

KS3 Maths Progress & GCSE (9–1) Mathematics

Full research
report
February 2019

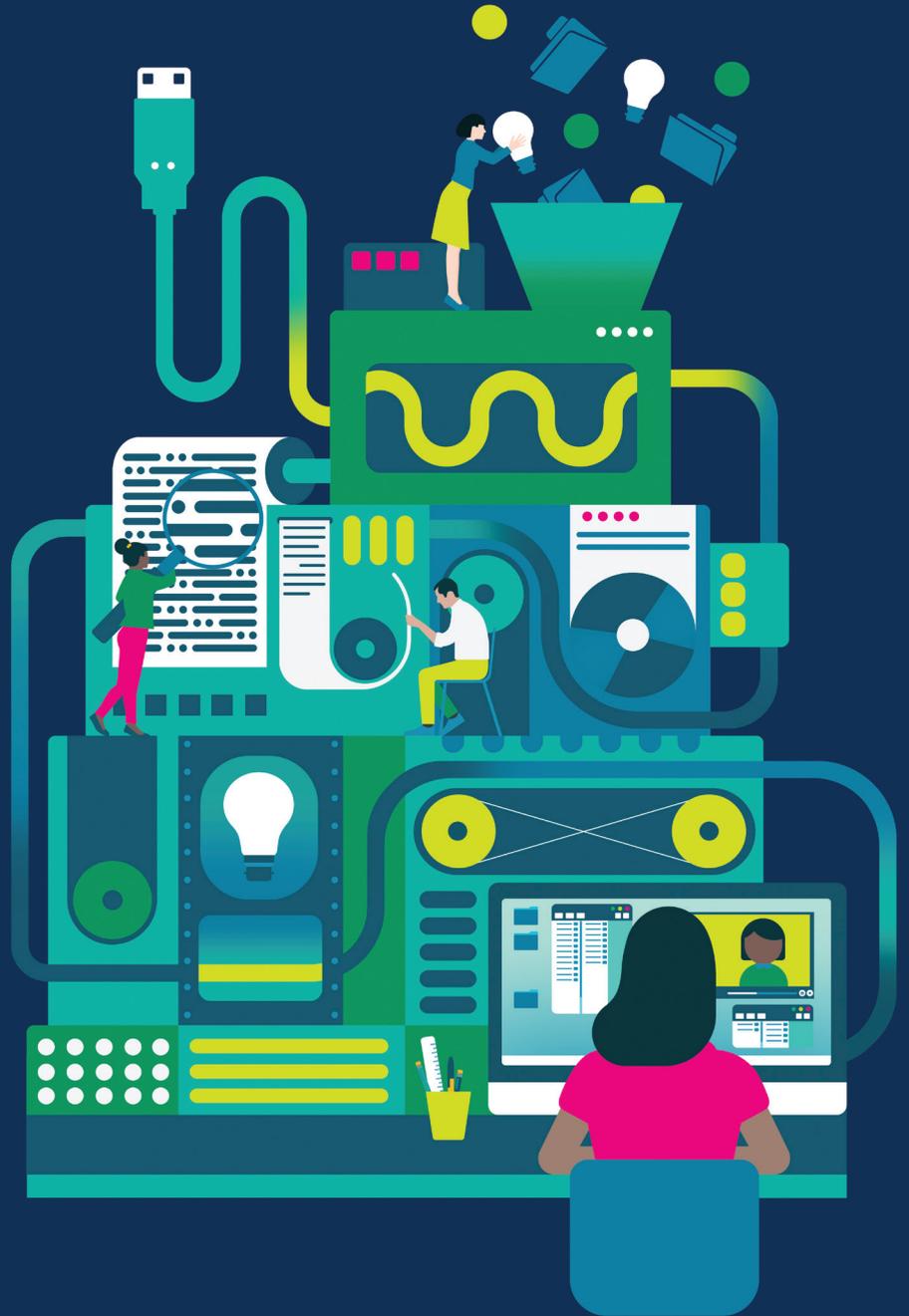


Illustration by Lucy Vigrass

Acknowledgements

This summary report is based on the full interim technical report, which was released internally in September 2018 and written by:

Dr Jennie Golding (UCL Institute of Education)

Dr Grace Grima (Director, Pearson UK Efficacy and Research)

Dr Alistair Hooper (Senior Researcher, Pearson UK Efficacy and Research)

