the level of preparation?
- 2. Does it affect learning in the long term?

METHODOLOGY

Using a quasi-experimental design, Year 1 and 2 students' **download frequency for their pre-class materials, performance on iRAT** and **year-end examination** were examined under two conditions; (1) under which the iRAT was graded and (2) under which the iRAT was ungraded.

Cohort	Year 1	Year 2
2013	Graded	Graded
2014	Graded	Ungraded
2015	Ungraded	Ungraded

Fig. 1 Table showing change in iRAT grading for 2013, 2014 and 2015 cohorts across Years 1 and 2

220 medical students from three consecutive cohorts (2013 to 2015) from LKCSOM were included in the study. Of note, the 2014 cohort experienced graded iRATs in Year 1 and ungraded iRATs in Year 2. Differences between both conditions were tested by means of six separate ANCOVAs, with Bonferroni correction.

RESULTS

Results revealed that students were downloading more pre-class materials prior to their TBL sessions (Fig. 1, $p<.001$), and performed significantly better (Fig. 2, $p<.001$) on iRAT when their performance was graded, even after controlling for cohort effects. Performance on iRAT also appeared to affect performance on their examination scores (Fig. 3, $p=.005$). The results of the study suggest that grading has a positive effect on download frequency, students' iRAT scores and year end examination scores.

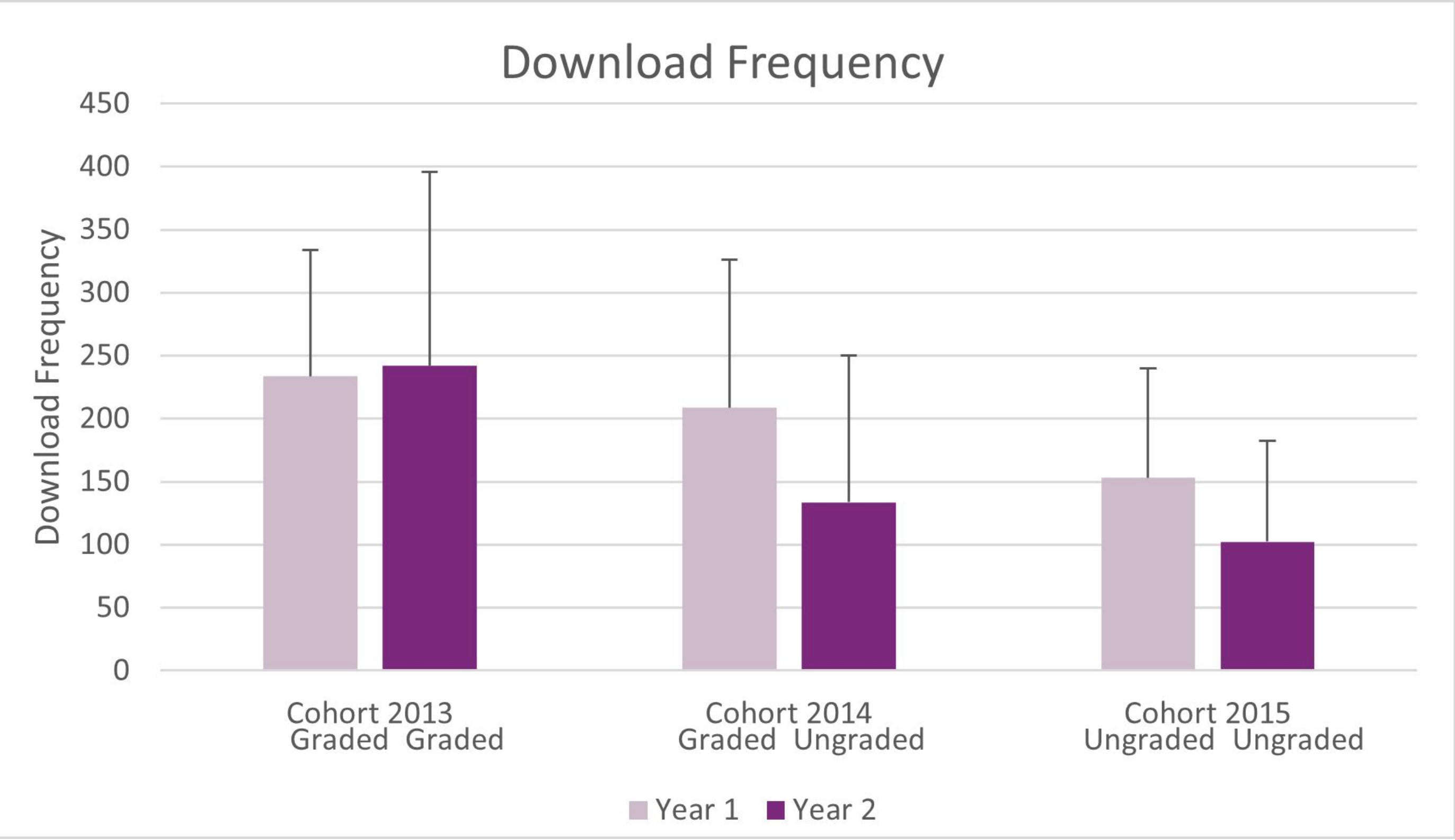


Fig. 2 Graph representing the number of times each student downloaded the pre-class materials (i.e. download frequency) for all TBL sessions in each academic year, across the three cohorts. The error bar represents one standard deviation above the mean value (+ 1 SD). Note: The vertical axis ranges from 0 to 450.

