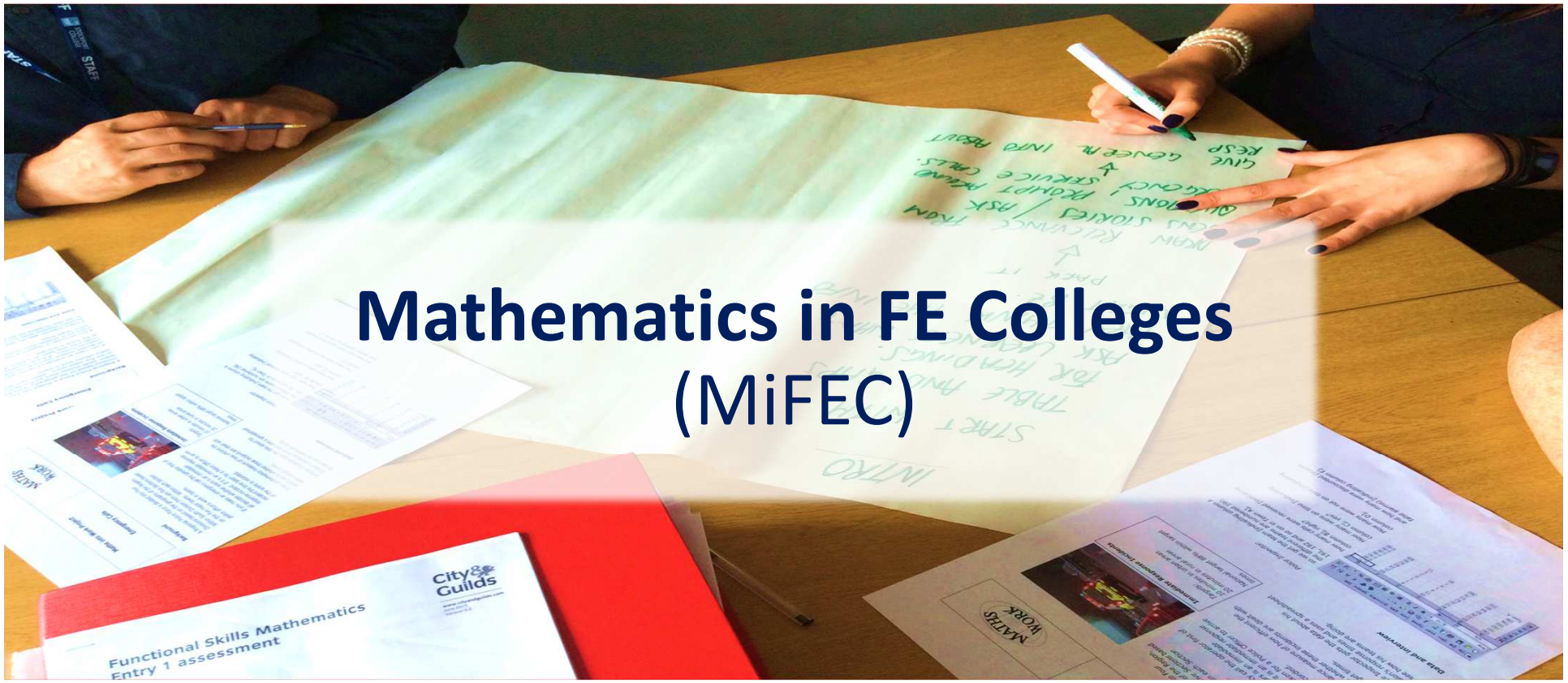
University of Nottingham
UK | CHINA | MALAYSIA



Mathematics in FE Colleges (MiFEC)

Diane Dalby and Andrew Noyes

BCME, April 6th 2018

University of Nottingham
UK | CHINA | MALAYSIA

Mathematics in FE Colleges (MiFEC)

Aims

The project aims to produce evidence-based advice for policymakers, college managers, curriculum leaders and practitioners on how to improve mathematics education in England's Further Education colleges. The main focus is on provision for 16-18 year old students studying mathematics at Level 2 or below.

