



# CTK LSEF Research

## Project findings for CHEMISTRY

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CHRIST THE KING  
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# Preface

The following report focuses on our research findings for the teaching and learning of **CHEMISTRY** to A/A\* at GCSE and A level, based on what we have learnt from our recently completed London Schools Excellence Fund project (a state-independent school research collaboration led by Christ the King Sixth Form College between January 2014 and September 2015). To the best of our ability, the findings laid out here are our empirically-informed responses to the two key research questions we set out to investigate:

## Research Question 1:

- What strategies do independent schools utilise to ensure their pupils achieve top grades at GCSE and A Level in English, Maths, Biology, Chemistry and Physics and how do they secure places for their students at Russell Group universities in such large numbers?

## Research Question 2:

- Are the strategies transferable to the state sector and can they be scaled up so that they can be made available to a wider community across London?

**It is our recommendation that the documents in this report be read in conjunction with our summary report entitled **What makes the difference**.** While the summary report presents an overview of our key learning from the project, each document in this report provides the richer details and discussions that underpin these findings. Therefore, as you explore this report the following should be noted:

- this report is made up of 13 'individual' documents
- although each can be read as a standalone document, ultimately, each forms a key component of the overall whole
- it is this 'whole' that tells the story of the various key enablers we identified working in partnership with each other, which lead to successful high level achievement at KS4 and KS5; quite simply, there is not one single element that, on its own, can provide what is needed

As such, we feel it would be prudent to keep all of these points in mind as you read, and advise that each document be considered within the broader context of the overall report.

We hope you enjoy reading about our research and that these documents will help to provoke discussion and stimulate thinking.

# Attributes of an A/A\* CHEMISTRY student:

What are the commonly-seen skills and behaviours of an A/A\* CHEMISTRY student?

On two occasions over the course of this project, the state and independent school teacher-researchers completed a bespoke teacher survey that had been designed to gauge their levels of professional confidence and understanding around teaching to A/A\* with their most able GCSE and A level students. One question (split into three parts) asked the Chemistry teachers to use their professional expertise to consider a list of six *suggested* key attributes for high-achieving KS4 and KS5 Chemistry students, and then respond as follows:

- Do you feel that any key skills are missing? If so, what else would you add?
- Are all equally important or would you put them into an order?
- Please cross out any that you feel might be superfluous.

Our analysis of the teachers' responses (laid out in the tables below) subsequently enabled us to create a clearer picture of what they feel are the key skills and behaviours most often seen in Chemistry students of A/A\* potential.

The views of state and independent school Chemistry teachers:

1	Observes with insight, usually offering perceptive interpretations and extrapolations
2	Asks novel 'what if'-type questions, making links to prior knowledge but often with lateral twists
3	Is reluctant to accept simplified explanations of phenomena or to work on anything which is low level and unchallenging
4	Sees relationships between variables easily and makes instinctive explanations of hypotheses
5	Makes intuitive leaps in different situations, showing genuine curiosity and persistent interest in topics
6	Absorbs new concepts rapidly demonstrating a great interest in the bigger questions such as the nature of the universe

## Are there others?

The Chemistry teachers drew on their professional experiences and insights to add the following frequently witnessed abilities and dispositions:

	ADDED:
7	Can and will explain concepts and phenomena to assist peers
8	Willing to work independently and be persistent in pursuit of an explanation
9	Can make synoptic links across learning in different subject areas and apply them to specific areas of Chemistry or to scientific questions

# Barriers to high level achievement:

that affect ALL SUBJECTS or SEVERAL SUBJECTS, and CHEMISTRY specifically

Drawing on their professional experience and insights, our state and independent school teachers highlighted what they felt are the key barriers to high level achievement in their subject within their school or college. Our analysis of all of this teacher survey data identified that some of these barriers are common hindrances for several subjects and, in some instances, these significantly impede progress for all five subjects explored in our study (English, Maths, Biology, Chemistry, Physics); these 'common' barriers have been summarised and presented in the table below. For **Chemistry-specific** details on these points please refer to the table overleaf.

IDENTIFIED BARRIER	ENG	MATHS	BIOL	CHEM	PHYS
<b>... for ALL subjects</b>					
■ 'Poor' or insufficient prior achievement for A* candidacy	√	√	√	√	√
■ Students' lack of understanding about the step-up from GCSE to A level and the broader requirements involved	√	√	√	√	√
■ Time	√	√	√	√	√
<b>... for FOUR subjects</b>					
■ Strength, depth and width of teacher's subject knowledge	√	√		√	√
■ Students' fixed mindsets/ low expectations	√	√	√	√	
<b>... for THREE subjects</b>					
■ Academic, subject-specific language issues	√		√		√
■ Students' lack of confidence		√	√	√	
■ Poor exam technique			√	√	√
<b>... for TWO subjects</b>					
■ Maths skills				√	√
■ Students' lack of understanding about 'the bigger picture'			√	√	
■ Large classes and challenge of meeting needs of wide ability range		√	√		
<b>... for CHEMISTRY-specific details, see overleaf</b>				√	

The state and independent school **CHEMISTRY** teachers identified the following as the key barriers to high level achievement in their subject:

1	<p><b>'Poor' or insufficient prior knowledge for A* candidacy</b></p> <ul style="list-style-type: none"> <li>■ from GCSE to A level</li> <li>■ from AS to A2</li> <li>■ identifying gaps in students' knowledge and teacher's strategies for addressing this issue</li> <li>■ lack of rigour in GCSE courses results in insecure or weak knowledge foundations, which impedes progress upon transition to A level</li> </ul>
2	<p><b>Maths skills</b></p>
3	<ul style="list-style-type: none"> <li>■ Students' lack of understanding of 'the bigger picture'</li> <li>■ making synoptic links between themes and concepts in the course</li> <li>■ that Chemistry knowledge is based on cumulative understanding</li> </ul>
4	<p><b>Poor exam technique</b></p> <ul style="list-style-type: none"> <li>■ ability to demonstrate understanding through appropriate application of knowledge - although students are good at learning the subject they need to be able to <i>show what they know</i> to be at A* standard</li> <li>■ lack of precision</li> <li>■ need to pay attention to detail</li> <li>■ overemphasis on exam paper practice at possible detriment to understanding focus of the questions being asked</li> </ul>
5	<p><b>Lack of an A* culture, e.g. an A* critical mass, A* role models and other A* exemplars, for students to better understand broader requirements for achieving A*</b></p> <ul style="list-style-type: none"> <li>■ quite simply, the need to work hard (but how to know how much is 'enough' in the absence of authentic benchmarks?)</li> <li>■ a commitment to achieving highly all year round through commitment to extension work and consolidation of difficult content (not just working hard for exams)</li> <li>■ level of detail and specificity required</li> <li>■ the need to question and become independent learners at A level</li> <li>■ the significance of resilience and persistence and understanding that challenge and difficulties are an important part of their learning</li> <li>■ challenging and stretching each other through interaction and competitiveness</li> </ul>
6	<p><b>Lack of expectation, e.g. 'culture of B grades being good enough'</b></p>
7	<p><b>Lack of self-esteem/ confidence/ intrinsic interest/ passion</b></p>
8	<p><b>Time</b></p> <ul style="list-style-type: none"> <li>■ to cover syllabus</li> <li>■ to go beyond the specification</li> <li>■ to revisit and consolidate</li> </ul>
9	<p><b>Strength, depth and width of teacher's subject knowledge</b></p> <ul style="list-style-type: none"> <li>■ ability to teach abstract concepts in a comprehensible way</li> <li>■ the importance of maintaining and updating subject knowledge</li> </ul>
10	<p><b>Significance of parental interest, e.g. through encouragement; understanding that high grades can enable progression to leading universities</b></p> <ul style="list-style-type: none"> <li>■ for supporting teachers to motivate students and helping to facilitate effective learning</li> </ul>

# Teaching strategies & practices that make the difference:

Which teaching strategies & practices make the difference for providing our most able students with a sufficient level of challenge to achieve A/A\* grades?

The Mayor's Education Inquiry reported in 2013 that our London state schools are doing exceptionally well in so many areas of education. However, one key area where our efforts are not quite hitting the mark is our ability to provide sufficient challenge and stretch for our most highly able KS4 and KS5 students to enable them to achieve their A/A\* potential. But what exactly does *sufficient* challenge and stretch look like in terms of our teaching? What does *sufficient* stretch and challenge look like in terms of our students' learning? What types of teaching strategies and practices *really make the difference*? How can we adapt what we currently do in order to give our most able students the depth and breadth of learning experiences they require, desire and so rightly deserve? And, how do we adapt our strategies so that our students can tackle the challenges that the new linear GCSE and A level curriculums will bring?

To begin with, our A/A\* students need...

## ...a strong subject knowledge as their starting point

The linear GCSE and A level qualifications have a greater emphasis on knowledge. Our research revealed the depth and breadth of knowledge that students in independent schools possess. To really challenge and stretch our A/A\* students, they need to have an expert grasp of subject knowledge that they can draw on and recall with ease and confidence. In addition, they need to possess an understanding and appreciation of 'the big picture' and of broader contexts for that subject. In and beyond our classrooms, they will develop this knowledge in a range of ways and from a range of sources whether it be through the use of targeted questioning; group, pair or independent research. However, our research indicates that, from time to time, we simply need to teach them some of this information. Not all the time, of course. But, what we saw in independent schools is that there is absolutely nothing wrong with, and certainly a lot to be gained from, being a knowledge-deliverer for parts of our lessons and doing this confidently and unapologetically. As we know, our position as teacher is multi-faceted and continually changes throughout the course of our lessons. Imparting knowledge is just one of the roles we will undertake, but is one that plays a significant part in lessons in being able to accelerate A/A\* students' learning to the level needed if they are to achieve their full potential. In order to do this well, our students want to see that we are experts in our subject, that we are knowledgeable and passionate about what we teach, and that we can provide them with clear explanations of the content we are teaching because all of this gives them genuine confidence about their learning experiences and increases the likelihood that they will come to us when they encounter difficulties in their learning.