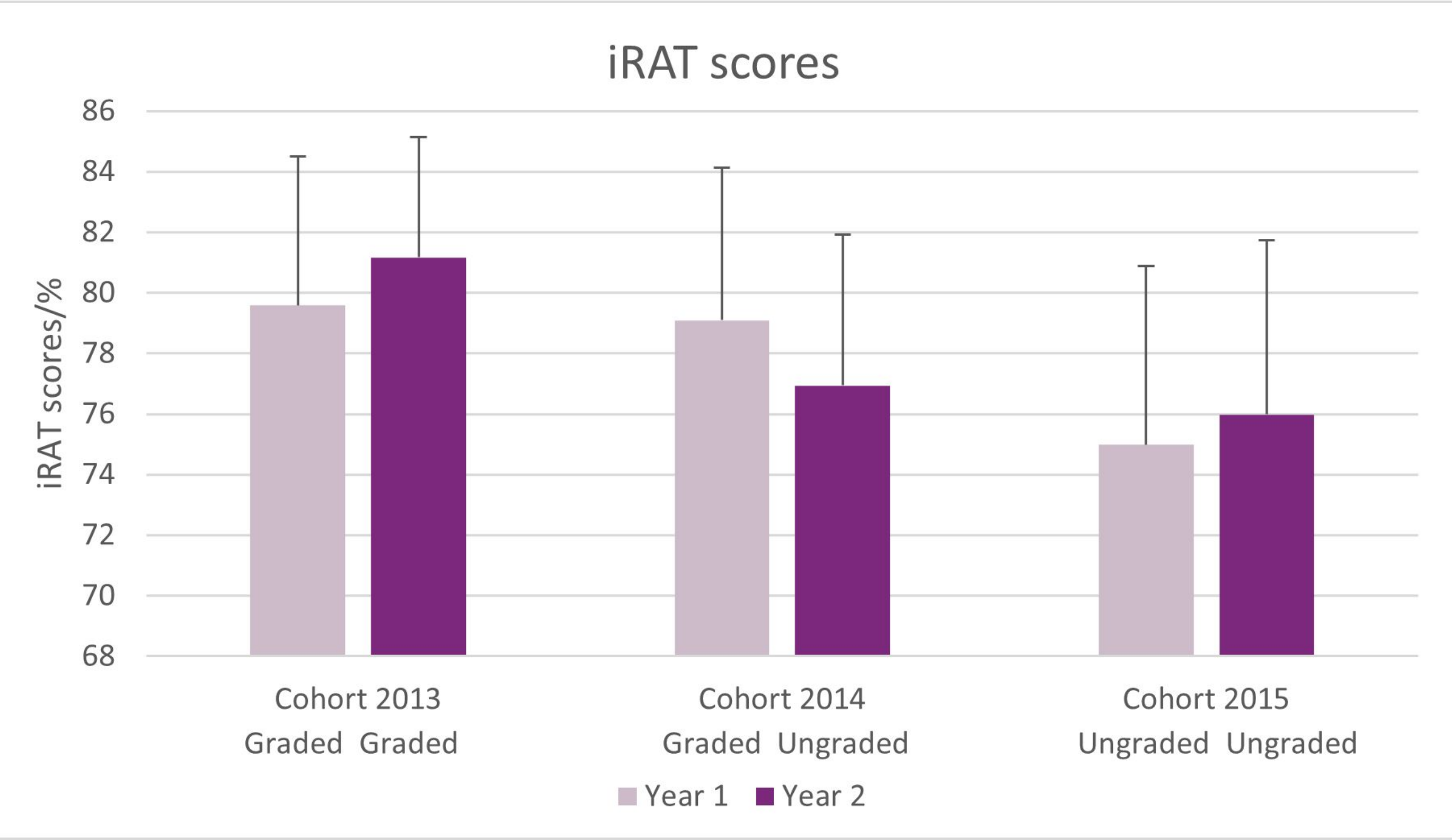


Fig. 3 Graph representing Year 1 and Year 2 iRAT percentage (%) scores across the three cohorts. Maximum iRAT score was 100%. The value in the bar indicates the mean iRAT percentage scores of each cohort. The error bar represents one standard deviation above the mean value (+ 1 SD). Note: The vertical axis ranges from 68 to 86%.