Approach

The project uses a mixed methods research design (Tashkori & Teddlie, 2010) to explore the complex interplay between factors that directly or indirectly affect students' mathematical trajectories and outcomes.

A multi scale approach (Noyes, 2013) will investigate:

- the national policy landscape for mathematics in FE
- patterns of student engagement over time
- college level policy enactment and curriculum implementation
- teacher workforce skills and motivations
- learning mathematics in vocational contexts.

A logic model (Funnell & Rogers, 2011) will be used to explore the key issues framing mathematics education in FE colleges.

Four research strands

Work Package 1

A national policy trajectory analysis and literature review.

Work Package 2

Analyses of student progression over time (using the ILR and Next Steps survey).

Work Package 3

Six main case studies of colleges in 2017/18.

24 additional ‘light touch’ college case studies in 2018/19.

Work Package 4

A survey of the mathematics workforce in FE colleges.

University of Nottingham
UK | CHINA | MALAYSIA

Work package 1: Policy and literature

How has FE mathematics policy and practice been shaped since c. 2000? What lessons can be learnt to improve the design of policy in the future?

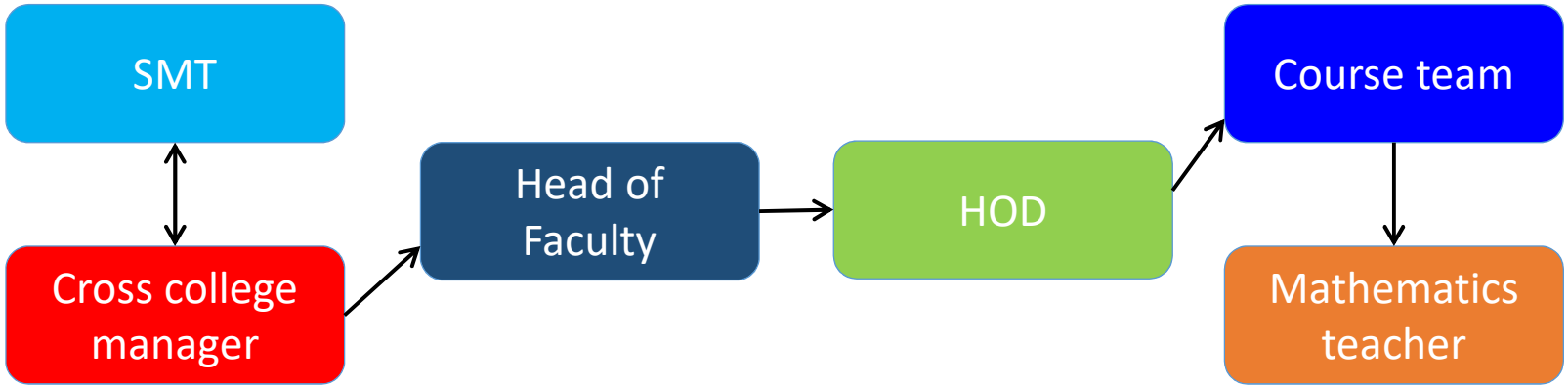
Emerging issues

- Reports that have influenced mathematics in FE include some about more general aspects of FE as well as those specifically about 16-18 mathematics or adult mathematics.
- Funding, governments and ministers are also factors for consideration.
- A number of key reports were published in 1997/8 so this is used as starting point. Other periods of significant activity and change are being highlighted for closer study.
- The origins of influential reports vary over time.
- The flow of ideas from ‘report’ to practice, research to policy, etc. is of particular interest.