Kristy Evers (Researcher, Pearson UK Efficacy and Research)

Abbreviations used in the report include:

KS3 = Key Stage 3

KS4 = Key Stage 4

ALDS = ActiveLearn Digital Service

AT = ActiveTeach

CPD = Continuous Professional Development

EAL = English as an Additional Language

FSM = Free School Meals

HoM = Head of Mathematics

MP = Maths Progress

NQT = Newly Qualified Teacher

PSR = Problem-solving and Reasoning

SEN = Special Education Needs

Contents

| | | |
|-----------|---|-----------|
| 1 | Research Project Summary | 4 |
| 2 | Product Summary | 5 |
| 3 | Learner Outcomes | 6 |
| 4 | Research Questions | 7 |
| 5 | Methodology | 8 |
| 6 | Key Stage 3 Findings | 9 |
| 7 | Key Stage 4 Findings | 11 |
| 8 | Discussion and Conclusions | 13 |
| 9 | Case Study | 14 |
| 10 | Next Steps | 16 |
| 11 | Appendix: Study School Characteristics | 17 |

1 Research Project Summary

A study conducted by Pearson UK Efficacy and Research team in conjunction with UCL Institute of Education.

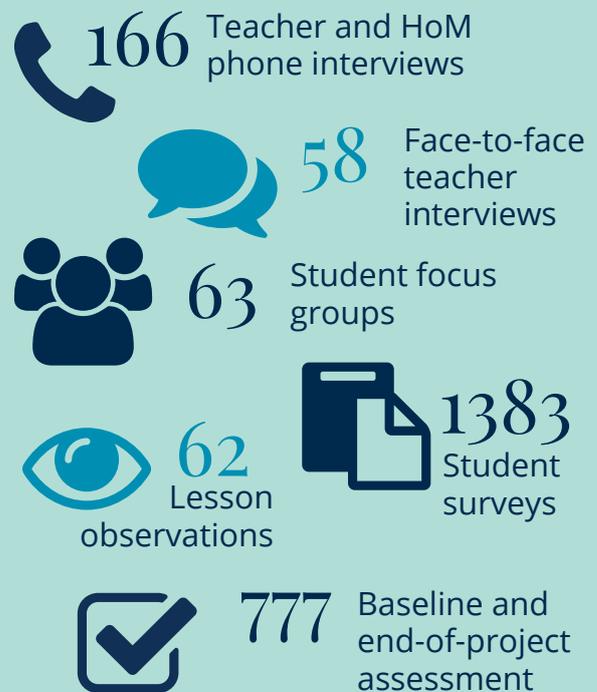
We asked what impact KS3 Mathematics Progress and GCSE (9-1) resources are having on young people: how are they being used, and how effective are they for supporting young people's learning of the 2014 National curriculum in England? The study was designed to be longitudinal over

two substantive years, building on a previous exploratory study. This is the final summary report and draws on data from 16 schools with varying characteristics (33 classes with their teachers and Heads of Mathematics), in addition to one school using the resources for the first time, used as a case study.

Who was involved?



How did we get the data?



What were the highlights of the findings?



Most KS3 and KS4 students felt confident, challenged and engaged when studying maths



Teachers felt that the resources thoroughly covered the NC and helped students progress well to the next KS



Teachers felt that the resources prepared students well for PSR and fluency

2 Product Summary

Key Stage 3 Maths Progress and GCSE (9-1) Mathematics offer a coherent set of mathematics materials for use in Key Stages 3 and 4 respectively (usually ages 11-16, years 7 to 11) in England. The resources consist of both print and digital resources. The print resources include Student Books (Pi, Theta and Delta for KS3; Foundation and Higher for KS4) and an array of workbooks. Through the ActiveLearn Digital Service (ALDS) teachers can find tools to help teach, plan, develop, track and assess.

These include lesson plans, worksheets, assessments and progression tracking. ALDS can be used for setting homework online or as an independent study tool for students. Questions are linked to each unit in the textbook, providing additional support and practice.



The two sets of materials together cover the 11-16 mathematics curriculum in the UK, which is assessed by GCSE Mathematics, taken by nearly all 16-year-olds. The 2014 National Curriculum describes the aims of learning mathematics to be that all students should:

1. become fluent in the fundamentals of mathematics
2. reason mathematically by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language
3. solve problems by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication

Resources for a 5-year curriculum

Resources that work seamlessly throughout 11 to 16 to prepare students for Pearson Edexcel GCSE (9-1) Mathematics. Both Ks3 and GCSE courses follow the same 'Master maths with confidence' approach, and Pearson Progression Services help you to track and support progress throughout.

