

An Applied Mathematics Pre-assessment to Identify At-risk Students and Promote Early Engagement in Pharmacy Calculations

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INTRODUCTION

- Decline in North American Pharmacist Licensure Examination (NAPLEX) pass rates nationwide¹
- Pharmacy calculations is the lowest scoring domain over the past three years²⁻⁴
- Limited data on incoming pharmacy students' academic readiness (GPA, PCAT retired)
- Early identification systems may identify students too late for timely intervention

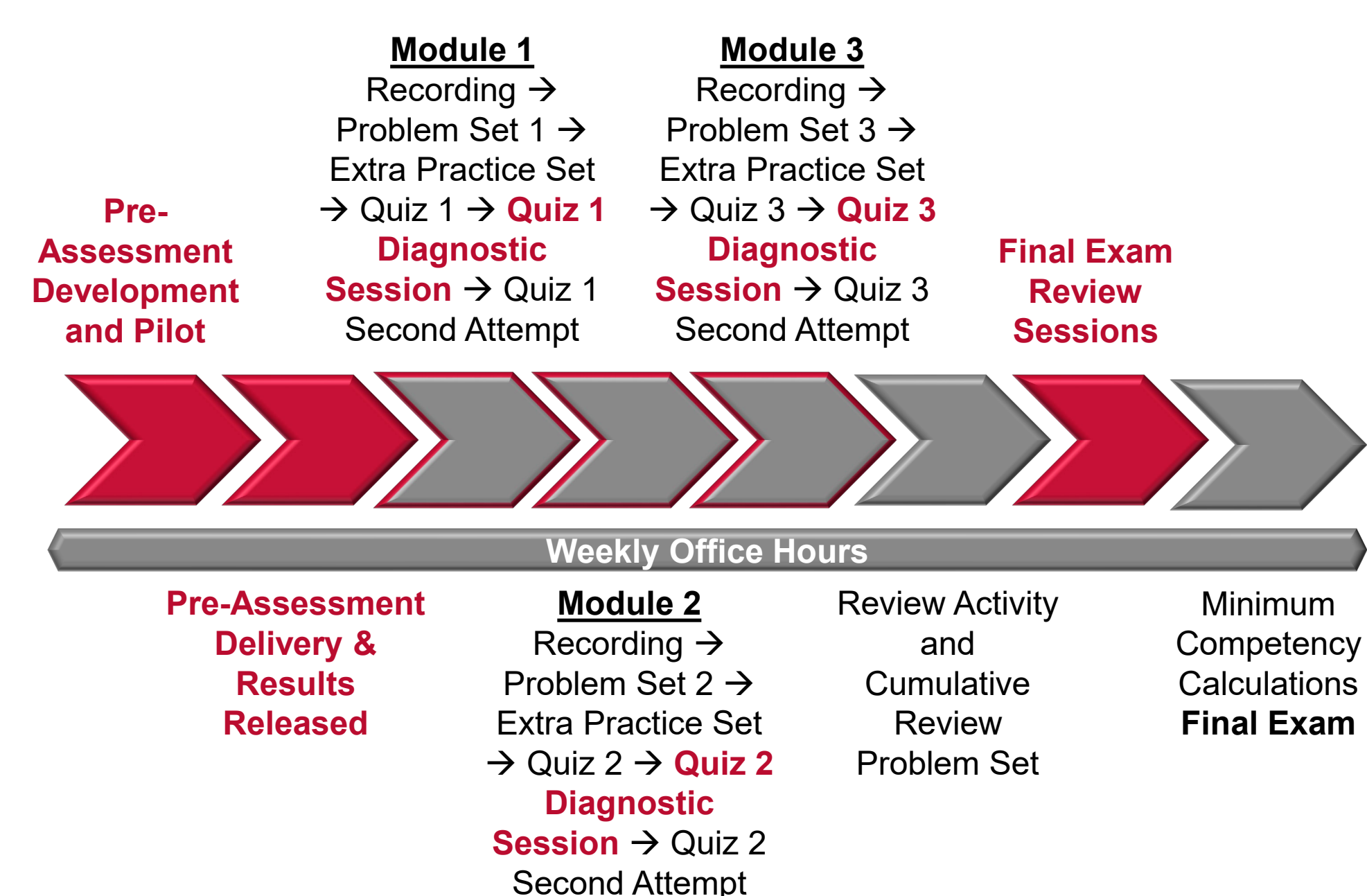
PURPOSE

- Identify at-risk students using an applied mathematics pre-assessment
- Determine the perceived and actual impact of student pre-assessment and engagement with optional office hours, quiz diagnostics sessions, and exam review sessions on pharmacy calculations final exam performance