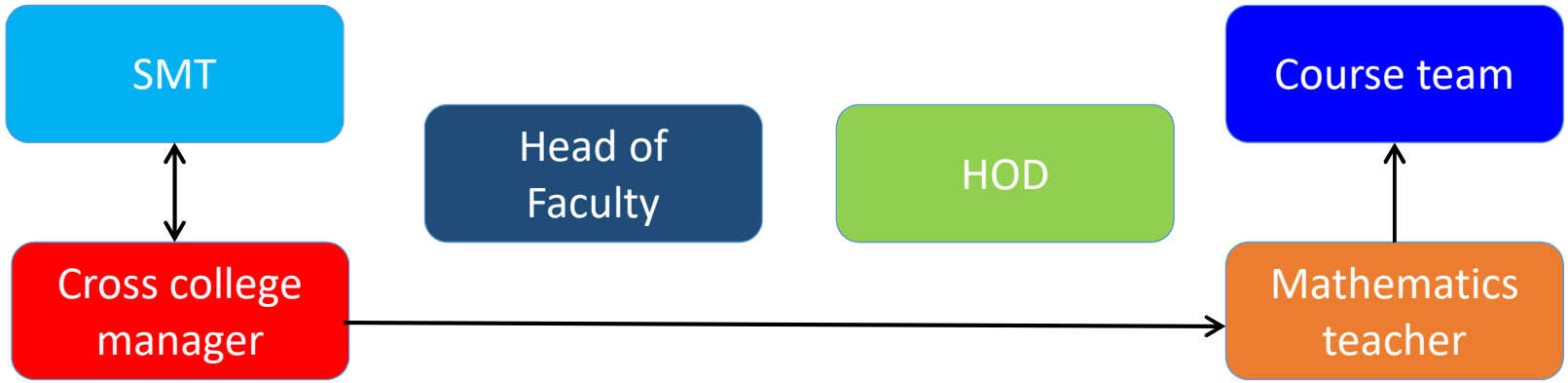
YEAR	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15
Government							
Government reports: general & mathematics			2011 March Wolf Review of vocational education	2012 October Lingfield Professionalism in Further Education	2013 DfES Payne Choice at the end of post compulsory education	2013 October BIS International survey of adult skills	
			2011 BIS. Skills for Life Survey.				
			Government response to Wolf report				
Other reports: general & mathematics	2009 June Nuffield Review of 14-19 Education and training	2010 Nuffield Values and variables	2010 October BIS FE and Skills STEM data report (RAE)	2011 November NIACE+ A dynamic nucleus, colleges at the heart oftheir communities	2013 March CAYT (Crawford & Cribb) Reading and maths skills at age 10 and earnings in later life	2014 March ETF Strategic consultation: Maths and English report	2014 November UKCES Employer perspectives survey
		2010 OECD The high cost of low educational performance	2011 April Ofsted A good numeracy teacher.	*2012 April Ofqual Review of functional skills standards in mathematics*	2013 Sutton Trust (Hodgen & Marks) The employment equation	2014 March ETF Strategic consultation: Maths and English report	2014 December ETF Effective practices in post-16 vocational maths
			2011 April Ofsted Tacking the challenge of low numeracy skills			2014 AELP & ETF English and maths in apprenticeships	2015 Feb NIACE Engaging learners in GCSE english and maths
			2011 January CEE Crawford Meschi & Vignoles Educational choices and institutional value			2014 C&G Sense and instability, three decades of skills and employment policy	2015 March ETF Making maths and English work for all
			2011 June ACME Mathematical needs summary				2015 August PE Porter Crossing the line
			2011 NIACE Numeracy				2014 Nuffield

Policy enactment in FE colleges

Example 1



Example 2



University of Nottingham
UK | CHINA | MALAYSIA

Work package 2: Student progression

Who attains what mathematics qualifications in FE and how has this changed over time? What are the relationships between prior attainment, FE mathematics outcomes and life experiences at age 25?

Emerging issues

- Good data is available from NPD, ILR and Next Steps but there are some challenges, e.g. changes in variables within the ILR over time.
- A cohort approach helps understand changes over time.

Examples of student pathways

Example 1: (2012-14) Student on Public Services course (Level 3)

Year in FE	1	2	3
Mathematics studied	Level 1 functional mathematics	Level 2 functional mathematics	GCSE mathematics

Example 2: (2016-18) Student on Animal Care course (Level 1)

Year in FE	1	2	3
Mathematics studied	Entry level functional mathematics	Level 1 functional mathematics	(GCSE mathematics)

- Varying government and college policies have significant effects on students' post-16 mathematics pathways.

Note: Students may also learn specific vocationally-specific mathematics within their main study programmes, although they often do not see this as mathematics.

