



Correlations between matric marks and mechanics misconceptions

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Content

Motivation? What is the "force concept inventory" (FCI)? • Why use the FCI? Matriculation Data • Correlations

Conceptual Understanding IS Important!

Lectures don't work

Physics majors don't understand classical mechanics - conceptually
Flipped classrooms more common
To improve student outcomes
Can teachers improve their andragogy?
Mazur - Peer Instruction

Peer Instruction

- Mazur
- Students get:
- Rapid feedback
- "Work" in peer groups
 IE Interactive Engagement

FC

- 30 multichoice questions
- 30 minutes (depends)
- pre and post test
- COMPARE the normalised GAINs
- Item by item analysis
- Dominant misconceptions



PAPER

Probing the effect on student conceptual understanding due to a forced mid-semester transition to online teaching

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Abstract

+ Article information

Abstract

The force concept inventory (FCI) can be used as an assessment tool to measure conceptual gains in a cohort of students. The FCI uses a conceptions/ 'misconceptions' lens rather than a context dependent perspective, such as 'knowledge-in-pieces'. In this study it was given to first year students (N = 256 students) pre- and post-mechanics lectures, at the University of Johannesburg. From these results we examine the effect of switching mid-semester from traditional classes to online classes, as imposed by the COVID-19 lockdown in South Africa. Overall results indicate no appreciable difference of gain, when bench-marked against previous studies using this assessment tool. When compared with 2019 grades, the 2020 semester grades do not appear to be greatly affected. Furthermore, statistical analyses also indicate a gender difference in mean gains in favour of females at the 95% significance level (for paired data, N = 48).

1. A research tool 2. Instructor Andragogy 3. Dominant misconceptions 4. Diversity Comparisons 5. Incusion: Gender

UJ Diversity

University of Joburg 63% are South African, 14% from the rest of SADC, 20% from the rest of Africa, while 3% are from the rest of the world Only 39.6% of doctoral students are female, while 68.5% are black, 3.3% are coloured, 7.8% are Indian and 20.4% are white (HEDA : 2018)

2022 Sample Data

Course	Description	No. Students	Average % correct answers
PHYS1A1	Physics Majors	28	36.7
PHY1A1E	1st semester Physics for extended programme	176	26.7
PHYG1A1	Physics for the Earth Sciences	9	33.3
PHYL1A1	Physics for the Life Sciences	19	30.0
PHYE0A1	Engineering Physics	105	33.3

Whole 2022 Cohort – Pre-test



Comparison of 2022 to 2021





Matriculation Correlations

- We are now at the stage to compare 2020, 2021 and 2022 cohort gains to their high school matriculation scores
- Why?
 - This may suggest course pathways / policy
 - Correlations: language, mathematics level
 - Unknown correlations cluster analysis
- Matric leads into a longitudinal study over at least several years

Example –2020 Data – Gender (Carleschi et al. (2022) EJP)





Conclusion

FCI Gain + Matric UJ Data EAL/D – Multiethnic Correlations & subgroups? Informed decisions Thank you for your time!

ACU