METHODS

- Retrospective cohort study of first-year pharmacy students (P1s)
- Outcomes of an applied mathematics pre-assessment and pharmacy calculations final exam were compared
- Factors that significantly contributed to success on the final exam were examined using univariate and multivariate logistic regression analyses
- Student perceptions of the pre-assessment and engagement opportunities were collected on the final course evaluation survey administered via Qualtrics

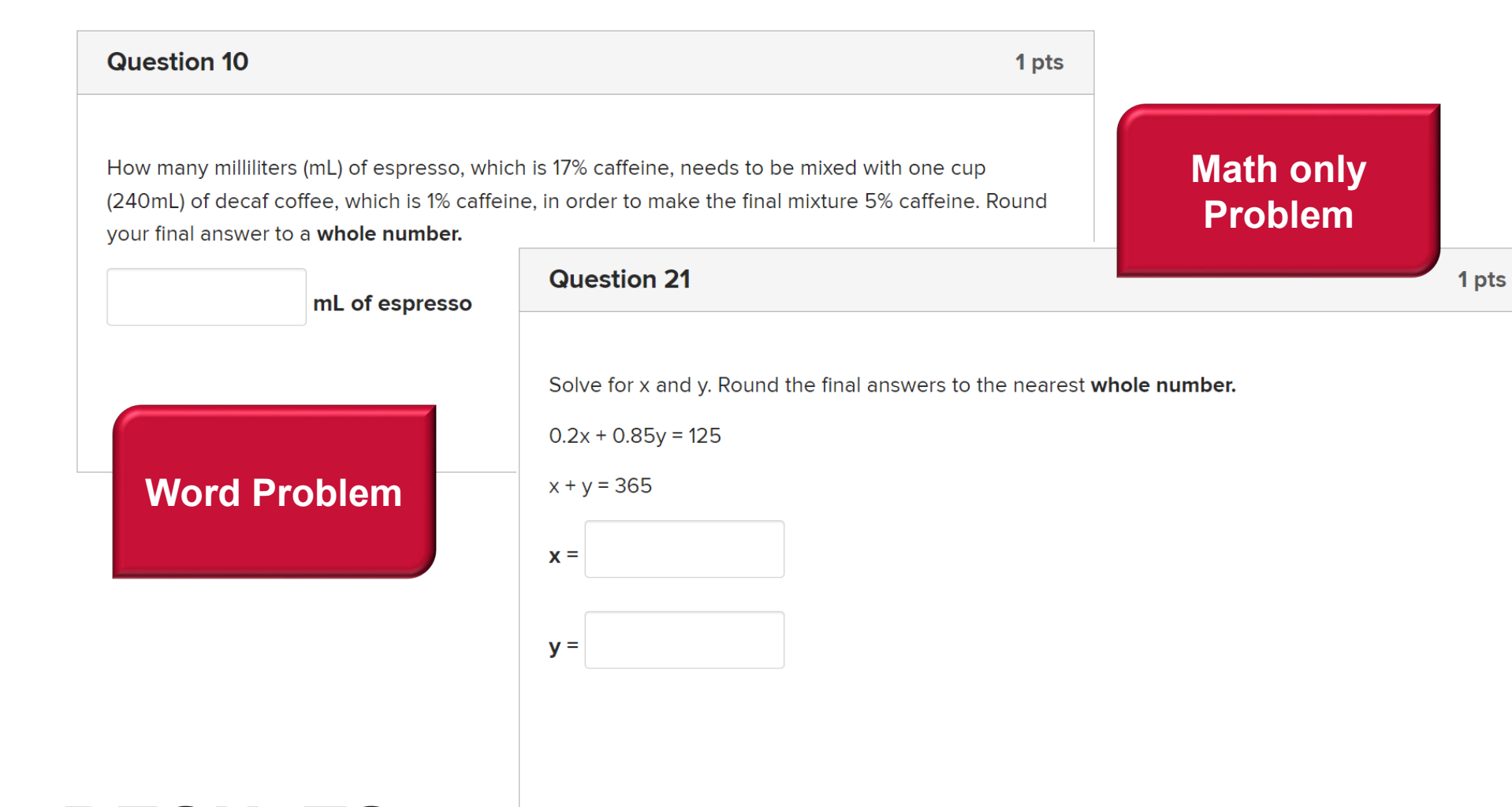
Pharmacy Calculations in P1 Integrated Patient Care Laboratory (IPCAL 1)