So, in our lessons we need to be imparting strong subject knowledge, which **requires us to be a confident knowledge-deliverer**. We need to also be capable of making references to wider knowledge, to broader contexts, to 'the big picture'. All of this means thinking about what we need to do to **ensure that we remain up-to-date and energised by our subject, and able to take learning beyond the specification**. The data in our study strongly suggests that ensuring we are highly knowledgeable and an enthusiastic expert in our subject and that we have opportunities to renew and update (*see Document 7 and Case Study 1 & 2 for examples of effective opportunities trialled in this project*) is absolutely critical to our students' learning experiences and their outcomes.

**Planning for knowledge acquisition for A/A\***

1. Knowing the specification and planning is crucial. It is important to identify what students need to know – what they need to have at their fingertips as opposed to what skills they need to develop and how they apply their learning.
2. Good subject knowledge at A level builds on firm foundations at GCSE. Identifying any gaps and filling these are crucial to a strong transition. The start of the course should address these.
3. Knowledge must be learnt and retained. This can be achieved in a range of ways and may sometimes require rote learning and repeated testing.

An effective **Chemistry-specific** example and reflection captured from the most effective state and independent school lessons seen in our study include:

**CHEMISTRY**

Making effective use of prep so that students come to class 'readier' for learning.

**Ways that the teachers in our study are keeping up-to-date with their subject knowledge include (but are not limited to):**

- *taking out and using subject-specific journal subscriptions* in order to keep up-to-date with latest developments and thinking;
- *joining and becoming engaged with subject associations* such as the Royal Society of Chemistry;
- *trailing an in-house 'solution' to improving each other's expertise*, which has been developed by one of our English teachers: this involves re-imagining the use of departmental meeting time to specifically include time for developing each other's subject expertise. The most common issues around attending any sort of CPD are 'time' and 'money'; this teacher's approach eradicates both by using what is already within his reach: mandatory meeting time for his subject colleagues to meet, and individuals' subject expertise that can be shared amongst the group in a collegial and non-threatening way;
- *creating a bank of subject knowledge podcasts*, e.g. the teachers in one of our subject groups are seeking to build on the in-house approach listed above, by creating short podcasts (approximately 10 minutes each) of subject knowledge that address 5 agreed key questions. Without doubt, every teacher is an 'expert' in a particular area or topic that their subject colleagues perhaps knows little about. If each person shares a focused snapshot of their knowledge through this podcast approach then very easily, and without much effort, we have a fantastic bank of 'starting points' that others can usefully use as 'ways in';
- *joining a subject-specific online community*, e.g. the subject networks we set up for our study (*see Case Study 1 for more details about these networks*), to connect and interact with other like-minded subject specialists; the opportunity to do this has been especially invaluable for some of our teachers who work in very small (even 1-person!) departments;
- *becoming involved in small-scale research projects*, e.g. taking advantage of professional development bursaries that our schools or subject associations might offer; collaborating with colleagues in neighbouring schools or through a Teaching Alliance;
- *increasing personal research activities* such as the use of Google and other internet search engines; YouTube videos; Hay Levels' mini lectures (<https://www.youtube.com/user/HayLevels>);
- *attending externally-provided CPD sessions* – although many of our teachers agreed it would be beneficial if there could be some sort of kite-marking of these events in order to highlight which ones teachers have found to be genuinely useful.

IN ADDITION, to further augment students' understanding of the subject, to better contextualise this within its 'big ideas' and to ensure this includes 'stretching' levels of challenge, their learning should not be confined to syllabus guidelines but, as a matter of course, should include...

### ...BEYOND-THE-SPEC and BEYOND-LEVEL LEARNING

Knowledge-rich, content-led lessons that go beyond the syllabus requirements were observed creating a sense that there is so much more to learn, which is vitally important for igniting our A/A\* students' passion, thirst and enjoyment for learning (the subject, and for learning *per se*). Lesson content that is not restricted to the exam specification reinforces the reality that the landscape of learning is far broader than that shown in the syllabus. Raising students' awareness of this helps to promote intellectual curiosity, which, in turn, can be instrumental for developing an intrinsic motivation for studying the subject that will drive them to engage all the time whatever the task. When learning for learning's sake and learning as its own reward start to become the norm, this lays the foundations for building a culture of learning that our A/A\* students need if they are to thrive and survive at the highest level of study in school and beyond.

*So, in lessons we need to ensure we are broadening our A/A\* students' vision of the subject and that, as an ongoing goal, we are seeking out ways to continually nurture their motivation and enjoyment of our subject*

### Planning for teaching and learning beyond-the-specification

1. A broad understanding of subject knowledge is essential in order to take students' learning above and beyond-the-specification. Throughout a teacher's career, their specialist subject knowledge should be maintained and also kept up-to-date: this is essential to help retain and renew their passion for their subject, which in turn should help foster their students' intellectual curiosity and awareness in the latest developments and thinking in the subject. Teachers should be pro-active in seeking out any such learning opportunities, and departmental and whole-school level buy-in to this is vital; this needs to be seen through their commitment to providing the support required to allow staff to take advantage of these opportunities.
2. The development of subject knowledge does not necessarily need to always involve significant financial expense. For example, by becoming an active member of a cross-school subject specialist peer-driven network, teachers have opportunities to 'work with' fellow subject specialist teachers in other schools in various ways that can help to address the subject-knowledge CPD element that currently appears to be lacking in external CPD provision. This type of peer-to-peer professional collaboration is based on harnessing teachers' expertise and using this to support the development of each other's subject knowledge/pedagogy expertise - an approach that has already been found to be both empowering and highly effective.

**Effective Chemistry-specific examples and reflections captured from the most effective state and independent school lessons seen in our study include:**

#### CHEMISTRY

encouraging students to contact speakers to invite them in, to talk to them afterwards (London universities very keen to do outreach work - Queen Mary, King's, Imperial)

Science Cafe - Wed afternoons - run by students, who organise for different speakers to come in

Using Pre-U books to take students' learning beyond-the-spec

Students are completing iGCSE questions that are at the same level as OCR AS Chemistry. They have a good foundation of knowledge.

Copy of New Scientist to early completers. Reading through with no direction.

**Ways we can do this include:**

- *seeking out opportunities to engage with other subject specialist colleagues (in-house and/or within other schools and cross-sector) to develop, adapt or create resources that will aid the process of teaching and learning by providing our A/A\* students with high level challenge and stretch;*
- *fostering an academically competitive atmosphere amongst our students, e.g. through entering in-house subject competitions; participating in national Olympiads; creating a collaborative classroom where peer contributions are valued as much as the teacher's and where students work together to solve problems;*
- *introducing our most able students to beyond-level work, e.g. posing A level questions to KS4 students; trialling undergraduate level exercises with KS5 learners. Although this might sound extreme, the A/A\* students in our research clearly voiced that they want to be challenged more; that they feel frustrated because they believe they are capable of achieving more! The potential gains are multiple: students can genuinely be stretched in their learning and thinking; their thirst for a deeper and broader understanding of the subject can be satiated; such experiences also allow them to better understand that challenge and persistence with problems are important features of learning and intellectual growth and, in turn, this will strengthen their academic resilience. And, for us as their teacher, this gives us additional insights into how far these top-end students can really be stretched and their readiness for this level of academic challenge.*

BUT ALSO, in our lessons, our A/A\* students need rich opportunities to be challenged in their learning. Our research indicates that A/A\* teaching needs to be carefully planned and that A/A\* students need to be specifically targeted using a different approach to teaching. The data from our study strongly suggests that this needs to include:

**...PLANNING VISION: discrete episodic lessons v. lesson-by-lesson in the context of an arc of learning...**

Here, it's important to continually ask ourselves a two-part question:

- how do we want our students to think about their learning:
  - by compartmentalising this into 'short' episodic chunks?
  - as a more continuous process that takes place over a series of lessons?

So as to avoid confusion, we should probably make clear that our research did not show that this needs to be, or even should be, an 'either/or' approach. These questions are really about challenging us to think consciously when we plan for teaching different aspects of the specification. At times, almost certainly, we will favour one approach over the other and this will likely depend on what we are teaching, how we want to teach it and which way we think makes most sense for helping our students to develop a strong and secure understanding of that content. Overall, our answers to these questions should then inform and drive how we plan for that learning to happen.

*So, for every unit or topic, we need to **approach both our long- and also shorter-term planning with clear ideas about how we want our students to be developing their understanding of that content.** Establishing this in our minds at the outset means we should then be able to plan (more) effectively, e.g. we can look ahead and make decisions about where it could be necessary to give more focus and time and then plan around this from the beginning; we can consider which teaching and learning approaches are best to use at different points, and which are possible to use, in the time available.*

**Planning for development of understanding across a series of lessons**

1. The idea of an arc of learning is that it sets a framework within which a topic or unit might be delivered. A good analogy for the arc of learning is a TV mini-series: over the period of the series the plot is introduced, developed and comes to a conclusion with the characters' motives being revealed. The series is made up of a number of individual programmes or episodes and, at the end of each, there is a cliff-hanger so that the audience are keen to tune in to the next programme.
2. In the same way for the arc of learning, the topic is introduced and developed across a series of lessons, with each lesson finishing with something that keeps up engagement ready for the next lesson. This means that each lesson is a bit different – there is no set format to follow. And, whilst the ingredients of outstanding lessons will be present in lessons, they would not necessarily *all* be seen *in every lesson*.

**Ways we can do this include:**

- from the outset when teaching a new unit or topic, making clear decisions about how we think our students can best develop a sound understanding that material – can this be achieved through episodic learning, or does this need to be developed continually over a number of lessons as part of a ‘bigger picture’? Based on this, we can then start to identify which key components from our teaching and learning cycle need to feature in any particular lesson or across a series of lessons because, as mentioned, they would not necessarily *all* be seen *in every lesson*.