Go to: www.pearsonschoools.co.uk/maths5yearsCurriculum

| Outcomes Category | Valued learner outcomes |
|-------------------------------|--|
| Learner Access and Experience | <p>Students have access to digital and printed resources</p> <p>Students have a positive learning experience</p> <p>Students are confident in studying mathematics</p> |
| Timeliness of completion | <p>Students successfully complete the intended course year by year</p> |
| Standard of achievement | <p>Students are fluent in fundamental mathematics knowledge and skills as specified in the 2014 National Curriculum for England</p> <p>Students develop competence in mathematical problem solving and reasoning</p> <p>Teachers are more confident to teach mathematics at KS3-4 through the use of KS3 MP and GCSE Mathematics (9-1)</p> |
| Learner progression | <p>Students are mathematically prepared for the next Key StageAdd</p> |



1. How is KS3 MP/GCSE Mathematics (9-1) being implemented in schools? (How do students experience use of print and digital learning resources?)
2. Are there any barriers for students in accessing the digital resources? (Can the KS3 MP/GCSE Mathematics (9-1) digital resources be accessed on tablets, smart phones and computers at any time?)
3. In what ways does KS3 MP/GCSE Mathematics (9-1) encourage students' confidence and a positive attitude towards learning mathematics?
4. Do teachers value the overall content, specific features of the platform (planning, assessing, reporting) and the CPD element?
5. How well is the resource perceived to help students understand and master the fundamental mathematical processes (problem solving, reasoning and fluency) laid out in the National Curriculum? (How, and with what effect, does KS3 MP/GCSE Mathematics (9-1) support teaching and learning needs?)
6. How well is KS3MP/GCSE Mathematics (9-1) perceived to prepare students for progression to the next stage of study?



KS3

Schools: 12

Teachers and HoM: 15

Students: 319

KS4

Schools: 15

Teachers and HoM: 24

Students: 458

+One case study school

Teachers and HoM: 4

Students: 46

| | KS3 | KS4 |
|--------------------|---|--|
| Phase 1 Autumn '16 | GL Baseline, KS3 Teacher telephone interviews | GL Baseline assessment, KS4 Teacher and HoM telephone interviews |
| Phase 2 Spring '17 | Structured lesson observations, Staff interviews, Student focus groups | Class teacher face-to-face interviews, Student focus groups, Structured lesson observations |
| Phase 3 Summer '17 | Student surveys, KS3 teacher surveys | KS4 Teacher and HoM telephone interviews, Students surveys |
| Phase 4 Autumn '17 | KS3 Teacher telephone interviews | KS4 Teacher and HoM telephone interviews |
| Phase 5 Spring '18 | Structured lesson observations, Staff interviews, Students focus groups | Structured lesson observations, Class teacher face-to-face interviews, Student surveys, Student focus groups |
| Phase 6 Summer '18 | Final assessment, Students surveys, KS3 teacher surveys | KS4 Teacher and HoM telephone interviews, Student GCSE outcomes, Year 11 teacher surveys |
| Phase 7 Autumn '18 | | HoM reflective post-GCSE survey Autumn 2018 re whole cohort |

Learner Access and Experience

- The printed textbooks were extremely popular with the teachers interviewed and used more than the digital resources; that was also true of students
- Within textbooks, 'strengthen and extend' questions were seen as encouraging confidence to grow in the students
- The review sections and hints also helped to foster improved confidence
- Students felt supported to succeed on challenging tasks
- Resources differentiated well although there remained some concerns over access for less able students
- Some teachers were reluctant to fully use ActiveLearn in class because of limited computer literacy or poor access; however, digital teacher support was highly valued and improved teacher workload
- A variety of other resources were also used to support teaching and learning

Achievement and Competence

- General agreement that the level of curriculum demand had increased. The resources reflect that but learners were not necessarily getting to grips with the mastery elements of the curriculum.
- Geometry is proving to be one of the most challenging areas to cover
- Teachers throughout the study had mixed conceptions of fluency, problem solving and reasoning but felt that the resources provided good coverage for newer curriculum content
- Teachers also had mixed levels of confidence when teaching for fluency, problem solving and reasoning
- Two thirds of the teacher responses were positive both that their students had made good progress in their problem solving over the course of the year and that the KS3 MP resources supported problem solving
- There was minimal parental involvement in terms of engagement with resources



