HSC mathematics preparation: entry, pathways and performance in first year STEM subjects

Jackie Nicholas, Mathematics Learning Centre
Rachel Wilson, Faculty of Education and Social Sciences
Leon Poladian, School of Mathematics and Statistics
John Mack, School of Mathematics and Statistics

THE UNIVERSITY OF SYDNEY

NSW HSC Mathematics Enrolments & subsequent University STEM enrolments

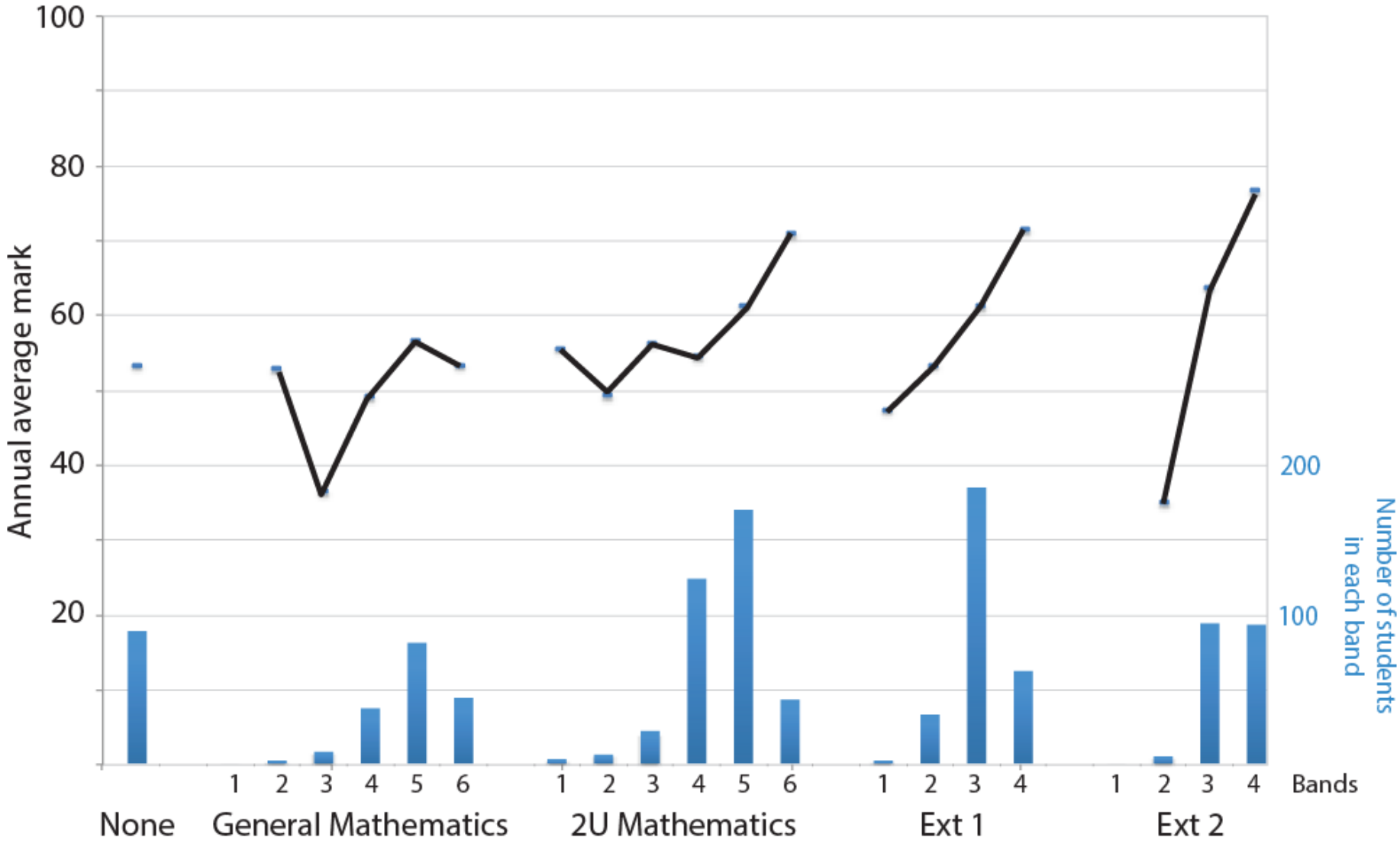
HSC participation in 2012 by level of Maths (ATAR eligible)

	Elementary	Intermediate	Advanced	
No maths	General	2 Unit	Extension 1	Extension 2
8400	27600	9900	5500	3200
15%	**51%**	**18%**	**10%**	**6%**

University of Sydney 2013 enrolment in STEM degrees by level of maths

	Elementary	Intermediate	Advanced	
	No maths or General	2 Unit	Extension 1	Extension 2
SCIENCE	317	399	275	215
ENG. & I.T.	14	102	227	172
Total (%)	**19%**	**29%**	**29%**	**23%**