**...a distinct ‘LEARNING PHASE’ and an ‘EXAMINATION PREPARATION PHASE’**

Teaching and learning in a number of the independent schools we worked with involved a distinct separation between a ‘learning phase’ and an ‘examination preparation phase’, which ultimately seemed to benefit their students. In the ‘learning phase’, efforts are solely centred on developing students’ subject knowledge and understanding by nurturing their intellectual curiosity through rich opportunities for:

- *discursive and exploratory learning* - for example, using a more open-ended approach to problem-solving where tasks are less tightly structured offers most able students a more creative learning process, which seems to suit them better;
- *high level problem-solving and risk-taking* - this means allowing students to make mistakes and to learn from them; this means viewing wrong answers as learning opportunities rather than failed attempts where the learner gives up easily because faced with difficulty.

All of this means planning for teaching and learning that goes beyond the end goal of formative and/or summative assessment requirements (although we are still going to have this in our minds, what we aren’t doing is making this the ultimate driving force for what happens in our classrooms). Instead, fine-tuning our attentions and our students’ attentions on learning for learning’s sake will spark interest and engagement and, these sorts of approaches, in turn, help to foster students’ intellectual curiosity in the subject as well as further develop their academic resilience and confidence as highly motivated, resourceful, passionate learners. In contrast, a separate ‘examination preparation phase’ is the time for focusing ruthlessly on revision, practice and the strengthening of examination techniques and study skills. Pushing the pace much earlier during the ‘learning phase’ means we then leave time for revisiting and consolidation in the ‘examination preparation phase’, which the data suggests works to students’ advantage. Taking the new linear A levels as an example, its structure will increase learning time in the Lower 6<sup>th</sup> year and so planning this type of learning should become more feasible.

*So, at the beginning of each academic year we need to ensure that our **overview planning for the year is based around two distinct phases: a ‘learning preparation phase’ that predominantly focuses on the deeper development of subject knowledge and the cultivation of intellectual curiosity; and an ‘examination preparation phase’ where full attention and energy are ploughed into consolidation and revision of all that has been learnt in the phase prior.***

**Planning for a learning phase and an examination phase**

1. Course planning should clearly identify each of these phases so that there is a separation between them, and so that the focus of each phase is evident (for teachers as well as for the students).

**Ways we can do this include:**

using the move to linear qualifications to re-think the way we plan the course, to re-think the way we plan for learning to happen. So, using A level study as an example, the removal of interim examinations at the end of the AS year means that we now have a valuable opportunity to re-imagine how we deliver the course across the two year period, a greater freedom to decide what pace we set for our lessons and how we will assess learning more strategically, both in summative and formative senses.

### ...access to HIGH CHALLENGE and EXEMPLAR A/A\* RESOURCES

There was widespread agreement amongst the independent and state school teachers in our research that resources and exemplars of A/A\* work are key to being able to nurture high level achievement with our most able students. But, as we learnt, access to sufficiently high challenge resources can be problematic for those of us working in state schools because, for many of us, it's likely we have just a small number of A/A\* grade students in our classes. So, where this is the case, the first obstacle we need to overcome is knowing what a sufficiently high challenge resource actually looks like! How able are we really, to gauge what 'sufficient' means in this scenario, and what approaches and strategies can we use to understand this better? Our state school teachers reported that they thought they knew this well until they saw what A/A\* looked like, in critical masses, in the independent schools.

*So, in our lessons we need to **ensure that the resources and other materials we use are genuinely stretching our A/A\* learners and are always moving their learning forwards**, and not just offering them 'more of the same.'*

#### Planning for access to exemplar resources

- Resources can be gathered from a range of sources. Some will come from obvious places such as textbooks etc. but other relevant and/or more up-to-date resources are also available via links and references such as those listed below:

**State and independent school Chemistry teachers in our study shared with each other the following sources that they use themselves to access particularly high challenge material:**

#### CHEMISTRY

Students are completing iGCSE questions that are at the same level as OCR AS Chemistry. They have a good foundation of knowledge.

Copy of New Scientist to early completers. Reading through with no direction.

Students are completing iGCSE questions that are at the same level as OCR AS Chemistry. They have a good foundation of knowledge.

#### Ways we can do this include:

- *seeking out opportunities to collaborate with fellow subject-specialist practitioners* (whether within our own or other schools, and/or looking cross-sector) as a means for sharing, exchanging, developing and/or testing resources, e.g. we could share a resource we have adapted, created or found, that we think is of 'sufficiently high' level, and ask for feedback based on others' professional experience of working with A/A\* students. This might open up a constructive discussion about useful ways to amend the resource (if required) or perhaps alternative ways of using it in order to build in a higher level of challenge;
- *becoming involved in subject-specialist networks with A/A\* achievement as its core focus*, e.g. in our project we have tested whether such networks can add value to our state and independent school teachers' professional practice. Their feedback clearly states they have greatly enjoyed and gained from opportunities to connect with others beyond their own school, that 'working' with others in this way has genuinely enabled them to develop their own thinking and understanding. 'Working together' has taken a range of forms including using an online forum to discuss, debate, to seek advice, to share and develop resources, to post links to upcoming CPD events that schools/individuals know to be useful and worth attending; participating in physical teacher exchanges where individuals have taught in each other's schools and classrooms to experience working with cohorts they do not usually experience in their own settings (*see Case Study 1 & 2 to read more about these CPD activities and experiences*).

**...a PACE that matches but also challenges their ability level**

For our A/A\* students, this means thinking deeply about the pace of teaching and learning to deal with how much content is covered and in what ways; from the outset of the school year, and in every lesson (and for beyond-lesson work, i.e. homework and prep), setting a pace that genuinely challenges our A/A\* students and moves their learning on rapidly by capitalising on every possible opportunity. It also means thinking about pace of recall, and how we ensure that our students are able to do this. But, our A/A\* students also tell us that we need to be ready to vary that pace so that they have time and space to secure and consolidate their understanding and so that we can check that this is being achieved.

***So, in every lesson we need to remain mindful of the pace at which we are teaching, and the pace at which we are expecting our students to learn, and be prepared to vary this accordingly.***

**Planning for pace**

1. Planning for pace can be a challenging task when this involves teaching in mixed ability classrooms, which are often common in state school settings. Differentiation will play a significant role here, as should our level of expectations for what our most able students should and need to be achieving – both in and beyond lesson time. The level and amount of work completed (in lesson time, and for prep and homework) needs to be checked to both assess students' progress and also help maintain their motivation to work hard.

***Effective Chemistry-specific examples and reflections captured from the most effective state and independent school lessons seen in our study include:***

**CHEMISTRY**

focusing more on prep work so that students come to class 'readier' for learning, which means that content can be covered at a faster pace as a result

doing prep work and being prepared to teach this to others in their class – each A/A\* student is paired up with 1/2 students, who provide feedback on the usefulness of the explanations provided

use of Harkness approaches for teaching and learning, which is an empowering technique that can be effective with different ability levels, e.g. high level challenge is available for those who are ready for it; and for a range of learning approaches, e.g. for those who are more suited to passive learning this is also possible:  
[http://www.exeter.edu/admissions/109\\_1220.aspx](http://www.exeter.edu/admissions/109_1220.aspx)

**Ways we can do this include:**

- *developing a stronger understanding of what an 'appropriate' pace looks like that works for our A/A\* students, especially if we are teaching them in a mixed ability class. 'Appropriate pace' for A/A\* is not necessarily always going to mean a 'faster pace' for the amount of material being directly covered in our teaching; it can also mean progressing our students quicker by setting higher levels of challenge and stretch in the tasks we set, in the questions we ask, in the expectations we have of how much they cover in and beyond our lessons. To gain first-hand insights into the types of effective strategies and approaches we can use we could become involved in practitioner-led CPD opportunities, e.g. to experience teaching (either independently or team-teaching) larger cohorts of A/A\* students; to seek advice through discussions and Q&A with others who have (more) experience of working with highly able learners etc.;*
- *using a research-informed approach (e.g. simple questionnaires or focus groups) to gather first-hand feedback from our A/A\* students about their learning experiences and ways we may be able to support them better. This information can tell us a lot about what they are finding useful and less so and ways they believe their learning experiences could be improved. We should never overlook or underestimate our students' ability and willingness to tell us what they think. In our study, their responses provided us with such rich, eye-opening insights into their experience of being an A/A\* student in our schools and colleges and these included specific suggestions for how else we can support them in their studies. For example, we learnt that our state school students highly value: their teachers' willingness to provide additional support beyond workshops and lesson time; the availability of dedicated learning spaces such as our Learning Resource Centres (LRCs); and that their teachers believe in their potential and push them hard to try and achieve this. But, they also told us they want to be helped to develop broader and deeper subject knowledge, e.g. by being given more challenging work, by engaging with a wider range of texts and authors, by reading more – and for their teachers to check that this is happening; they want to ensure their understanding of concepts is secure; they would like additional support to prepare for formal examinations. So, if we want to know what our students think, the best way to find out is really simple: give them the opportunity to tell us!*

**...excellent use of QUESTIONING**

This means refining the way we use questions, i.e. for what purpose(s), and considering the types of questions we ask so that our A/A\* students are continually being engaged and make progress in their learning. Frequently in our study, we saw learning being enhanced and effectively steered using the mechanism of questioning as it provided learners with intellectual encouragement to explore subject matter more deeply, both in and beyond the lesson and the confines of the syllabus. Used well, it helps to foster interest and a sense of discovery about lessons. In turn, this develops students' intellectual curiosity and builds academic confidence. And, in mixed ability classes, our use of questioning can be an effective discriminator where differentiation is required.

***So, in every lesson we need to remain conscious of how we use questions to stretch our A/A\* learners so that pathways to understanding offer challenge and demand the use of higher order thinking skills.***

Planning for use of effective questioning

Every opportunity should be taken to encourage students to think deeply and broadly in their responses. This requires teachers to possess strong subject knowledge and students to be academically resilient and persistent in order to find answers to 'difficult' questions.

The questions asked need to be both cognitively challenging and also able to progress students' understanding every time. This needs to happen as a matter of course so that higher-order, open-ended questions create opportunities to open up learning and so that they continually develop students' intellectual curiosity.

In addition, where necessary, students should be reminded to use subject-specific terminology in their spoken and written responses so that in time this will become commonplace practice.