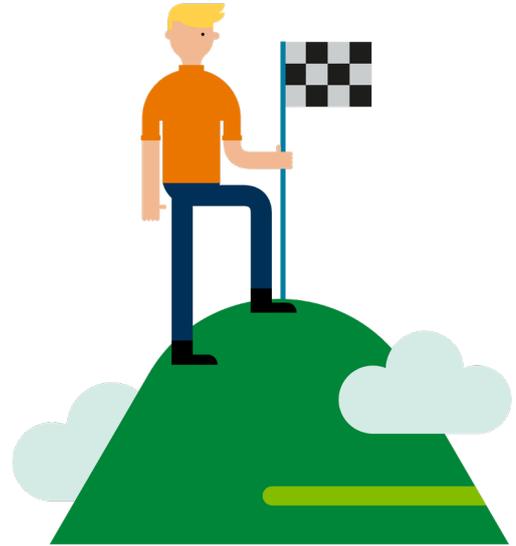
The textbooks encourage learners "to think not just how to do it, but why am I doing this?"

School 2, KS3

6 Key Stage 3 Findings

Learner Progression

- Schools are thinking in terms of a five-year learning continuum to age 16 and including more problem solving and reasoning in their KS3 teaching
- Data suggests a small above-average progression for the study students, but with some large variation by school
- There was evidence of correlation between teaching approaches observed to be well-aligned with curriculum intentions and significantly above-expected progression, particularly where the teacher was building on good understanding of all the students, the mathematics and the resources.



What did students think were the most useful resource elements?

 **Unit structure**
(*check-up, strengthen and extend* sections),
hints and key points

 **Worked examples**

 **ALDS homework and videos**

Learner Access and Experience

- In the vast majority of schools, the principal resource used was GCSE (9-1) Mathematics although as year 11 progressed, more use was made of Emporium resources
- The 'typical' lesson was usually described as including the textbook at some point
- Teachers seemed more engaged with teacher aspects of ActiveLearn than with the students-focused components
- 'Check-up', strengthen and 'extend' sections, hints and key points were regularly referred to as important elements for engagement, motivation and learning
- The main types of resources used from the Emporium were specimen exam papers and problem-solving question sets
- The increased level of demand appears to have impacted student confidence in both positive and negative ways, with real challenges for weaker students at each tier
- The consensus was that the resources catered well for the middle to top range of mathematics abilities in each tier but there were gaps at the very extremes, especially the lower end. However, teachers were not always aware of related resources designed especially for those students
- The problem-solving and reasoning elements of the textbooks were perceived to be extremely challenging, though necessary for weaker students, and highly valued, for the mathematical development of stronger students

Achievement and Competence

- Teachers sometimes signpost to parents the exercises, activities, chapters etc. that are supporting for homework. This might happen at parents' evenings, via email or on a 'share my homework' platform
- End of unit assessments were adapted and used to suit the progression structure and planning adopted for the class
- The majority of teachers felt their students had made good progress with their fluency and indicated that they thought the GCSE Mathematics (9-1) resources had been effective at supporting that progress in fluency
- The majority of teachers felt the resources helped develop reasoning
- The majority of teachers felt their students had made good progress with their problem solving and indicated that they thought the resources had been effective at supporting this
- Teachers largely use the resources selectively, choosing particular topics or sections within topics to suit their class's perceived needs: only students aiming at top grades within a tier typically engage with the range of the textbook provision

Progression

- There was an agreement amongst the interviewees that the resources support their students' progression in all aspects of their mathematics
- The KS4 teachers and students valued the resources' excellent coverage of the curriculum content
- HoMs are reasonably positive about the support offered by the resources towards that
- KS4 students in this study made above-average progression



What did students think were the most useful resource elements?



Hints and key points and unit structure



Front-of-class projection of Student Book



Answers and ALDS homework and videos



"I can see the lower-end achievers are progressing as much as the high-end achievers. So within their capability, they are all progressing through"

School 7, KS4

8 Discussion and Conclusions

Overall, there was a positive reaction to the resources. Teachers and students benefited from resources consistent with early GCSE sample and specimen papers.