METHODS

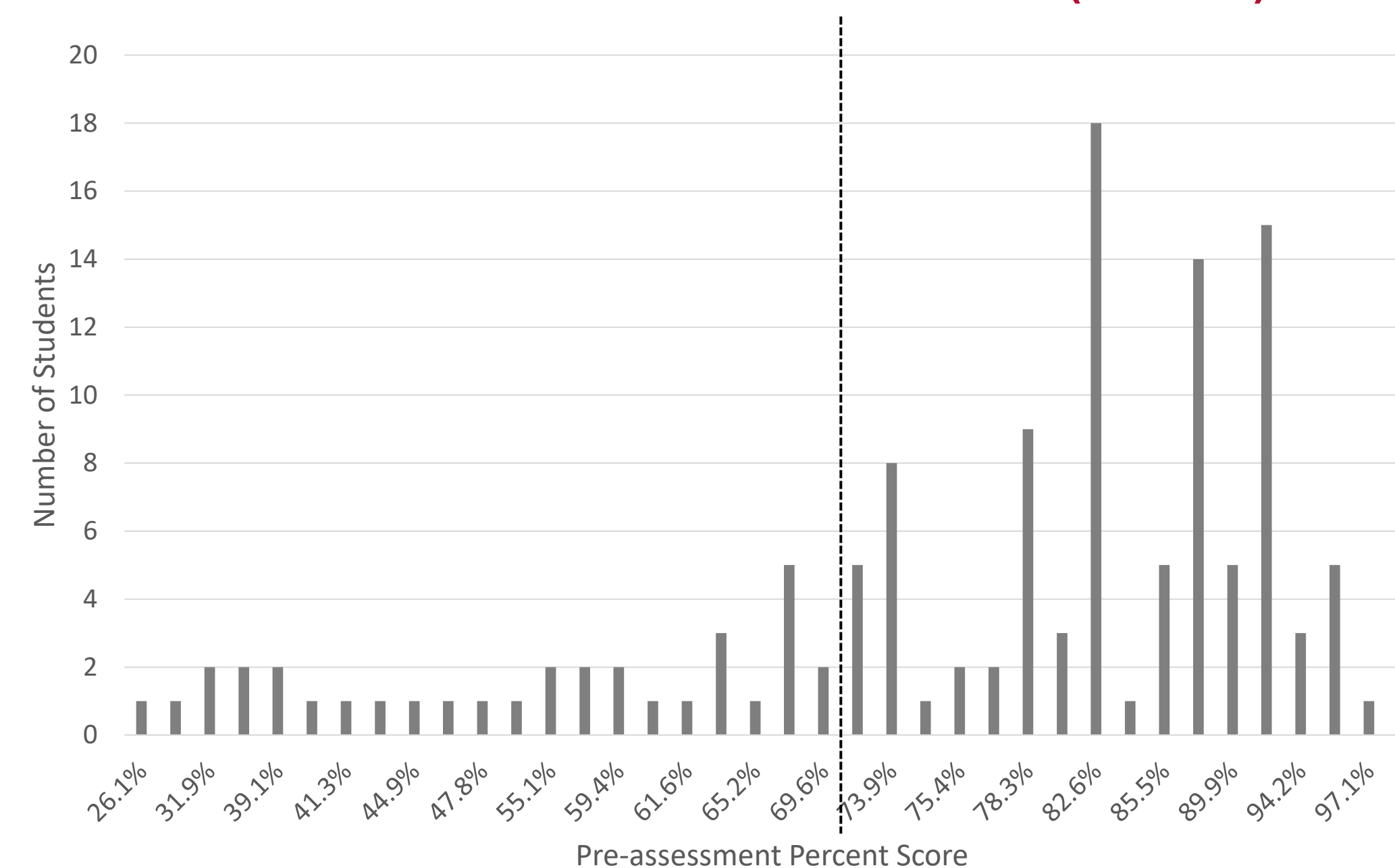
Applied Math Pre-assessment (Readiness Activity)