***Effective Chemistry-specific examples and reflections captured from the most effective state and independent school lessons seen in our study include:***

**CHEMISTRY**

Teacher questions students on their answers and asks other students to elaborate on the answers.

Open question 'what happens if...' raised engagement.

Follow-on questions – students had to justify statements that they made and explored why they came up with the answer.

**Ways we can do this include:**

- *where relevant and possible, moving away from closed questioning that predominantly aims to elicit a limited and usually pre-determined range of responses from students;*
- *posing more higher-order, open-ended, probing questions that broaden the possibilities for learning and which raise the bar by challenging students to elaborate and justify their responses as often this means calling on cognitive processing skills such as critical thinking and problem-solving;*
- *developing strategies that explicitly foster independent thought (and move students away from dependency), e.g. Harkness discussions;*
- *training ourselves to become comfortable with the silence that can follow after we've asked a challenging question. At one time or another, it's likely we've all felt the temptation to succumb and fill what feels like an awkward silence; however, it's so important we find ways to resist this urge if we want to leave the space open for students to respond, to present or try out explanations or hypotheses, to actively engage, which they will. These sorts of experiences all contribute to building students' confidence to contribute and take risks, which our research found plays a significant role in advancing high ability students' learning. If we jump in too soon, and if students become accustomed to this happening, the danger is we prematurely close down valuable learning opportunities and, in turn, this can strip away their desire to engage and to persevere.*

**...consistent use of ACADEMIC, SUBJECT-SPECIFIC LANGUAGE**

Lower academic language skills frequently hold back our students at KS4 and KS5 and our research has reaffirmed that this is a difficulty that persists even for some of our A/A\* students. Common issues include struggling to recall and/or accurately use subject terminology, and the ability to match the quality of their written work with their stronger oral language skills. In order to work consistently at A/A\* level, we need to ensure our students possess the ability and confidence to produce extended, reflective answers using the academic language of the subject – both in their spoken responses as well as in their writing.

*So, in every lesson we need to **ensure we are positively promoting the use of subject terminology and also developing students' flexible use of academic language in both their speech and writing.***

**Planning for subject-specific language development for A/A\***

1. By explaining and modelling the use of subject-specific academic language, in context and on repeated occasions, and expecting and requiring students to use this too in all of their spoken and written responses, in time its use will become more commonplace to the point that students will no longer need to consciously consider the language of their explanations and justifications.
2. At times, this ability will need to be (re)developed with our students, e.g. when new terminology is introduced for a new topic. Every time, the same 'process' and expectations should apply: explanations and modelling of terminology in context and a requirement for students to incorporate this into their spoken and written language.

**Effective Chemistry-specific examples and reflections captured from the most effective state and independent school lessons seen in our study include:**

**CHEMISTRY**

Lots of technical language used, precision expected

glossary, which students actively use - don't look it up, think about it and put in your own words

**Ways we can do this include:**

- *focusing specifically on learning key vocabulary;*
- *modelling the use of subject terminology in our own speech and writing;*
- *selecting resources and other materials that model the genre and use of subject-specific terms;*
- *positively encouraging, and requiring, our students to be precise in their spoken and written responses and contributions - it may be that we need to prompt them to re-articulate their ideas so that this moves from the general (everyday language) to the specific (subject-specific language) and that initially we provide scaffolds to help them achieve this. Over time, as students start to use this subject terminology more and more, what will happen is this starts to become second nature to them to the point that its use becomes the norm in class and other contexts such as examinations; university admissions' interviews etc.*

**...recaps and CONSOLIDATION OF PRIOR LEARNING**

The data from our study shows that students' poor prior knowledge and a perceived lack of rigour and knowledge-richness in some GCSE courses combine to form a weak foundation for their progression to A level learning.

*So, in our lessons we need to **ensure that we make links between new knowledge and students' existing knowledge** (and this might mean referring to previous lessons we've taught or even referring to learning developed at an earlier key stage) and that we are **always seeking to build on sound understandings and not misconceptions.***

### Planning for consolidation of pre-existing knowledge and understanding

1. In order to make effective progress in the teaching time available, it can make sense to initially 'take several steps backwards' to assess (however formally or informally) the level and accuracy of students' prior knowledge and understanding, e.g. at the point of entry to your course; at the beginning of each new unit or topic. Although sufficient and timely coverage of the syllabus remains a key priority, by first ensuring that any confusions and/or misunderstandings are identified and addressed, over the longer-term this means more rapid and sound progress can be made. Pushing forwards without doing so could otherwise prove to be a false economy.

**Effective *Chemistry-specific* examples and reflections captured from the most effective state and independent school lessons seen in our study include:**

#### CHEMISTRY

trial questions and materials sent to potential Chemistry students for them to try [in advance of beginning A level study]

teacher is a knowledge deliverer but he is also questioning students and drawing on their previous knowledge

teacher is calling out content-based questions and [A2] students are calling out the answers. Teacher is drawing out students' knowledge from Year 8 and GCSE.

#### Ways we can do this include:

- *at the point of transition (or before, if possible), and as a regular feature of our lessons, considering how to best find out the depth, breadth and security of our students' understanding so that confusions and misconceptions are identified and addressed early.* Doing so means we can move students' learning forwards at a potentially more rapid pace, feeling confident that we are building on accurate and secure foundations as opposed to more deeply embedding errors and misunderstandings;
- *employing greater use of 'prep' and careful planning during the transition period* to try to ensure that all students are working from the same starting point;
- *finding ways to take our A/A\* students beyond the confines of the syllabus.* Not only will a deeper and broader knowledge base assist with their transition to the next stage, it promotes the development of an open mindset towards their subject learning, which is absolutely critical for their intellectual growth and stimulation.

Although many of the research activities and experiences in our study were aimed at eliciting teachers' thinking about their own and their peers' practices, what we also wanted to find out was what do our students think about their learning experiences in our schools and colleges. This was important to us for at least two reasons: firstly, while we probably think we know, and our perceptions may be right, we felt strongly that there was no better, more respectful way to be certain than to actually ask them; secondly, we hoped this information would help us think more deeply about what we might need to do to better support the growth and development of our A/A\* learners.

At two points over the course of our project (carefully timed so as to minimise any possible disruptions to their learning), we asked a sample of highly able students in each of our state sixth form colleges and the four independent schools (approximately 50 from each institution; a total of 328 students) to complete our specially-designed survey that contained a mix of open-ended and scale-rated questions. One of the open-ended questions we asked in our first survey was: ***In what ways could your learning and study experiences in the following A-level subjects be strengthened: English, Maths, Biology, Chemistry, Physics?*** The question instructed students to comment on each of the subjects relevant to them. All of their responses have been summarised and the main, recurring suggestions for Chemistry have been presented in the table below:

<b>CHEMISTRY</b>	
1	<p><b>Ensuring GCSE foundations are secure</b></p> <ul style="list-style-type: none"> <li>■ including more testing during the course to assess understanding</li> </ul>
2	<p><b>Stronger links to theory and specification content and increased real world application of the subject</b></p>
3	<p><b>More challenging work, including additional broader learning opportunities in and beyond the classroom</b></p> <ul style="list-style-type: none"> <li>■ <i>e.g. difficult essay titles; additional reading (journals, books, magazines); attending lectures</i></li> <li>■ but students want to feel confident that the syllabus has first been covered sufficiently</li> </ul>
4	<p><b>More exam preparation support</b></p> <ul style="list-style-type: none"> <li>■ e.g. notes; past papers; videos; workshops; competitions to drive motivation; guidance on revision approaches</li> </ul>
5	<p><b>Clearer explanation of complex concepts</b></p>
6	<p><b>More varied in-class learning approaches</b></p> <ul style="list-style-type: none"> <li>■ e.g. more structured lessons</li> <li>■ e.g. interactive learning opportunities such as group tasks</li> <li>■ e.g. more practicals, experiments, visual aides</li> </ul>

## **(More) Effective monitoring & assessment practices:**

How can monitoring and assessment be used (more) effectively, and what could this look like?

We know that the monitoring and assessment of our students play necessary and important roles in what we do as teachers, and what we learn from doing this is intended to help both us and our students in terms of planning for development, progression and differentiation, where appropriate. The 11-16 state schools involved in this study, along with our own sixth form colleges, began the project feeling confident that the systems we have in place in our respective institutions are working well for achieving these aims. Although this remains the case, the data from our research has since encouraged us to question whether we could actually be using these practices (even) more effectively – not only for our own purposes but also to achieve (even) more positive outcomes for our learners. Could we all benefit from thinking about and ‘doing’ monitoring and assessment differently? The learning from our study suggests that perhaps we could...

**Target grades - markers of potential or barriers to progression?**

There is little doubt that target grades are important and informative. However, following time spent observing in each other's classrooms and after discussions with colleagues in those schools, some of the teachers in our study started to ask themselves questions about the extent to which an 'overuse' of target grades may be hindering more than helping the academic progression of some of our most able learners.

Probably without exception in our state schools and sixth form colleges, we make our students aware of their predicted grades and their progress towards these is measured at several points across the school year and these results are shared with them; of course, this can be useful because it provides them with an indication of their potential in each subject being studied. This information can also be useful for us as teachers in terms of planning for their development and progression and is one of the core elements in our monitoring processes that help us to identify and respond to anyone who is falling behind. However, our research also showed us that, sometimes, the use of this projected attainment information can have a limiting and possibly detrimental effect on learners' progression – as illustrated in the following examples from our study:

***An example of how target grades can constrain a teacher's ambitions for their students***

Following one state school teacher's research experience of teaching lessons in an independent school, they recorded reflections that questioned the limitations of their tried teaching approaches for some students' ability to progress in one of the classes taught. The teacher described that, based on brief knowledge given to him about the class's overall target grades, he had consciously set an academic 'ceiling' for those learners before the lesson began and used this to plan where to pitch the lesson in terms of challenge and stretch. However, in his subsequent reflections on the particular strengths and weaknesses of that lesson, he felt that his decision to 'cap' this ceiling had resulted in valuable opportunities being missed in terms of maximising the learning that could have been achieved in that session. The teacher reflected that his somewhat rigid approach to deliver the lesson he had prepared, without any deviation from 'the plan', had likely constrained the extent to which he had been prepared to challenge the students when in fact some were evidently capable of being stretched further. Despite this teacher coming away feeling a little dispirited by his realisations, nonetheless he felt this CPD experience had proved invaluable as it had enabled him to better understand the need to be flexible in his approaches irrespective of what is known about students' predicted potential.