ActiveLearn:

- Whole-class use of ActiveLearn was valued
- ‘Teacher-educative’ ActiveLearn videos support teachers’ subject knowledge and their pedagogical skill set

Teachers:

- Improved knowledge of fluency, of reasoning and of problem-solving, supported by the resources
- Teachers reported enhanced mathematical confidence and self-efficacy, and grade outcomes were also very positive
- Planning resources saved teachers considerable planning time
- Print resources remain popular

Students:

- The attitudes of the students in this study to their mathematics experiences were unusually positive for 11-16 years olds in this country
- Students largely attributed their degree of confidence to their teachers, but teachers themselves said the thorough coverage in the resources and their obvious alignment with the aspirations of the new curriculum, gave teachers themselves confidence
- Students seem to have made at least as good progression as comparable students historically
- Curriculum coherence is key: Teachers’ conceptualisations of the aspirations for fluency as well as PSR, were heavily framed first by emerging GCSE papers and second, by the resources. It is therefore critical that GCSE papers retain coherence with both curriculum intentions and with resources created to support those.



“They (students) definitely know more now, they’re more ready to take on more. The resources are so good that way, and I suppose the teaching must be very good as well!”

School 12, KS4

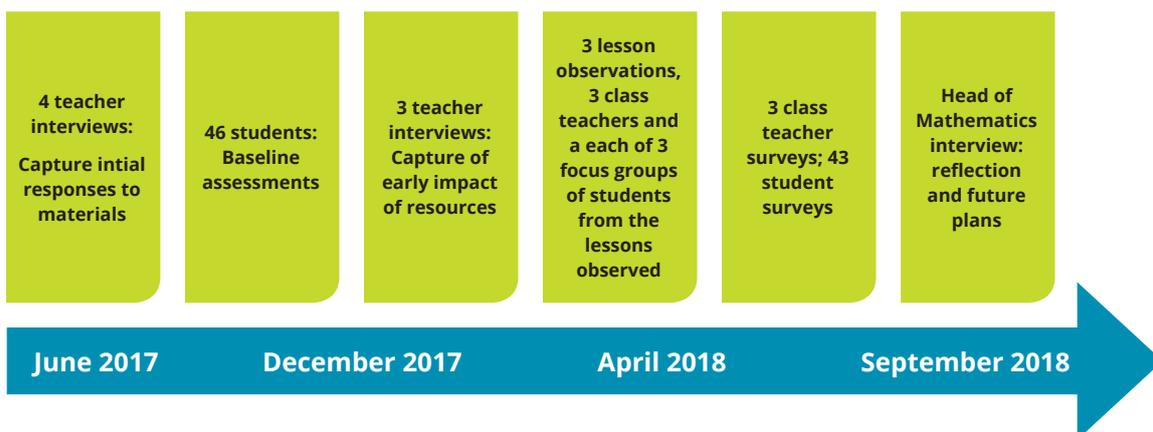
Context

This section of the study differed from the rest in that it was essentially an in-depth case study of a department embarking on use of the two sets of materials. The School was struggling with Maths attainment - 59% 5 A*-C*-C including English and Mathematics at GCSE, but only 60% gaining C+ in Mathematics GCSE. They were suffering high staff turnover in mathematics, and most of the department budget was taken up with photocopying. Teachers had access to a small variety of

textbooks, including some designed for the new GCSE curriculum, but students did not. Finally, there were no detailed Schemes of Work.

This case study adopted a longitudinal lens over the four terms from introduction to the KS3 MP and GCSE (9-1) Mathematics materials in a Summer term. Then it looked at the related forward planning, through first use and into fairly established first year use.

Case Study – Methodology



Access and Experience

- The resources were perceived to fully support the intentions of the curriculum, helping to tackle fluency, problem solving and reasoning
- There were aspirations to fully engage parents with supporting ActiveLearn homeworks and use of the resources
- Resources were seen as particularly supporting the needs of less experienced or effective teachers
- Teachers used a variety of other resources in conjunction with GCSE (9-1) materials, and pointed explicitly to enrich tasks as complementary enrichment for students
- Teachers and students were explicit that students in both Key Stages enjoyed using the resources

Achievement and Competence

- The impact on learner confidence was seen to be very positive
- Differentiation was deemed to be strong but there were gaps at the lowest end of the ability range
- Students were appreciative of the range of questions in KS3 MP, and the scope those gave for building up confidence over time
- Teachers noted the potential of peer working in order to challenge the range of students in the class

Progression

- Planning was heavily aligned with the Pearson planning resources
- By the early Summer term 2018, it was apparent from school 17's formal half-termly progression monitoring that the classes of teachers making significant use of the KS3 MP and GCSE (9-1) resources were making substantially better progress than similar students in previous years

Case Study Summary

A whole-departmental approach, with the provision of relatively small-scale support was shown in the school to lead to rapid effective use of the materials in classrooms.