Performance in first year Science units vs. HSC mathematics course and attainment band



NSW HSC MATHEMATICS SUBJECTS vs. SYDNEY UNIVERSITY MATHEMATICS UNITS

Pathways and assumed knowledge

elementary	intermediate	advanced	
General Mathematics	2 Unit Mathematics	(3 Unit) Extension 1	(4 Unit) Extension 2
No calculus	Basic calculus	reproduce proofs trig identities polynomials parametric curves integration by sub	create proofs complex numbers conics more integration applications
Intro to Calculus (300 students)	Fundamental (600 students)	Normal (1500 students)	Advanced (250 students)

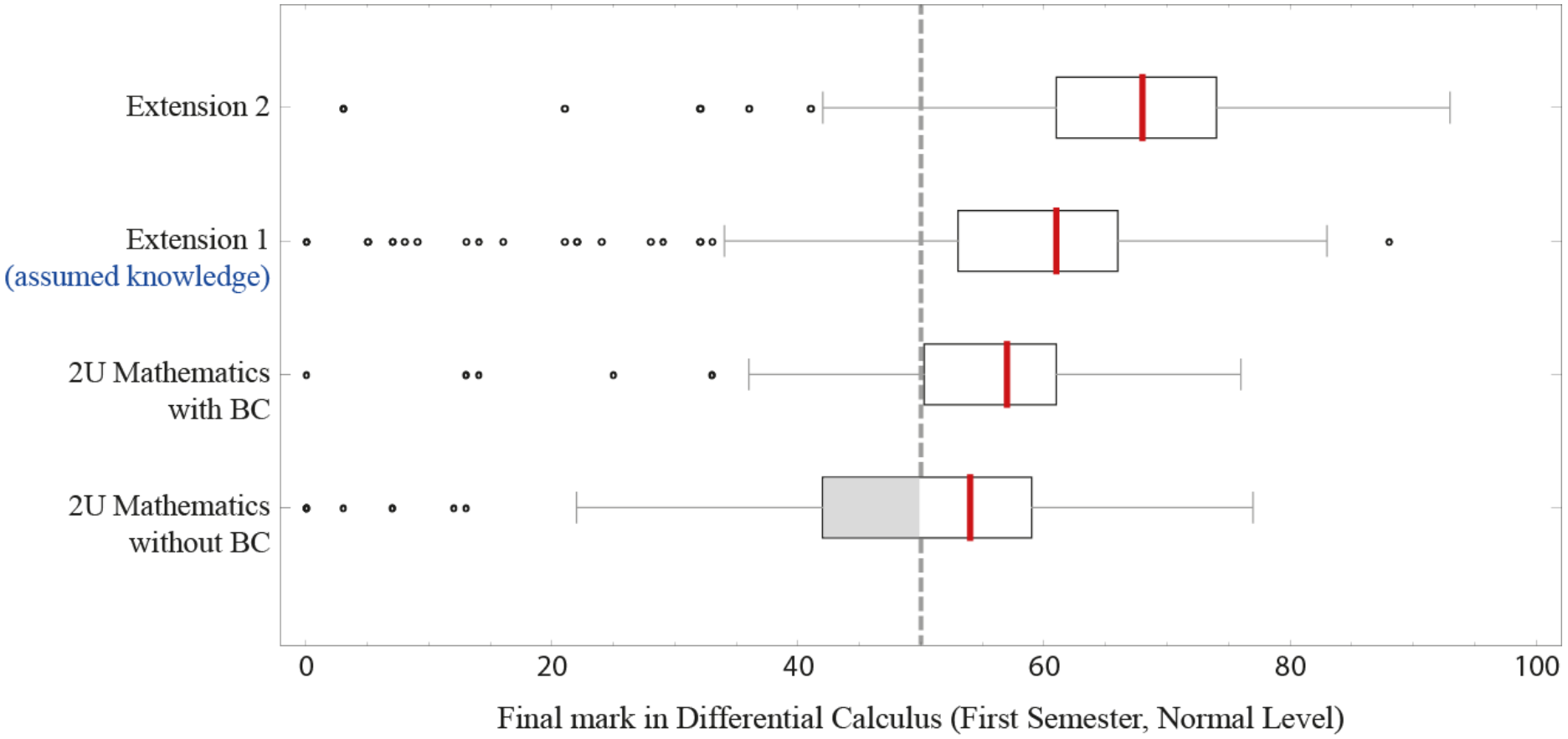
NSW HSC MATHEMATICS SUBJECTS vs. SYDNEY UNIVERSITY MATHEMATICS UNITS

Bridging course pathways for underprepared students

elementary	intermediate	advanced	
General Mathematics	2 Unit Mathematics	(3 Unit) Extension 1	(4 Unit) Extension 2
No calculus	Basic calculus	reproduce proofs trig identities polynomials parametric curves integration by sub	create proofs complex numbers conics more integration applications
Intro to Calculus (300 students)	Fundamental (600 students)	Normal (1500 students)	Advanced (250 students)