**An example of how target grades can constrain students' ambitions for their learning**

For a different lesson, a group of teachers from both sectors had collaboratively developed what they felt were high challenge resources for use with their highly able students; the aim was to see whether it was possible to create materials that could be genuinely effective in both contexts. As well as developing the resources together, the group discussed how they might use this with their students and, after a productive and open discussion, the group agreed to trial a less scaffolded approach akin to what often happens in some independent school lessons. In essence, this would involve giving the questions to the students and 'letting them work it out' with minimal, if any, assistance from the teacher.

After one of the state school teachers had completed her test of the resources, she recounted frustrations with the way some of her students had chosen to engage with the activity. She felt some individuals just did not want to move outside of their 'academic comfort zone' and be seen 'struggling' in any way - perhaps because of an assumption that students of their predicted target grade should not find anything difficult or be making any mistakes. She described such students as ones "... *who already think they 'know everything' as they have attained A/A\* in mock examinations... who are considered 'successful' in mathematics (top set – A/A\*)*". In this instance, the students' knowledge of their target grades was seen acting as a hindrance to their continued progression because it had resulted in their active resistance of engaging with any task they felt they could not work out correctly and with ease. This seems to typify a fixed mindset for learning, which, for us, flags up several concerns: firstly, it seems ultimately restrictive because it creates a misguided belief that academic potential is fixed and progress cannot be made beyond this; secondly, it strongly suggests the lack of some key character traits and learning approaches such as resilience, persistence and high intrinsic motivation that our research has indicated play a significant role in students' ability to achieve at the highest level (see Document 6 for our findings on '**The impact of character traits on students' ability & confidence to progress**'). Achieving target grades is highly commendable, of course. But, it is essential that learners do not let the achievement of their target grades (such as in their formative mock exam assessments) prematurely close down their learning potential by assuming that even greater achievement is not possible and should not be strived for. Thus, if or when we share target grade information with our students it is important we ensure they understand these grades are 'indicative only' and so, all the time, using any opportunities to reinforce to them our belief and expectation in the possibility of their continued learning growth over the full 2-year GCSE/ A level study period.

Conversely, in many of the independent schools, there was a noticeable lack of a target driven culture. Of course, teachers engaged in monitoring practices and possessed a clear awareness of each student's target grade. But, possibly the most striking difference was their under-emphasis on grades and assessment requirements compared to our state schools. On numerous occasions, the data arising from our teacher-researchers' notes strongly suggested that the overt motivation behind the business of teaching and learning in the independent school classrooms was to continually cultivate students' passion and intellectual curiosity for learning about that subject. Their covert motivation was, of course, to ensure the students achieve their potential and the highest grades possible; teachers just did not draw their students' attention to this on the frequent basis seen in many of the state school classrooms visited. By encouraging students to want to learn for learning's sake, and not (just) for the purposes of examination requirements, learners seemingly developed a palpable thirst for subject knowledge and were clearly keen to understand more simply because they found the content interesting. This contrasted sharply with the outlook of some state school students whose willingness to engage with content was decided according to whether or not they would be tested on it. All of this led one state school teacher to record the following thought: "From this I reflect that we (or the pressures from our government) have created a culture of something only being worthwhile if it's being tested. I don't know if this comes from the teachers or the students or a mixture of both. It cannot be specific to a single subject as I don't promote this value, yet the [students] still have this resistance to 'new'".

### **Prep and homework – can we use these more strategically in order to make (even more) significant gains in teaching and learning?**

Through our research, it became clear to us that the overall faster coverage of syllabus content in the independent schools was being achieved through the effective use of a range of strategies including the setting of prep and homework. By being able to compare and contrast our own practices with those of our peers in the independent schools, we were able to see that the way these are used to progress students' learning differs somewhat from the way we tend to employ these strategies in our own schools. For instance, one prep task set to a group of independent school students required them to complete a significant amount of reading ready for their next English lesson. The students' completion of this reading and comprehension task outside of lesson time meant they should be coming to class ready to work on that text, which is what our state school teacher-researchers reported seeing happening. As a result, the students' learning in that lesson was able to move on at a more rapid pace than if they had had to first spend time reading the text through. Over the course of a term and even the year, it is then easy to understand the cumulative impact of these lesson-on-lesson gains. Of course, for these strategies to be effective relies heavily on students' completion of the work and tasks set. In the lessons observed and based on some discussions with students, we could see that the significant drivers ensuring this happened include:

- ✓ the students' high intrinsic motivation and passion for learning;
- ✓ the students' understanding of their teacher's and school's high expectations around prep and homework;
- ✓ the teacher's provision of detailed, constructive and timely feedback that helps build students' academic confidence and resilience, and which enables them to know what they need to do to improve their knowledge, understanding and skills.

Our research therefore strongly suggests that we could benefit from re-evaluating our use of homework and prep. In some of the state school lessons observed, teacher-researchers noted a sense that too little homework and prep was being set for students and, interestingly, after visiting classrooms in the independent schools, some state school teachers were coming away with a re-shaped understanding of how to use these more effectively in order to drive learning forwards faster and more efficiently with their students both in and beyond their lessons. Looking across all of our data, however, it is clear to us that although significant gains can be made for in-class teaching and learning and for teaching and learning overall by increasing the amount of work students undertake outside of lessons, this can only be a 'quick win' for teachers if it is accompanied by the checking and marking that we saw as commonplace in the independent schools we visited. A sample of our highly able students told us in their survey comments that they want to be given more challenging work and some even requested for greater amounts of homework; but, some also stated how important it is to them that their teachers check they have actually completed the work they've been asked to do. For us, it seems clear that these students are certainly not fearful of or uninterested in working more and harder. But, in order to maintain these high levels of motivation and engagement, what they want and need to see is their efforts acknowledged and recognised by their teacher.

### **Monitoring and review – how might we use these processes to help (better) facilitate the timely development and progression of students' learning?**

Data gathered from students (written comments made in their survey responses and verbal comments shared with some of the teacher-researchers during their lesson observation visits) helped highlight to us that how and when we monitor and review their work makes a real difference to how useful they deem this feedback to be. It was evident that this needs to be both constructive and timely. As we know only too well, over the course of a term and the school year, we are trying to progress our students' learning at a pace that develops secure understanding, ensures full coverage of the syllabus and also leaves time for additional consolidation and revision. With all of this in mind, it is not difficult to see why our students feel it is critical that their marked work is returned 'quickly': so that they can take on board and use our feedback at the perceived moment of relevance which is when this learning is current and fresh in their minds. If the delay becomes too long the simple reality is students' cognitive focus moves on (because it has to) to the next topic, or even the topic after that, and therefore, despite this feedback still being needed and still being useful, they told us that they are less likely to take this into account because, in effect, that particular learning moment has passed.

The students also told us that their teachers checking they have undertaken and completed any work set is very important to them, and this includes prep work as much as homework. They talked about the significance of these reviews and the timely receipt of feedback because they draw on both to provide them with some of the encouragement they feel they need to continue persevering with their studies. Frequent review of content learnt was also seen making a clear difference to the development and progression of students' learning. During the teachers' visits to each other's classrooms we observed this playing a key role in helping learners to consolidate their understanding as well as aiding their ability to recall knowledge with both ease and rapidity, all of which ultimately strengthened their learning. In addition to these benefits for students, these regular checks on learning also support us to plan (potentially more effectively) for progression because by regularly assessing the extent to which our students have understood the material taught these timely opportunities should ensure we are identifying and addressing any confusions and/or misconceptions so that these do not persist by going unmissed. At times, the way in which we are checking might be through more formalised assessment approaches but sometimes this might happen more informally such as through our use of skilful questioning.

# Nurturing a culture of excellence:

How to nurture a whole school excellence culture and what difference can this make?

*“If you get the building blocks and learning environment of the school right and all subscribe, people will achieve more than they think they might have through their capability (both [students] and teachers). Creating the right conditions – all about attention to the individual. Shaping the outlook of the [students] and the outlook of the teachers. A belief that most [students] will get there.”*

*(IND-1; Wider school research data)*

If we are truly committed to doing the best to support our most able students to achieve their A/A\* potential, we need to consider every possible angle of influence and that means leaving no stone unturned in terms of examining what we do at every level: at an institutional level as much as at teacher and student level. In addition to the specific teaching strategies and approaches we have observed making a difference for high level achievement, what has also become apparent is the whole school excellence culture that underpins every way of thinking and being in the independent schools in our study.

## Ethos

The mission of each institution was seen acting as a powerful force in the ethos of each school/college we visited. The notion that success is the norm was common to all four schools/colleges. Threaded through their holistic approach to students’ development is a clear sense of ambition and a strong work ethic, both of which are underpinned by assumptions of scholarship that are enveloped in a distinct vocabulary of excellence. A growth mindset serves to develop and promote a strong sense of self-belief and students are continually challenged to develop ‘off-the-spectrum’ thinking.

## Expectations – of staff, of students; reinforced at every level, e.g. around independent learning, prep, homework, conduct etc.

Expectations play a particularly important role in the pursuit of excellence - and this applies at all ability levels. Not only is engagement with school traditions and routines insisted upon in all the independent schools we worked with, it became extremely clear that their expectations were expressed in a myriad of ways and at every level in order to create a whole school culture of excellence. These expectations were seen appearing as fundamental parts of the fabric of each school and college. They are deeply embedded in everything that each institution does, with many strong systems and practices in place that quietly support and work together to reinforce them.