Following on from this study, we will be looking at developing both ActiveLearn and the textbooks in various ways.

ActiveLearn

ActiveLearn developments:

- Printable homework worksheets
- More videos and games
- Redesign of zoom areas
- Service and functionality improvements
- Transferring to a new questions builder to improve usability and reliability
- Speed improvements - updating technology used to run online services

The textbooks (and digital versions) developments:

- Review and development of entire KS3 Maths Progress series
- Core series includes more accessible starting point, more fluency questions, review of worked examples
- New KS3 and GCSE Purposeful Practice Books include 'Exam Practice' section, with ResultsPlus examiner feedback
- Updates to GCSE end of unit, end of term and end of year tests, including mark scheme





| | |
|--|---|
| <p>School 1</p> <ul style="list-style-type: none"> ● Use textbooks and full ALDS at both KS ● Very high proportion of EAL and FSM students ● Between 800-900 students | <p>School 2</p> <ul style="list-style-type: none"> ● Use textbooks at KS3 and ALDS and practice books at KS4 ● 'Good' Ofsted rating ● Between 800-900 students |
| <p>School 3</p> <ul style="list-style-type: none"> ● Use all textbooks, ALDS, revision books and Access books at KS4 ● High proportion of EAL and FSM students ● Over 1000 students | <p>School 4</p> <ul style="list-style-type: none"> ● Use Delta textbooks, ALDS and ActiveBooks at KS3 and textbooks and online planning and assessment materials at KS4 ● Between 800-900 students |
| <p>School 5</p> <ul style="list-style-type: none"> ● Use textbooks and ALDS at KS3 and textbooks, AT and workbooks at KS4 ● High proportion of FSM and SEN students ● Between 700-800 students | <p>School 6</p> <ul style="list-style-type: none"> ● Use textbooks and teaching materials of ALDS at KS3 ● High proportion of EAL and FSM students ● Between 800-900 students |
| <p>School 7</p> <ul style="list-style-type: none"> ● Use textbooks at KS3 and textbooks, ALDS and workbooks at KS4 ● Fewer than 200 students | <p>School 8</p> <ul style="list-style-type: none"> ● Use textbooks, ALDS, Active Books, workbooks at KS4 ● Over 1000 students |
| <p>School 9</p> <ul style="list-style-type: none"> ● Use textbooks and ALDS at KS3 and textbooks, AT and workbooks at KS4 ● High proportion FSM students ● Over 1000 students | <p>School 10</p> <ul style="list-style-type: none"> ● Use textbooks, ALDS and workbooks at KS4 ● Over 1,300 students |
| <p>School 11</p> <ul style="list-style-type: none"> ● Use textbooks (for staff only) and ALDS at KS4 ● Above average number of FSM and SEN students ● Between 700-800 students | <p>School 12</p> <ul style="list-style-type: none"> ● Use textbooks and ALDS at KS3 and textbooks, AT and workbooks at KS4 ● High proportion of EAL and FSM students ● Over 1000 students |
| <p>School 13</p> <ul style="list-style-type: none"> ● Use textbooks and ALDS at KS3 and textbooks, ALDS, revision guides and Access books at KS4 ● Between 600-700 students | <p>School 14</p> <ul style="list-style-type: none"> ● Use textbooks, AT and Access books at KS4 ● Over 1300 students |
| <p>School 15</p> <ul style="list-style-type: none"> ● Use textbooks and ALDS at KS3 and textbooks, ALDS, workbooks at KS4 ● Over 1500 students | <p>School 16</p> <ul style="list-style-type: none"> ● Use textbooks at both KS ● Above average number of FSM ● Between 700-800 students |



When you have finished with this leaflet please recycle it

Pearson Education Ltd is committed to reducing its impact on the environment by using responsibly sourced and recycled paper.

PEUK A0207

