

Cognitive Skill Development of Different Physics Assessments

Introduction

Assessments are an important part of a student's skill development, including their cognitive skills. According to Bloom's Taxonomy there are six cognitive levels associated with knowledge: *Remember*, *Understand*, *Apply*, *Analyse*, *Evaluate*, and *Create* [1]. These levels are in order of increasing cognitive complexity. Different types of assessment will help to develop cognitive skills to different degrees. This research looks at how the assessment types used throughout a first-year undergraduate physics course vary in developing cognitive skills.

Context

- This work presents the analysis of cognitive levels present in all the assessment types from a first-year undergraduate physics course at the University of Glasgow.
- The assessment types coded are weighted as follows:
 - Exams (50%)
 - Labs and project work (25%)
 - Class tests (10%)
 - Check point quizzes (10%)

Coding Process

- The tasks which the students were required to carry out were coded according to Bloom's Taxonomy.
- Exams and class tests: the questions themselves were coded according to the cognitive level related to the command word. For example, 'Calculate...' would be coded as *Apply*.
- Labs and project work: the students' tasks in the sessions were coded, as well as the example report to be followed.

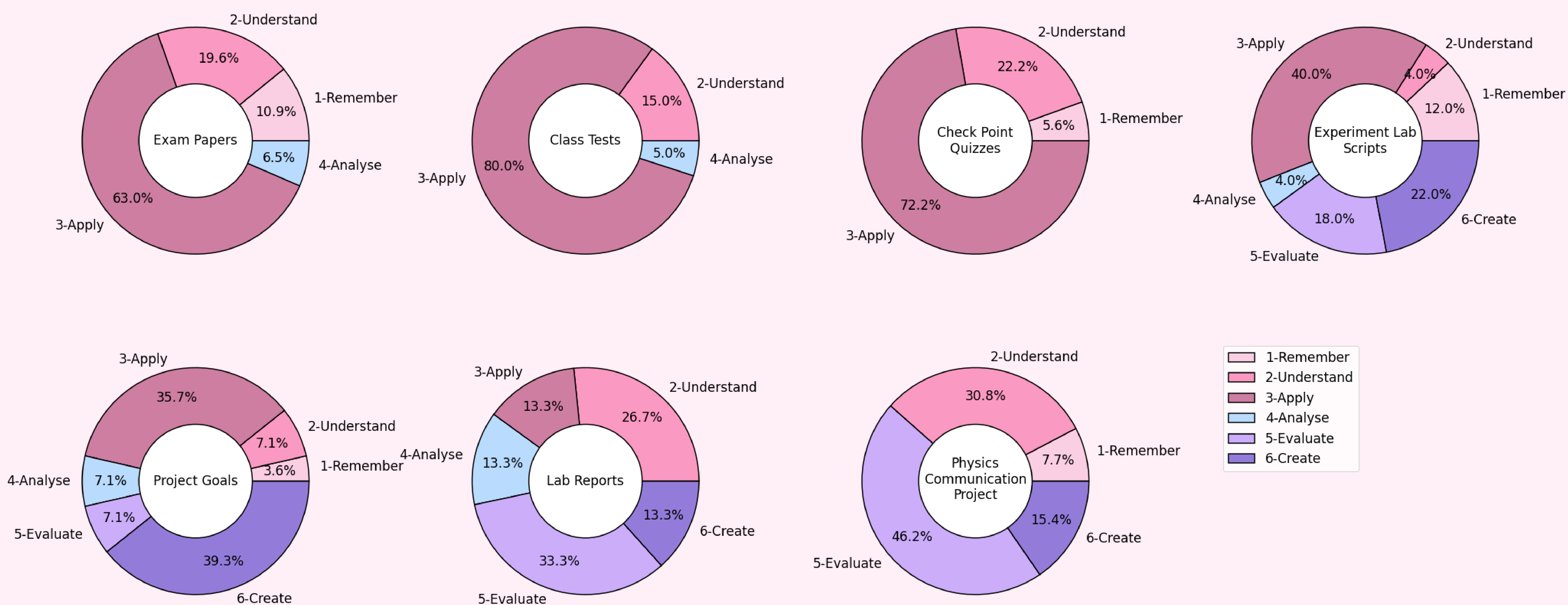


Figure 1: The percentage of codes made up by each cognitive level across the seven different assessment types used in Physics 1.

Main Findings

- Assessment with exam style questions generally help develop level 3, *Apply*, most frequently but rarely aid in higher level skill development.
- A similar study on cognitive levels in exams by Gates and Pugh finds comparable results where exams mostly develop level 3, *Apply* [2].
- Labs and project work help to develop a broader range of skills, including higher order skills, such as levels 5 and 6, *Evaluate* and *Create*.

It is crucial to have a range of assessment types to best aid students' skill development and to allow them opportunities to best demonstrate their learning

References

- [1] Anderson L. W. et al. (2001). A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives. isbn: 080131903X.
- [2] Gates J. and Pugh S. (2021). "The Application of Bloom's Taxonomy to Higher Education Examination Questions in Physics". In: New Directions in the Teaching of Physical Sciences. doi: 10.29311/ndtps.v0i16.3674.