In practice, what we observed was:

- **A/A\* students being challenged and stretched by the expectations of their teachers,**  
e.g. there are clear requirements that students will: complete homework and prep set; they will adhere to specified deadlines; they will come to class ready to engage in the serious business of learning (in practice, this means that when they enter the classroom they settle quickly so that there is not a moment lost for learning, and often this happens without any prompts required from the teacher).
- **A/A\* students being challenged and stretched by the expectations they held of themselves,**  
e.g. several A/A\* independent school students in this study spoke about the considerable amount of additional work they do outside of lessons in order to ‘keep up’, especially if they do not understand something covered in class. For these students, failure is not seen as an option.
- **A/A\* students being challenged and stretched by the expectations of the institution,**  
e.g. expectations are set at the application stage. For example, students are required to become involved with extra-curricular activities, they are required to adhere to deadlines and to complete work set. Engagement with school routines is insisted upon.

- **teachers being challenged and stretched by the expectations of their A/A\* students,**  
e.g. with their students already working at a high level and eager to feed their appetite for subject knowledge, this means that teachers need to ensure they are continually inspiring their students through their own passion, enthusiasm and expertise in the subject.
- **teachers being challenged and stretched by the expectations they held of themselves,**  
e.g. one school told us that “their staff feel equipped to deal with their very ablest students. They have real world expertise in their departments, be it publishing academics, authors or composers.” Despite this, it is clear that the teachers in these schools do not rest on their laurels but instead, like their students, are eager to top up their subject knowledge all the time.
- **teachers being challenged and stretched by the expectations of the institution,**  
e.g. expectations of staff are set at the application stage and these are reinforced throughout a teacher’s time at the school/college. One school states, “The school has high expectations of all its learners... [it expects] teachers to ensure all students gain at least an A grade”. In all the schools/colleges, teachers are expected to act as role models of excellence: to be knowledgeable and passionate about their subject, to have advanced and up-to-date understanding, which they will use to inspire their students. They are also expected to ‘add value’ by bringing additional skills that add to the school or college’s extra-curricular programme, e.g. through particular sporting prowess; musical abilities etc.
- **institutions being challenged by their commitment and determination to maintain and/or improve their abilities to provide excellent standards of education to all their students,** and this was seen in everything the school/college is and everything the school/college does, in their efforts to achieve this goal year-on-year.

#### **Development of a culture of learning**

The highest level of scholarship is expected from all students at the independent schools. During our visits, we frequently saw and heard about students demonstrating a scholarly, growth mindset in the way they approached and engaged with their learning, both in and beyond the classroom. For these schools, this type of mindset is spoken about as an attitude of mind, not a description of intelligence. It focuses on intellectual curiosity and independent study. And, in many different ways within and beyond the classroom, to this end, the schools/colleges are continually striving to create independently-minded, academically inquisitive individuals.

#### **Independent learning and the development of appropriate study habits and skills – in and beyond classroom**

We found a greater amount of independent learning happening outside lessons in the independent schools compared to our state schools. We learned that independent school students invest significant amounts of time studying outside of lessons when they are struggling with a topic covered in class because they do not want to be seen as unable to keep up. Teachers in these schools told us that their students are actively encouraged to be resourceful when they hit upon difficulties in their learning, e.g. to try consulting with peers for guidance; conducting online research etc. rather than simply approaching the teacher in the first instance. Although our state school students spoke in similar ways about how they tackle challenges in their learning, overall, there was a sense that lower expectations were being placed on these students (by themselves, and also by their teachers). All this tells us that we need to raise the bar and demand more of our highly able learners, which is also the message echoed in comments made by several students in our study. They told us that some of the best ways we support them to achieve at the highest level is through our belief in their ability to do well, and that we show this by pushing them hard and continually challenging them despite the fact they may be lacking the same degree of confidence about themselves.

**Extension and enrichment/ super-curricular learning opportunities and its central place in learning**

Subject extension and enrichment feature strongly in the independent schools: there are numerous clubs and societies to be part of and the range is vast, which accommodates students' varied interests. Their place in learning is effectively summarised in this statement from one school: *"The extra-curricular programme is outstanding, supporting further the school's aims to be a place where the whole personality can grow, to teach pupils that education is much more than passing examinations and to encourage pupils to challenge themselves."*

In some of these institutions, societies are organised and run by the students themselves albeit under the supervision of a staff member. Amongst other responsibilities, this will entail organising guest speakers to attend and participate in a dinner and give a talk.

In these institutions, extension and enrichment frequently offers students fun exploration of subject knowledge as opposed to 'more of the same' that tended to be found happening in our state schools. Of course, it's important to acknowledge that 'time' is a potential key obstacle for state schools that tends not to be a concern for schools in the independent sector: quite simply, we have less time to dedicate to this type of provision. But, even where time is not the major issue, our research has helped us to realise that a far trickier barrier needing to be overcome is how to raise our students' interest in, and willingness to engage with, this broader curriculum. In informal discussions with our teacher-researchers, some students spoke about a tendency to prioritise hobbies and other 'outside' activities above involvement in enrichment and extra-curricular subject activities on offer at their school. This suggests they may be failing to recognise the added value that involvement in these clubs and societies can bring, in terms of opportunities for exploring subject knowledge more broadly and deeply that perhaps is not possible in class and which would offer them the higher level of challenge that they tell us they are absolutely hungry for! But, if their current experiences of in-class extension have generally involved being given 'more of the same' as opposed to something that genuinely excites and stretches them further in their subject then perhaps it is for this very reason why they are prioritising as they do. This raises two key questions: *how do we extend learning for our most able students in groups with a wide ability spread?; how do we ignite our students' interest and passion in the subject beyond the scope of the lesson and can peer group influences be used to help embed this?*

# The impact of character traits on students' ability & confidence to progress:

Which character traits make a difference for progressing students' learning, and how can these be developed?

## **Which character traits make a difference for progressing students' learning?**

The teacher-researchers' descriptive notes (from their cross-sector visits to, and experiences in, each other's schools and classrooms) included repeated references to character traits seen in many of the students they observed and/or spoke to. These frequent mentions lead us to believe that such traits are significant cogs in the overall wheel of academic progression and success for so many of these high level KS4 and KS5 learners. Our data strongly suggests these are instrumental to building the high levels of confidence and ingenuity needed to respond effectively to the difficulties and challenges that inevitably form part of A/A\* grade learning. In addition to the students' demonstrable passion for learning, they frequently exhibited some or all of the key dispositions presented in the table overleaf, which we feel signifies a 'scholarship mindset' (our own term). This mindset was additionally populated by particular approaches to learning and success, which we have also identified and described here:

REPEATEDLY NOTED CHARACTER TRAITS AND APPROACHES TO LEARNING AND SUCCESS	WHAT THESE LOOKED LIKE IN PRACTICE...
<b>Diligence and drive</b>	➤ an exceptionally strong work ethic coupled with a commitment to developing a sound understanding of taught and independently-learnt subject knowledge
<b>A belief that ‘failure’ is not an option</b>	➤ a commitment to investing the time and effort required (beyond lesson time) in order to ‘keep up’ and/or achieve clarity of understanding of concepts and topics covered in class
<b>Persistence</b>	➤ determination to persevere when faced with learning difficulties and challenges
<b>Resilience</b>	<ul style="list-style-type: none"> <li>➤ a willingness to engage and take risks without, or in spite of, a fear of being wrong</li> <li>➤ viewing wrong answers as learning opportunities</li> <li>➤ an ability to make mistakes and be undeterred</li> </ul>
<b>High intrinsic motivation</b>	<ul style="list-style-type: none"> <li>➤ viewing learning (of the syllabus as well as beyond-the-spec) as its own reward and enjoying learning for learning’s sake</li> <li>➤ a readiness to engage, all of the time, ‘whatever the task’</li> </ul>
<b>Intellectual curiosity</b>	<ul style="list-style-type: none"> <li>➤ a keenness to know more about the subject, irrespective of whether this knowledge is required for examination purposes</li> <li>➤ proactively asking questions to learn more and/or to develop a stronger grasp of the content being taught</li> <li>➤ a willingness to apply knowledge flexibly in order to further and deepen understanding</li> </ul>
<b>Self-responsibility</b>	<ul style="list-style-type: none"> <li>➤ understanding the importance of taking ‘ownership’ of own learning for consistent high level academic progression, and developing the confidence to do so</li> <li>➤ resourcefulness to overcome difficulties/ challenges arising in learning (<i>in our study, the most common strategies used by students were: [1] working in their own time, e.g. revisiting notes; doing wider reading and/or web-based research; [2/3] seeking support and assistance from peers; [2/3] looking to their teacher for help by asking questions - although this could vary from subject to subject and appeared to depend on the perceived strength of the teacher’s subject knowledge</i>)</li> <li>➤ a willingness to admit confusions or misunderstandings in pursuit of high level achievement</li> <li>➤ being effective independent learners including cultivation of effective study ‘habits’, e.g. <i>concentration, time management, note-taking, organisation</i></li> </ul>

### How can we develop these character traits and learning approaches?

The time spent in each other’s classrooms, in a range of schools, provided our teachers with rich opportunities to reflect on the approaches they saw and heard about, which they felt were really making a difference to progressing learning in those lessons. Our analysis of almost 300 sets of research notes written between our teachers, led us to identify several strategies that were being highlighted time and time again. These were seen employed in different classes, sometimes within the same school, sometimes in different schools, to broadly the same positive effect, i.e. the effective development of particular character traits that were enabling students to make significant strides in their studies. In the table below, we have summarised these key approaches; for each, we have described what was seen happening in actual practice and outlined how we believe they were assisting these learners to progress.