- Twenty-two calculations questions (open-response) and one critical thinking question (select all)
 - Thirteen word problems and nine math only
- Tagged to calculations content areas
- NOT written in pharmacy context

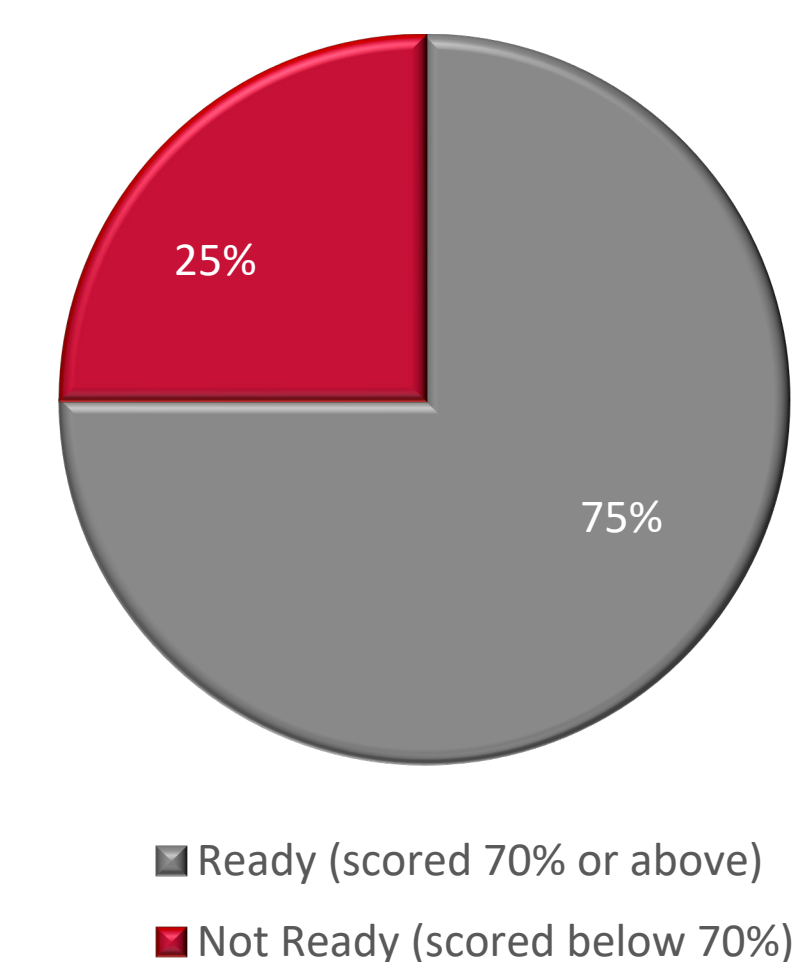


RESULTS

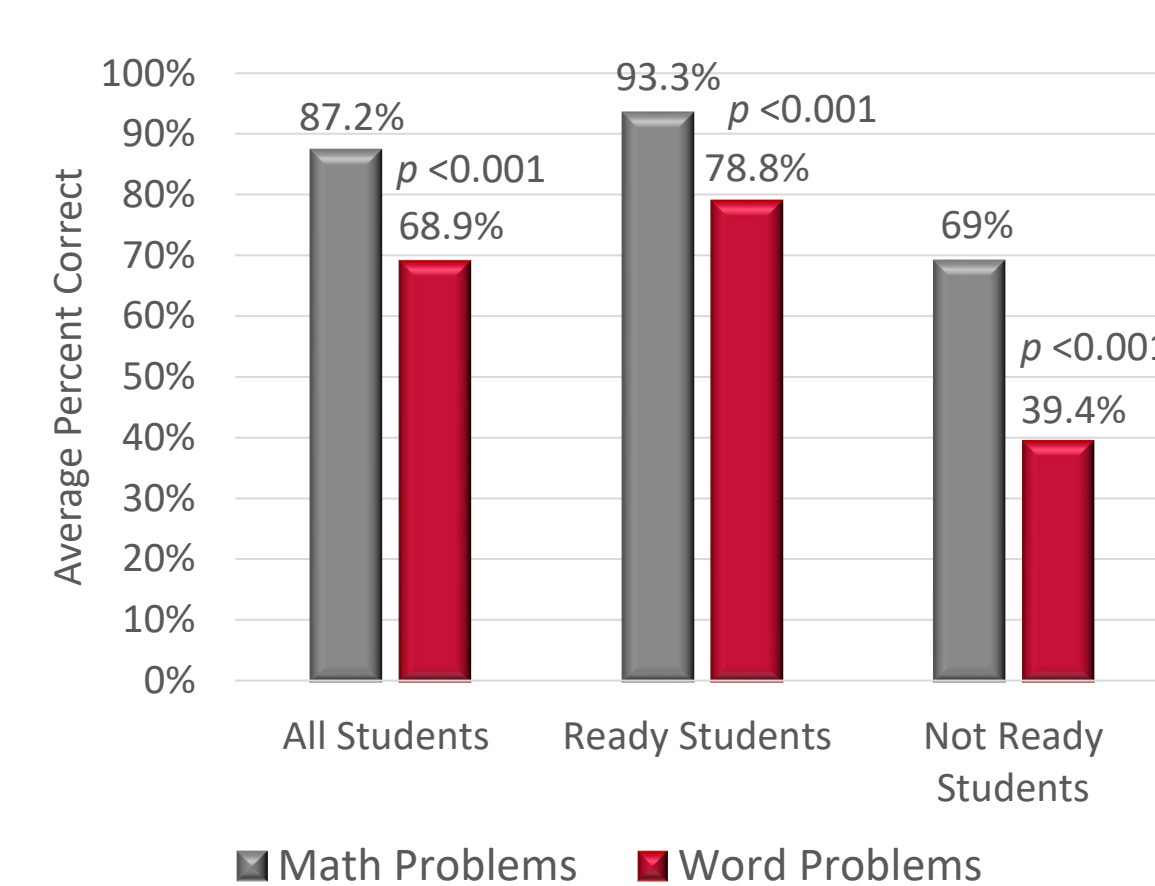
Pre-assessment Score Distribution (n = 136)