NPD/ILR

The National Pupil Database (NPD) provides baseline GCSE and social data.

The Individualised Learner Record (ILR) is linked, for the following three years, for each GCSE cohort.

NPD base data	ILR data								
GCSE year	2008	2009	2010	2011	2012	2013	2014	2015	2016
2006	Next Steps Survey cohort								
2007									
2008									
2009									
2010									
2011									
2012									
2013									

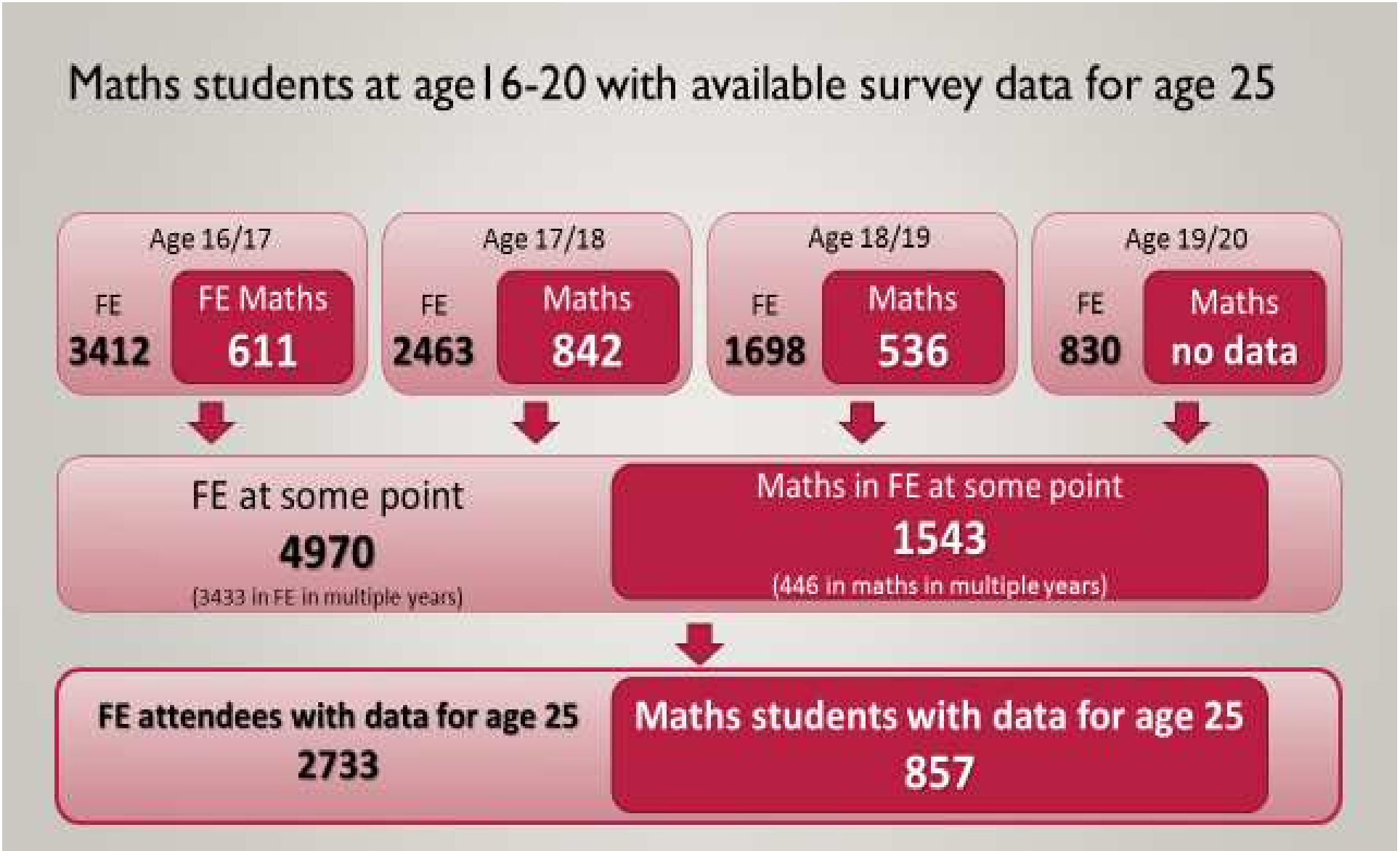
Next Steps survey

Next Steps, previously Longitudinal Study of Young People in England (LSYPE), follows a cohort of 15770 young people born in 1989/90.