STRATEGY OBSERVED	WHAT WE SAW IN PRACTICE...	HELPS TO DEVELOP:
Building on skills, expectations & prior knowledge learnt in earlier key stages	<ul style="list-style-type: none"> <li>• Connections were made to ideas and knowledge previously learnt, ensuring that new learning was built on sound and secure foundations</li> <li>• Students were strongly encouraged to 'think' and 'do' hard work</li> </ul>	<ul style="list-style-type: none"> <li>• Intellectual curiosity</li> <li>• High intrinsic motivation</li> </ul>
Finding out what students know & exploring learning together	<ul style="list-style-type: none"> <li>• Even where a strong didactic element was present, this approach was seen to be more effective than 'telling' students what we want them to know</li> <li>• Students were strongly encouraged to 'think' and 'do' hard work</li> </ul>	<ul style="list-style-type: none"> <li>• Intellectual curiosity</li> </ul>
Allowing students opportunities to 'fail'	<ul style="list-style-type: none"> <li>• Students explored their learning, they were encouraged to take risks and potentially make mistakes and recognised these as learning opportunities</li> </ul>	<ul style="list-style-type: none"> <li>• Resilience</li> <li>• Persistence</li> </ul>
Using open-ended approaches to problem-solve, including opportunities for students to explore & enter into discourse	<ul style="list-style-type: none"> <li>• Where tasks were less tightly structured, this allowed for a more creative learning process that seemed to better suit highly able students (conversely, on occasions our data showed that formulaic and prescriptive approaches can inhibit creativity, curiosity and risk-taking)</li> </ul>	<ul style="list-style-type: none"> <li>• Resilience</li> <li>• Intellectual curiosity</li> <li>• Self-responsibility including learning resourcefulness</li> </ul>
Setting high expectations within lessons	<ul style="list-style-type: none"> <li>• Frequently, the level of expectation was evident in the pace of lessons seen – but, this did not always mean working faster through the content being covered in class...</li> <li>• Sometimes, this meant: asking 'hard' higher order questions that required students to 'think' deeply; including high[er] levels of challenge and stretch in tasks set; the amount of work expected to be covered in lessons; setting 'beyond-level' work, e.g. posing A level questions to GCSE students (although support and scaffolding was still provided, where appropriate, so that the tasks and expectations did not become too overwhelming)</li> </ul> <p><i>NOTE: Many highly able students made requests for increasingly challenging work and admitted frustrations because they felt they were capable of achieving more; repeatedly, they expressed desires to broaden and deepen their knowledge and understanding. They told us they want us to push them in their learning and that they really appreciate seeing our belief in their abilities.</i></p>	<ul style="list-style-type: none"> <li>• Diligence and drive</li> <li>• Persistence</li> <li>• Resilience</li> <li>• High intrinsic motivation</li> <li>• Intellectual curiosity</li> </ul>
Setting high expectations regarding work outside lessons	<ul style="list-style-type: none"> <li>• At the application stage, schools/colleges and their teachers make clear to students what is expected of them with regards their time and effort commitment beyond our lessons – and this is reinforced at every level over the year</li> </ul>	<ul style="list-style-type: none"> <li>• Diligence and drive</li> <li>• A belief that 'failure' is not an option</li> <li>• Self-responsibility</li> </ul>
Promoting an academically competitive atmosphere within classrooms	<ul style="list-style-type: none"> <li>• Peer contributions were encouraged to be valued as much as the teacher's and fellow students could also be viewed as 'experts'</li> </ul>	<ul style="list-style-type: none"> <li>• Persistence</li> <li>• Resilience</li> <li>• High intrinsic motivation</li> </ul>
	<ul style="list-style-type: none"> <li>• Students worked together to solve problems</li> </ul>	
Students' becoming involved in, & taking responsibility for, extra-curricular activities	<ul style="list-style-type: none"> <li>• Engagement in the broader curriculum was seen as critical to the education of the 'whole person'</li> </ul> <p>There is a clear expectation that students will participate in such activities; irrespective of this, they seemed to recognise the broader value of engagement, e.g. this can enhance and extend their in-class learning; it can help them to develop wider transferable skills needed both in and beyond the classroom such as organisation, collaboration, negotiation and self-responsibility as well as increase motivation and confidence levels</p>	<ul style="list-style-type: none"> <li>• Intellectual curiosity</li> <li>• Motivation (which may be intrinsic or extrinsic)</li> <li>• Self-responsibility</li> </ul>

# Professional cross-sector collaboration & engagement with professional networks

Why can this be valuable and how can this add to my teaching?

## Professional cross-sector collaboration

The premise of our London Schools Excellence Fund study is centred on professional collaboration between state schools and colleges in the state and independent sector. For this to be genuinely effective and valuable, our experiences have taught us that the presence of some key ingredients is vital and these include a willingness to be open-minded about the possible learning gains from this research and a reciprocal relationship between peers that supports sharing and engagement. As one independent school teacher reflected, rather than make the longer journey to our state schools and colleges in South-East London he could easily visit another local independent school instead; but, for him, the gains to be made far outweigh the logistical inconveniences. In his eyes, a visit to a different independent school would likely show him 'more of the same' of what he sees and/or does already in his own independent school whereas his visits to schools in a different sector have allowed him far richer possibilities for developing his thinking and learning.

### Can powerfully enrich teaching and learning for both sectors

The design of our research study enabled our state and independent school teacher-researchers to become involved in a range of action research experiences and activities. For each, we asked them to record research notes around particular themes and to write any reflections about what they had seen or done. The activities that many teachers experienced included:

- a number of one-day visits to each other's schools to observe their specialist subject being taught;
- first-hand experiences of teaching in each other's schools;
- the collaborative development and testing of high challenge resources for use cross-sector;
- discussions about interim project findings at a Reflection and Sharing Day;
- the testing of specially created cross-sector online subject networks, to explore their utility for developing and sharing subject knowledge and pedagogy expertise.

It was clear that from the very first visit they made to each other's schools, many teachers, from both sectors, were beginning to think about new possibilities for their own teaching and/or reflecting on some of their own practices and starting to question their actual effectiveness. As a way for us to gauge the level of influence of these research experiences on teachers' thinking and understanding, we asked all of our teacher-researchers to complete a survey, which they did twice: once, soon after the project began and, for a second time, approximately one year later after they had completed all of their research activities. Their comments in these surveys told us that these experiences had been beneficial for them in many different ways: they had helped them to sharpen as well as deepen their understanding about practices and approaches, skills and the level of knowledge needed to really work effectively with their A/A\* students; they had learnt about a broader range of teaching and learning approaches; for some, without realising it, their engagement with other subject specialists had helped to reignite their passion for their subject and for teaching it to others.

Some examples of the professional benefits arising for teachers in the independent sector through this collaborative venture are illustrated in the following quotes:

- I am questioning my practice more as a result of the project and am starting to look at how I could be more effective in driving up results even more. (IND-1-ENG)
- Seeing many of the same problems across a wider range of students has helped clarify my thinking (IND-2-PHYS)
- I had forgotten how good white boards are - visiting schools involved in in the LSEF helped to remind me how useful they are in lessons. (IND-3-CHEM)

- I sometimes assume a lack of key terminology use is due to a lack of revision, however I've come to realise that students often just forget to use a term which they don't use every day. I will be spending more time focusing on this in future lessons. (IND-3-BIOL)
- It has helped me to clarify what I need to do to help the pupils I teach because we have been made to identify and discuss the things we do. I think before that I took a lot of things for granted. (IND-3-CHEM)

In some cases, the teachers reported that their experiences of discussing, experiencing and seeing teaching and learning in state schools had had an impact on their thinking about teaching and learning. For some, their thinking about pedagogy had changed or developed:

- I certainly have stopped forming opinions on the ability of students or my perception of what they can achieve based on how vocal they are in class or how quickly they can respond to questions. I no longer put any value in speed (not that I valued it above all other factors previously) at which students work but instead the depth of their understanding, how well they can link concepts and apply them to other situations, and also how insightful they are when engaging in discussion (IND-4-CHEM)
- I have become even more pragmatic about it! For the A\*, a lot of it is perspiration rather than inspiration. (IND-3-MATHS)
- Realising that a knowledge-rich focus is key to success. (IND-4-ENG)
- My thinking has convinced me that with maths in particular, if a teacher is uncomfortable at all with the content, the students have no chance. (IND-3-MATHS)
- An increased belief in the importance of showing pupils where an equation for example comes from rather than plucking it from thin air. (IND-4-PHYS)

For the state school teachers, over the period of the project, there was a strong sense that teachers' confidence and knowledge had grown as indicated by their comments about different ideas and activities they had implemented into their classroom practice as a result of what they had seen, experienced and discussed in the independent schools. Many of these were based around thinking and challenge activities:

- Tried to get pupils thinking 'outside' of their comfort zone (with much resistance - particularly from high achieving boys). (KS4-3-MATHS)
- I have done some useful work with Year 10 students at our partner schools where I've tried out specific reading and writing strategies with them to bridge the gap between GCSE and A-Level. I'm currently evaluating some of the results from this. (KS5-2-ENG)
- I have also placed more focus on the discussion with questioning rather than on waiting for students to take notes. I have set more note-taking as prep work and monitored this so that more time is available for trying to apply the key concepts and focusing on language and exam technique. (KS5-2-PHYS)
- I do not 'dumb down' questions and I expect students to come to my level more than I used to. This is difficult when you have extremely weak students in a class with A/A\* students as the weak students can become lost. (KS5-1-CHEM)
- Students lead the lesson with teacher's resources that have been given to them in preparation (KS5-3-BIOL)

### A model of collaboration v. a model of patronage – independent schools acknowledge they don't have all the answers!

Despite the independent schools possessing an excellent track record of high achievement at GCSE and A level, it was clear to us that they do not rest on their laurels. Some teachers from these schools spoke candidly that it is certainly not the case that they have all the answers to teaching and learning! It was their willingness to enter into genuine collaboration as opposed to assuming the need for a model of patronage, which enabled both sides to learn and gain so much. Many of the teachers' reflections made it clear to us that both sides really had benefitted from working together to move their teaching and learning practices forwards...