Pre-assessment Scores



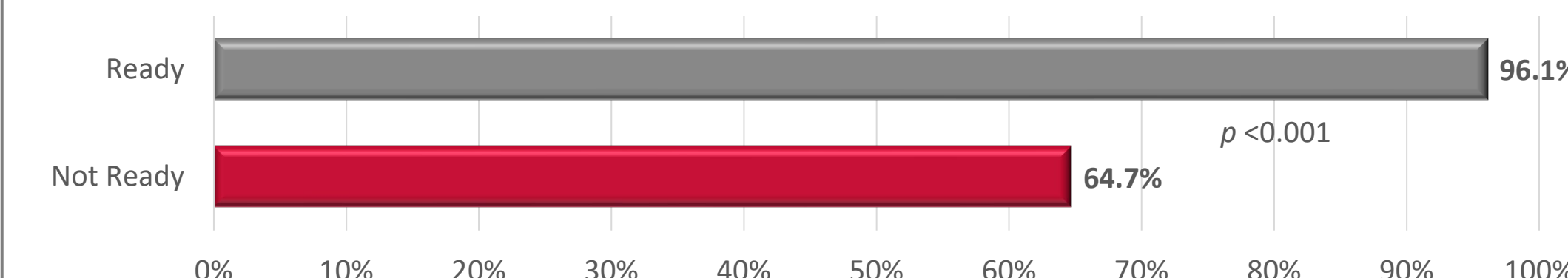
Math vs. Word Problems



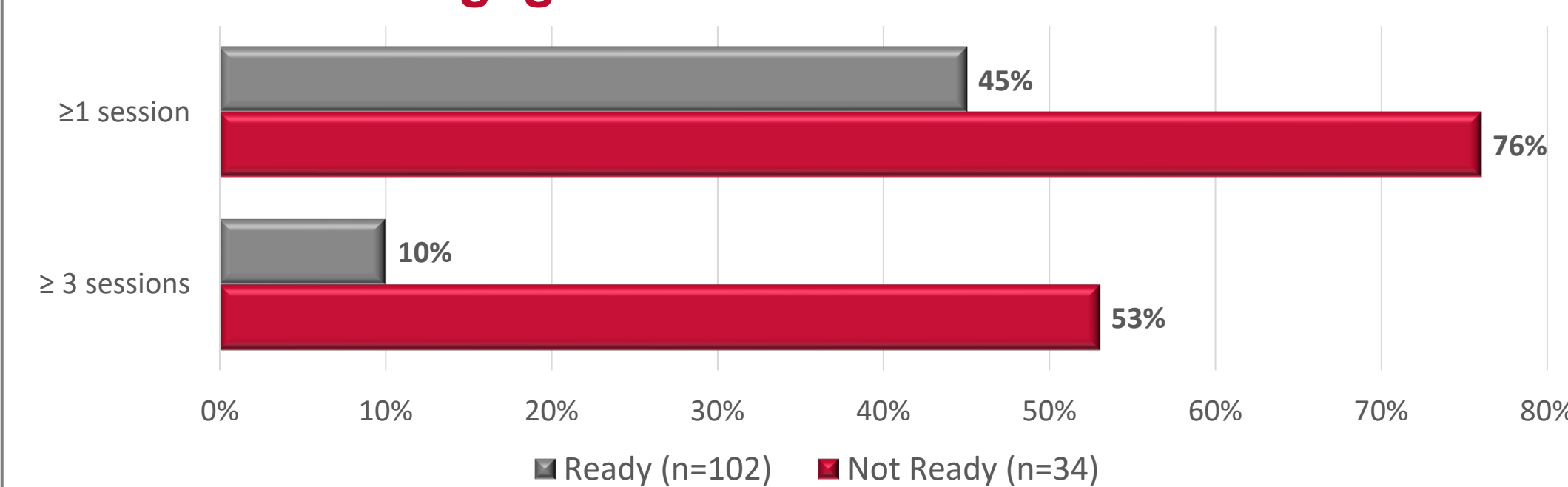
RESULTS

- Performance on the applied math pre-assessment positively correlated with the calculations final exam (Pearson's correlation coefficient $r=0.66$, $p<0.001$)