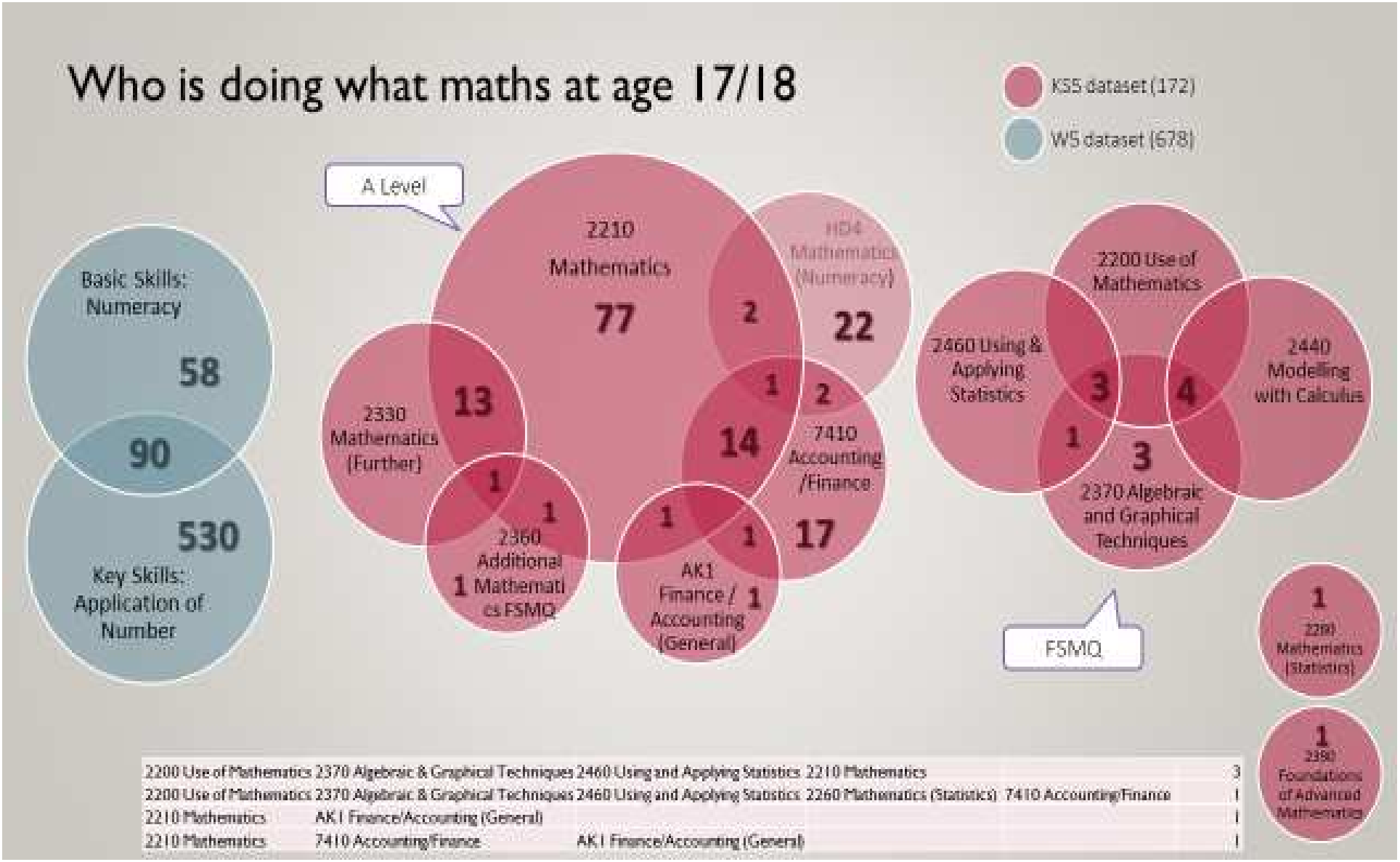
The study began in 2004 (when aged 13-14) and has collected information about education and employment, economic circumstances, family life, physical and emotional health and wellbeing, social participation and attitudes.