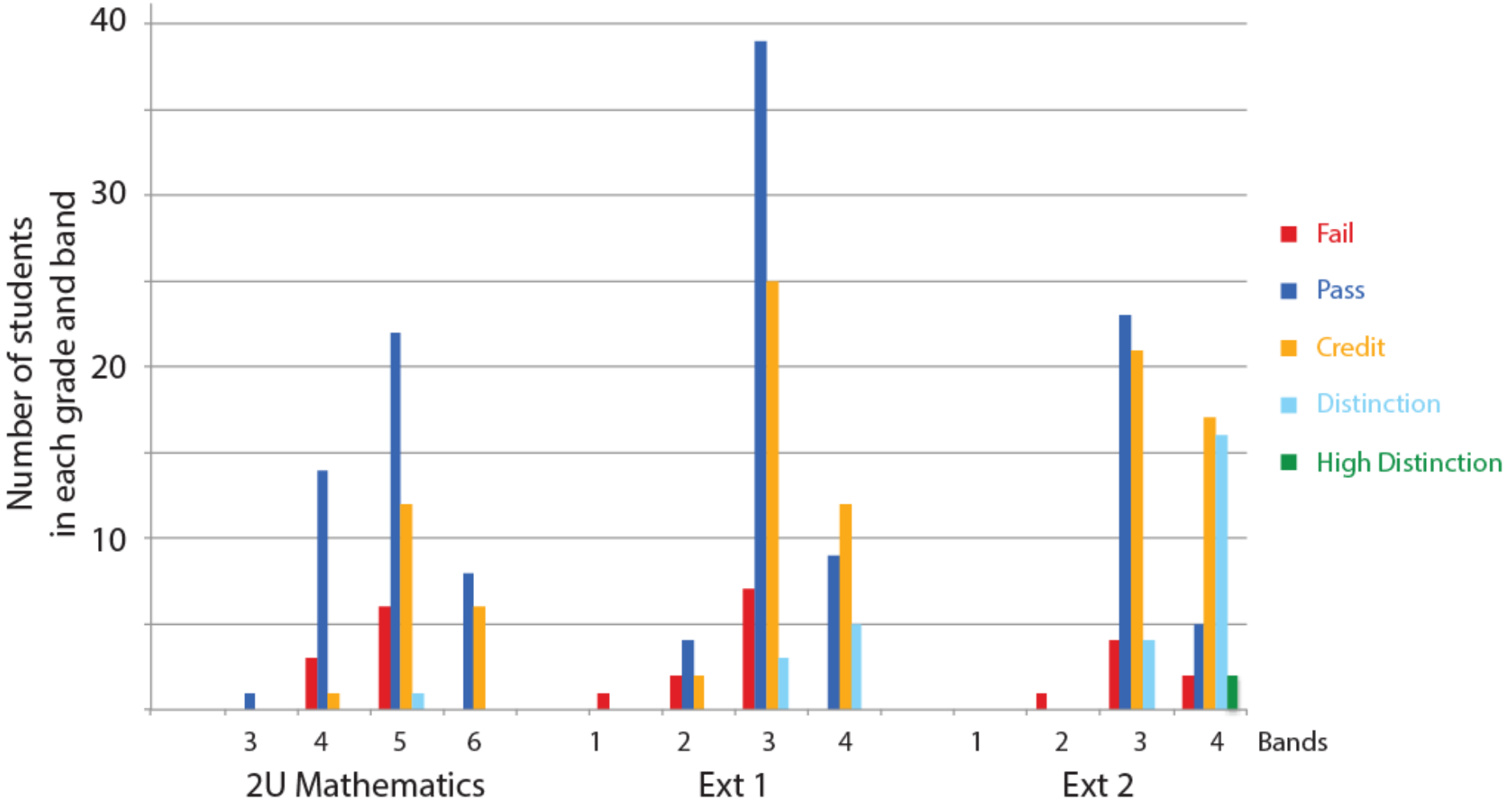
HSC Background and Bridging Course participation vs. success in first year maths

Upward shift in median mark with both HSC preparation and BC participation



Performance in a science unit vs. HSC mathematics background

Performance in Normal level, first year PHYSICS (biggest cohort)



Similar results for other science subjects

Key points

- Highest level of mathematics studied at HSC is a predictor of success in first year STEM . . .
- . . . but, the HSC achievement band is also critical
- Any prerequisites should take both of these above factors into account
- Over 75% of underprepared students who did the Ext 1 bridging course were able to pass first semester Normal level calculus . . .
- . . . but, did not achieve at the level of students who had the relevant assumed knowledge
- Nearly 20% of students enrolled in STEM degrees had only done General Mathematics or no maths at all