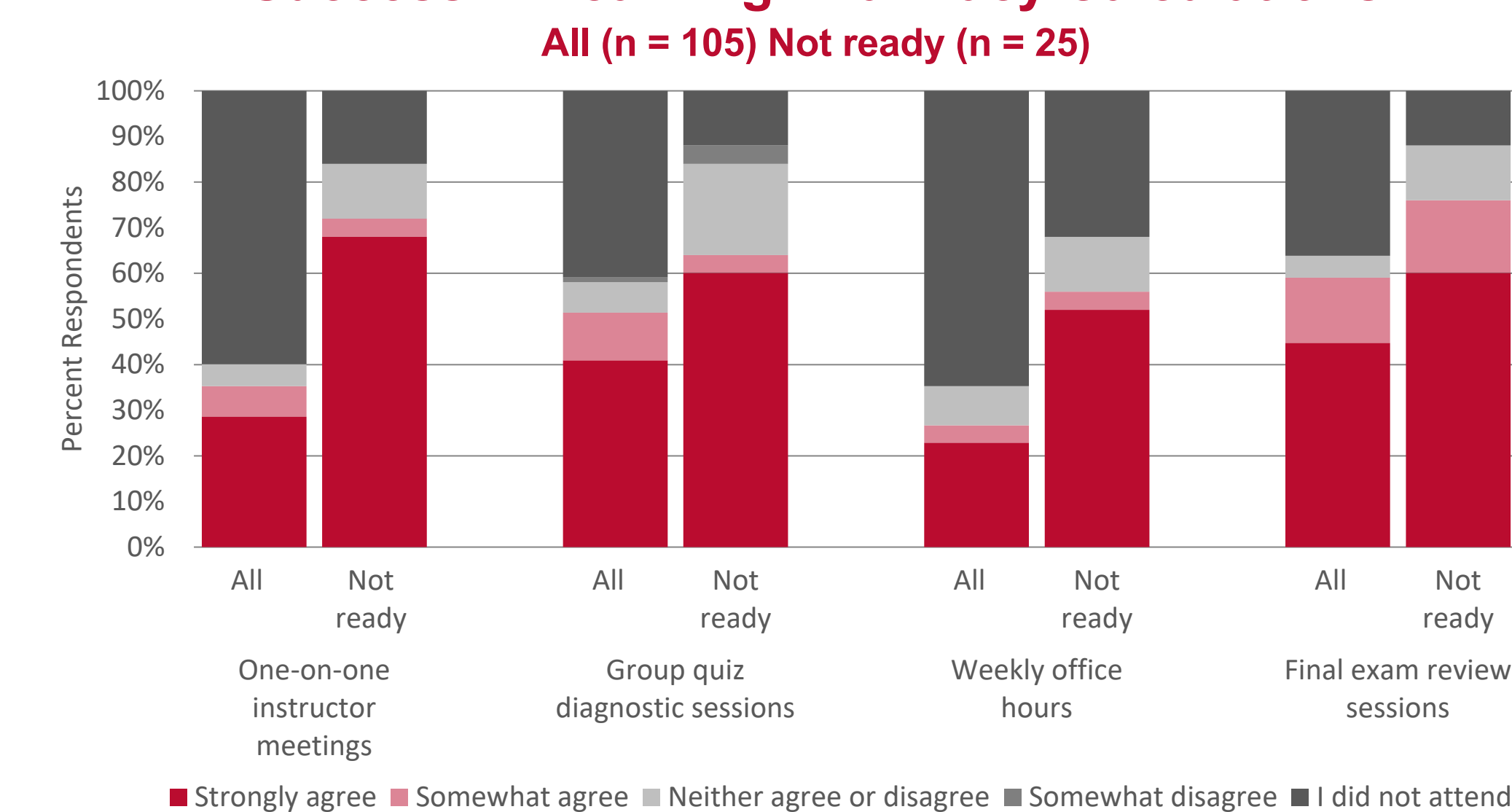
Calculations Final Exam Pass Rates



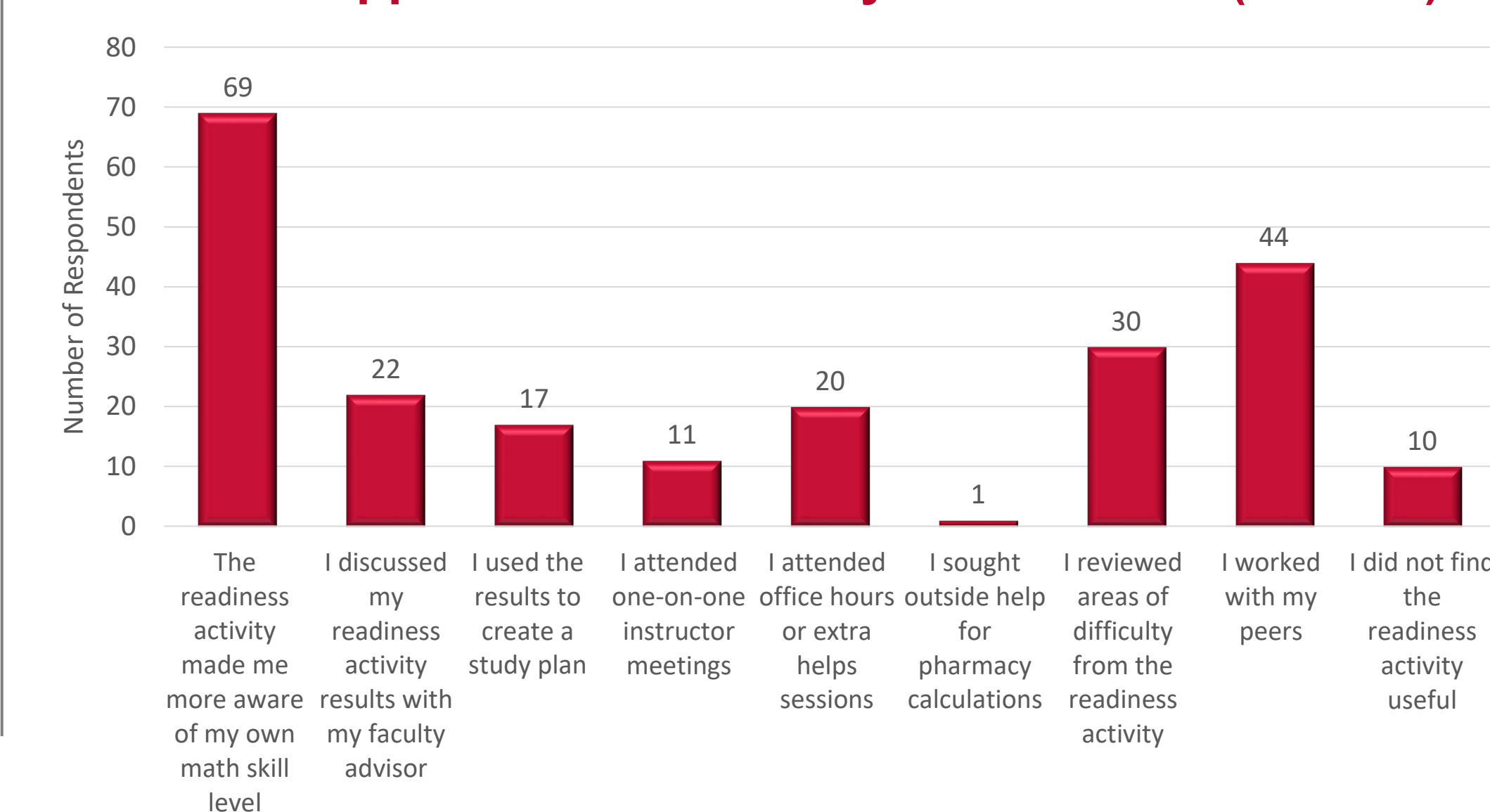
Engagement Session Attendance



Student Perceptions of Factors Influencing Overall Success in Learning Pharmacy Calculations



Student Perceptions of the Pre-assessment's Impact on their Approach to Pharmacy Calculations (n = 105)



RESULTS

- Zero non-passing final grades (D or E) compared to five the previous year
- Percent of students requiring in course remediation decreased compared to the previous year (12% vs. 16%) and all successfully passed remediation

"If I had to choose, I would say the calculations review sessions were the most valuable for me. They allowed me to walk through problems with instructors who were using their own time to make sure that we felt comfortable with the content. At times it was personal, one-on-one conversations with instructors or TAs, and other times (when applicable) it was small group conversations to talk through problems and understand different methods of getting to the answer."

"I reviewed my results from the readiness activity but I got so busy with other things that I never got around to reviewing the areas I showed weakness in. I had to work hard to do well on the calculations quizzes and I feel if I had made time to review those topics I could've done better."

CONCLUSIONS

- The applied mathematics pre-assessment can be used as an early intervention tool to identify at-risk students and encourage student engagement
- While the impact of the engagement opportunities could not be fully explored, students perceived them positively

FUTURE DIRECTIONS

- Utilize pre-assessment data to identify high performing students and develop an in-course peer tutoring program
- Assess calculations performance over time and compare to NAPLEX Domain 3 performance

REFERENCES

- Brandon HH, Romanelli F. The North American Pharmacist Licensure Examination (NAPLEX) Pass Rate Conundrum. Am J Pharm Educ. 2024; 88(5): 100701. <https://doi.org/10.1016/j.ajpe.2024.100701>
- National Association of Boards of Pharmacy. NAPLEX 2023 Calendar Year Report. January 31, 2024.
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ACKNOWLEDGEMENTS

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