The most recent survey took place in 2015/16, when the cohort members were 25 years old.

Next Steps survey data



Next Steps survey data



Work package 3: College case studies

- How do FE colleges mediate post-16 mathematics policy?
- What different strategies have been employed?
- How has/is funding shaping college policy and classroom experience?
- What are the workforce strengths and limitations?
- How is curriculum and assessment changing?
- What are the unintended consequences of policy upon classrooms?

Emerging issues

- Inconsistencies in the national data available to select a sample of colleges.
- Key factors for selection of case studies – college size, maths progress measure, number of GCSE ‘re-sit’ students, size of academic provision, latest Ofsted grade, region, type of locality.

University of Nottingham
UK | CHINA | MALAYSIA

College data

Region	Students at end of 16-18 study	Students at end of 16-18 with at least one A or AS entry	Students at end of 16-18 included in maths progress measure	Average progress made in maths	Location	Ofsted grade
SE	1074	16	408	-0.33	Urban city and town	2
NW	694	11	366	-0.53	Urban city and town	3
SE	3546	223	1480	-0.23	Urban city and town	2
SE	850	10	354	-0.02	Urban city and town	4
SE	845	48	367	-0.33	Urban city and town	2
GL	1904	6	962	-0.27	Urban major conurbation	2
GL	1802	249	704	-0.25	Urban major conurbation	2
E	888	5	431	-0.74	Urban city and town	3
YH	2684	403	1079	0.46	Urban minor conurbation	1
SE	972	7	424	-0.27	Urban city and town	2
SW	1051	4	383	-0.40	Urban city and town	2
WM	1997	14	896	-0.53	Urban city and town	3

University of Nottingham
UK | CHINA | MALAYSIA

Maths progress measures

Points awarded	Grade achieved					
	Reformed GCSEs (9-1)	Legacy GCSEs (A*-G)	Functional skills	Free standing maths	ESOL	AQA use of maths
8	9	A*				
7.7	8					
7	7	A				
6.3	6					
6		B				
5.7	5					
5	4	C				
4	3	D	L2	L2 (all grades)	L2 (all grades)	A*/A/B/C
3	2	E				
2.5			L1	L1 (A-C)	L1 (D/M)	D/E
2		F				
1.7				L1 (D)		
1.5					L1 (pass)	
1	1	G				G
0.8				L1 (E)		
0.4			Entry Level	Entry Level	Entry Level	
0	Fail	Fail	Fail	Fail	Fail	Fail

Main case studies

Visits to all six main case study providers have been completed for 2017/18, involving 14 days of visits across the country. A further 24 colleges will be visited during 2018/19 and follow up visits made to the first six.

No of colleges visited	No of sites visited	Number of interviews				
		College principals or CEOs	Senior managers	Other managers overseeing maths	Staff teaching maths	Vocational staff
8	13	6	4	17	39	14