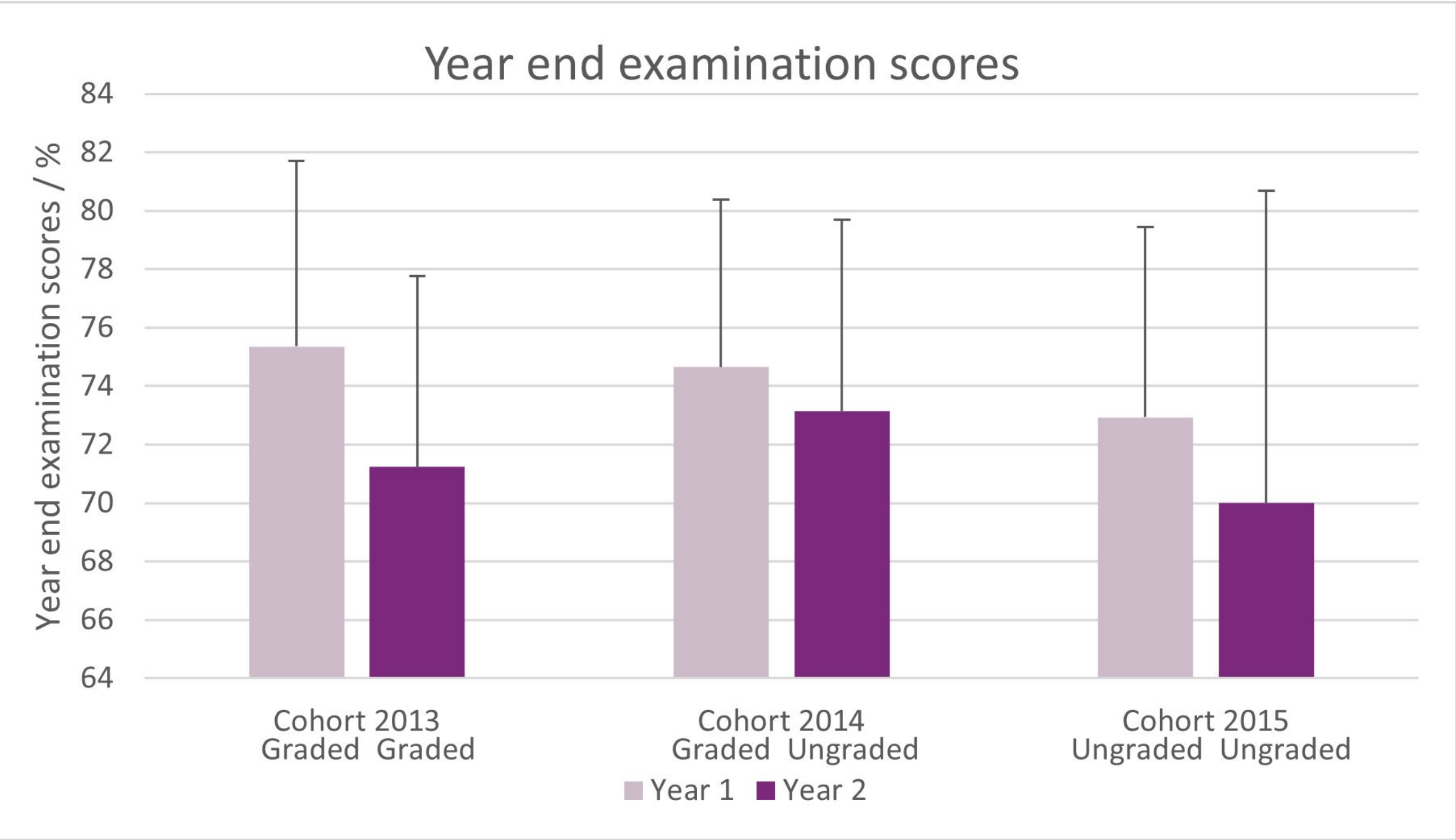


Fig. 4 Graph representing Year 1 and Year 2 examination percentage (%) scores across the three cohorts. Maximum examination score was 100%. The value in the bar indicates the mean examination percentage scores for each cohort. The error bar represents one standard deviation above the mean value (+ 1 SD). Note: The vertical axis ranges from 64 to 84%.

DISCUSSION & CONCLUSION

The objectives of the study were to explore the effects of changing iRAT from graded to ungraded on in-class preparation and long-term learning.

Results showed that students **prepared more before class when iRAT was graded** as evidenced by significantly higher download frequency which translated to correspondingly **better performance in iRAT and year end examinations**. This supports prevailing literature advocating for grading TBL as it can create a higher level of accountability for pre-class preparation (Michaelson and Sweet, 2008) and allow learners to develop normative behaviours, such as pre-class preparation, and it is thus crucial to the learning process (Haidet et al., 2012).

However, this does not call for the total removal of ungraded iRAT nor demand that all TBL exercises be graded as benefits to team development in an ungraded setting have yet to be explored.

Future research can explore the effects of **grading on team dynamics and processes in TBL** and substantially increasing the iRAT weightage to correspond to the time devoted to TBL during the semester as suggested by Parmelee et al. (2012).

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