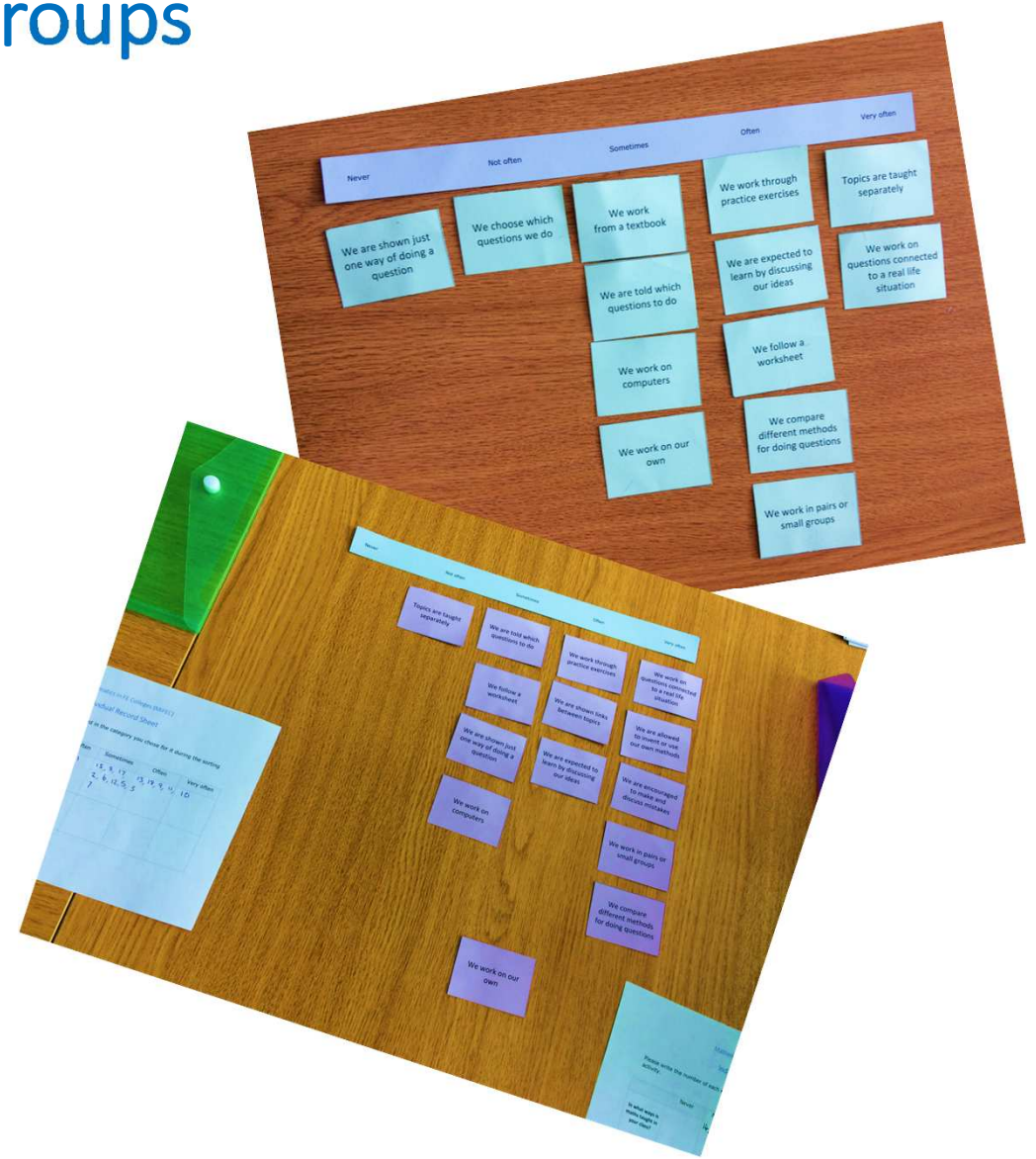
73 interviews have been conducted and 23 student focus groups, involving a total of 130 students. Colleges have completed a staff audit, data summary and provided other documents relevant to the study.

Full-time teaching mathematics only	Full-time teaching mathematics as their main subject	Full-time vocational or other subject but teaching some mathematics	Full-time or part-time manager but teaching some mathematics	Part-time teaching mathematics only	Part-time teaching mathematics as their main subject	Part-time teaching vocational or other subject but teaching some mathematics	Hourly paid or sessional college contract for mathematics	Agency contract for mathematics	Faculty	Site where based
X										
			X							
				X						
X										
X										
X										
				X						
			X							
X										
							X			
X										
X										
X										
X										
				X						

Student focus groups

Students have:

- provided background information about their mathematics qualifications
- taken part in group discussions about their experiences of mathematics in college
- carried out individual card-sorting activities about mathematics teaching.



Emerging theme 1

A trend away from Functional Mathematics towards GCSE.

The main driver for this is the growing importance of the mathematics progress measure, as opposed to a singular focus on percentages crossing the Grade 4 threshold. This is compounded by the increased difficulty of Level 2 Functional Mathematics and its unsuitability as a stepping stone to GCSE. There is concern, however, about students experiencing multiple failures with more colleges moving to enter those having attained Grade 1 and 2 for GCSE mathematics rather than taking functional mathematics.

Emerging theme 2

(In)stability in the college mathematics teacher workforce

Many colleges have difficulty recruiting mathematics teachers but those with effective strategies to achieve workforce stability see multiple benefits:

- Stable workforces can develop collective approaches to planning;
- CPD has clearer, sustained effects on quality;
- Students respond negatively to changes in staffing and value continuity.

Current strategies to achieve stability include financial incentives and ‘grow your own’ schemes, in which staff from other college areas (e.g. vocational, student support) are re-trained to teach mathematics.

Emerging theme 3

A whole college approach

Mathematics provision seems to be more effective when:

- senior managers are actively involved, investing time and financial support to overcome problems;
- where vocational areas share responsibility for mathematics provision, e.g. by encouraging embedded approaches and taking an active role in monitoring attendance.

Emerging theme 4

Use of meaningful and relevant data to inform decision-making.

Many colleges take a ‘try it and see’ approach towards:

- strategic decision-making for mathematics provision;
- choices concerning teaching and learning.

Those who collect meaningful data and use it to inform their decisions have more confidence that their approach is meeting student needs. Whether this leads to more effective strategies and outcomes will be explored through further analysis of available data.

University of Nottingham
UK | CHINA | MALAYSIA

Work package 4: Mathematics teacher workforce

Who is teaching post-16 maths in FE now? (to include roles, responsibilities, knowledge and skills). What FE mathematics training and development needs exist now and will be needed in the short to medium term?

Emerging issues

- There is little reliable national data on the FE mathematics teacher workforce.
- Pathways into teaching mathematics in FE colleges are very varied.
- The reasons why people are teaching mathematics in FE colleges and how long they intend to stay are unclear.

University of Nottingham
UK | CHINA | MALAYSIA

Survey of mathematics teachers in FE

General background: some general background data will be requested including gender, age group and mode of employment.

Teaching experience: pathways into teaching mathematics in FE colleges; professional experience; general teaching experience; specific mathematics teaching experience; previous employment and reasons for becoming a mathematics teacher in FE.

Teachers' roles and responsibilities: teaching hours; additional responsibilities and the key elements of daily work.

Changes over time: changes in employment; expected changes in workload and employment; teacher satisfaction.

Training and PD: teachers' mathematics qualifications, teaching qualifications; professional development; possible skills needs.

Useful references

Ball, S.J., Maguire, M. and Braun, A., (2012). *How schools do policy: Policy enactments in secondary schools*. London: Routledge.

Dalby, D. (2017). The professional identity of mathematics teachers in Further Education. *Adults Learning Mathematics*, *12*(1), 7-16.

Dalby, D. & Noyes, A. (2018) Mathematics education policy enactment in England's Further Education colleges. *Journal of Vocational Education and Training (in press)*

Dalby, D. & Noyes, A. (2016). Locating mathematics within post-16 vocational education. *Journal of Vocational Education and Training*. 68(1), 70-86.

Dalby, D. & Noyes, A. (2015). Connecting mathematics teaching with vocational learning. *Adults Learning Mathematics,* 10(1), 40-49.

Funnell, S., & Rogers, P. (2011). *Purposeful program theory: effective use of theories of change and logic models*. San Francisco: John Wiley & Sons.

Noyes, A. (2013). Scale in education research: towards a multi-scale methodology. *International Journal for Research and Method in Education*, 36(2), 101-116.

Tashakkori, A., & Teddlie, C. (Eds.). (2010). *Sage handbook of mixed methods in social & behavioural research*. Thousand Oaks, CA: Sage.

University of Nottingham
UK | CHINA | MALAYSIA

Further information about the project is available at
http://www.nottingham.ac.uk/research/groups/crme/projects/mifec/index.aspx

or from Diane Dalby

diane.dalby@nottingham.ac.uk