Some independent school teachers also fed back that as a result of what they had seen, experienced and discussed in the state schools, some of these activities had subsequently become incorporated into their classroom practice:

- *Massive whiteboards in all the maths classrooms to encourage group work and variety in lessons - as seen in KS5-ST-1 lessons. (IND-3-MATHS)*
- *Tried more AfL e.g. 'invisible marking' to force students to address mark schemes. Tried to rewrite some prep exercises to include more open-ended questions as well as routine practice. Talked to students more about how to study and how to learn. (IND-2-PHYS)*
- *I have started using more preparatory homework e.g. reading an article or a text book chapter, so that students arrive to lessons with the ability to ask more insightful questions and have the chance to iron out any issues that they have already met. (IND-3-BIOL)*

Example quotes from the second staff survey are provided here serve to further illustrate what the teacher-researchers have learnt through their ability but also the opportunity to reflect on their own and each other's practices:

- *I feel that developing reading skills is absolutely essential to getting an A\* and the project has helped me to see ways to do that. (KS4-2-ENG)*
- *I certainly have stopped forming opinions on the ability of students or my perception of what they can achieve based on how vocal they are in class or how quickly they can respond to questions. I no longer put any value in speed (not that I valued it above all other factors previously) at which students work but instead the depth of their understanding, how well they can link concepts and apply them to other situations, and also how insightful they are when engaging in discussion (KS5-1-CHEM)*
- *I have found the support from IND-2 and the google chrome network helpful. It is actually the first time that I have worked with colleagues from such a range of schools. I always feel inspired after visiting other establishments. (KS5-1-PHYS)*
- *I have had experience with what strategies are used for the most able in the country and have used this to push my top set students to make exceptional progress. (KS4-2-MATHS)*

### Engagement with professional networks

*Can new technologies help us drive forwards the sharing and development of subject knowledge and pedagogy expertise between teachers, across schools and sectors?* This is the question we set out to answer through our trial of two e-platforms: Google and Microsoft 365. Specifically for this purpose, we created five online subject networks: one per subject (English, Maths, Biology, Chemistry, Physics). Network membership for each subject group comprised a mix of KS4 and KS5 state schools teachers and independent school teachers who taught across both key stages. Three groups (English, Biology and Physics) tested the Google e-platform while the other two groups (Maths and Chemistry) tested Microsoft 365.

The vision for these subject networks was for them to provide a space and opportunities for professional collaboration and dialogue between colleagues in the schools involved in our study. Given that we work in different geographical locations and have different schedules, but share a common goal to work with each other to better understand A/A\* teaching and learning, we wanted to see if using technology could play an instrumental role in making this happen. What factors contribute to making an online subject network effective and successful? And also, what are the barriers and constraints (technology-related or otherwise) that may inhibit use and/or active participation, and can these be overcome?

**A different/more empowering way of 'doing' CPD – professionals 'speaking with' professionals – peer-to-peer**

All of the experiences and activities that teachers participated in for this study proved to be invaluable CPD opportunities through which they told us they learnt a great deal in terms of moving their thinking and understanding forwards, increasing their confidence to try new and/or adapted approaches, and renewing and revitalising their passion for their specialist subject. All of this came as a result of our teacher working with other teachers: peer-to-peer. Some teachers told us that the opportunity to talk and work with subject specialist colleagues had been invaluable; this was particularly true for teachers who work in very small departments (sometimes, a department of just 1!) In addition, teachers told us they had found it so useful to be afforded the time and space to talk with their colleagues in other schools and sectors about what is happening in their subject, about particular issues and concerns. These types of experiences and interactions were rich CPD opportunities seemed to work extremely well for teachers in both the state and independent sector.

**CPD experiences not otherwise available in own settings, e.g. opportunities to experience teaching a large cohort of high ability/mixed ability students and how this might help to recalibrate teaching practices...**

Being involved in this research study and committing to working with colleagues in other schools and sectors enabled these teachers to access a range of CPD experiences that would not otherwise have been available to them. For example, some teachers took part in a cross-sector teacher exchange where they had the opportunity to teach one or more classes in each other's schools. Admittedly, a small number of teachers felt some reservations about doing this and were perhaps a little sceptical as to what they could gain. But, nonetheless, they participated and what they found was they were (nicely!) surprised with just how much they were able to learn and take from the experience. One state school teacher reflected that through the opportunity to teach a large(r) cohort of high ability students she was able to experience first-hand how effective her teaching approaches and strategies were with students working at this level, and to see these learners 'at work', i.e. how they engage with their learning, the teacher and the content being taught. Subsequently, she was able to reflect on all of this to consider how she could incorporate this learning into her own approaches.

**Access to high challenge/exemplar resources; opportunities to develop/test resources**

We know that suitably challenging resources are a key component to being able to work effectively with our A/A\* students. But, very real issues for many of us working in state schools include: access to such resources, and knowing what a 'suitably challenging resource' looks and feels like. To try and address this, in our study, groups of state and independent school teachers collaborated to develop and test resources to explore whether it is possible to create materials that can challenge high ability students in both sectors. In almost all cases, the teachers chose to adapt existing resources for this exercise. One group tried a 'resource swap', which involved each teacher relaying to their group which topic they were currently teaching or which topic would be coming up next and, where possible, colleagues providing a 'tried-and-tested' stretch and challenge resource for them to test. By working with (more) experienced peers, the state school teachers were able to develop a more informed feel for high challenge resources and ways to use them with their A/A\* students.

Featured below is an example of how a group of state and independent school Chemistry teachers developed and tested high challenge resources, and the key learning that arose from this:

**The group's approach to this research 'test':** The state and independent school teachers collaborated to identify an area of the syllabus with which their students experienced difficulties: they all agreed on 'synthesis'. The independent school teacher collated a number of resources and shared these with the group. Together, they proposed and agreed the format and nature of the questions to be used.

**Resource tested:** Synthesis of substituted benzenes

**Tested by:** Three state school teachers (one KS4; two KS5) and one independent school teacher – resources tested with A2 students in every case.

**Ways in which resources were deemed to be challenging:** The majority of questions were open-ended in nature, and provided students with few/no clues. In addition, there were no definite or defined answers to the questions, and therefore required students to think outside of the box; the intention was this should provide students with opportunities to explore different routes to their responses and encourage them to be creative in their thinking.

**Overall:** One of the state school teachers noted his students' high level of engagement and motivation with this work. This was indicated in a number of ways including their determination to learn and understand new words and their willingness to read beyond what is required for the specification. For the other group of state school students, the opportunity to work on this task in differentiated groups appeared to work well and the teacher observed that his most able students were able to evaluate different routes in order to select the most appropriate based on the development of their understanding. The independent school teacher was less concerned about the effectiveness of this resource for helping her students to achieve the correct response; rather, her aim was to find ways to encourage them to develop their thought processes as a means for progressing their understanding. She observed that the resource allowed students to think and discuss, which, in turn, enabled her to identify any misconceptions in their thinking.

**Key learning from this 'test':** The resources tested by all the teachers in this group with their most able students seemed to work well in every case in terms of providing increased challenge. Being able to apply this learning to real world contexts also appeared to increase students' interest. In addition, the opportunity to undertake the same work as their independent school peers seemed to enhance some state school students' curiosity – possibly, by feeding their academically competitive spirit.

**Opportunities to offer students activities/experiences not otherwise possible in mixed ability state school settings (which, in turn, can help to develop character traits that can prove useful in and beyond the classroom), e.g. Science practicals; lectures by academics; engagement with professional figures**

Through collaboration, it became possible to arrange particular activities and experiences for students that contribute to providing them with a broader diet of challenge and stretch. On one occasion, a state school teacher was able to organise for a group of her highly able students to attend an independent school for the day. During their time there, they participated in some classes and experienced being taught by an independent school teacher, used some first edition texts for their learning and gleaned some insights into a typical school day both in and beyond the classroom for its regular students.

In addition, in the teacher surveys completed by our teacher-researchers in each year of the project, they expressed their preferences for the types of strategies and support they felt would help them the most to work to A/A\* level with their students. Their preferences have been summarised in the table below:

Question asked: *What would enable [CHEMISTRY] teachers to make the most progress in increasing or nurturing A/A\* performance?*

CHEMISTRY: State school teachers (KS4 & KS5)	
SURVEY 1	SURVEY 2
■ SETTING/STREAMING	■ WORKING WITH STAFF FROM OTHER SCHOOLS/ COLLEGES
■ RESOURCE MATERIALS	■ SETTING/STREAMING
■ SUBJECT-BASED INSET	■ RESOURCE MATERIALS
■ STUDENT BOOSTER SESSIONS	■ STUDENT BOOSTER SESSIONS
	■ EXEMPLARS OF A/A*

CHEMISTRY: Independent school teachers	
SURVEY 1	SURVEY 2
■ RESOURCE MATERIALS	■ SUBJECT-BASED INSET
■ STUDENT BOOSTER SESSIONS	■ EXEMPLARS OF A/A*
■ EXEMPLARS OF A/A*	

# CASE STUDY 1:

## Cross-sector subject networks



### Overview

From the outset, our research with independent schools was founded on the notion of collaboration: a genuine interest and commitment to work together to explore what we could learn from each other to improve teaching and learning in our schools and colleges. And so, in addition to organising a range of research experiences and activities for our teachers, we wanted to test whether 'new technologies' could play an effective and meaningful role in helping them to share and develop each other's subject and pedagogy expertise. Towards the end of Phase 1 in our project, each of our teachers was therefore assigned membership to one of our specially-created cross-sector, cross-key stage (KS4 & KS5) subject networks. We formed five networks in total: one per subject.

Our vision was for these networks to be run by teachers for teachers, and for them to provide space and opportunities for professional collaboration and dialogue between subject-specialist colleagues in our participating state and independent schools. To help oversee these interactions, we invited two subject specialists, one from a state school and one from an independent school, to be subject facilitators for their subject group. These were not intended to be onerous roles; their key responsibilities would essentially be to help encourage and steer communications where and when this seemed appropriate and helpful. On reflection, we identified how significant their involvement was in helping to ensure that these networks developed and then maintained a strong subject-focused, practitioner-driven approach throughout. The teachers might use their network to discuss issues and concerns or they might share ideas, resources and materials; in essence, they had the autonomy to use it for any purpose they felt was useful for what they were trying to achieve. For the networks to best fit the teachers' professional needs, we felt it was imperative that they were the ones to decide which topics, issues and concerns they wanted to focus on. In many cases, these were determined by what they felt were the current key priorities or recurring issues for the teaching and learning of their subject. Overall, the aim was for the teachers to communicate and collaborate within a professionally supportive environment where all subject specialist members would actively contribute to working on these agreed priorities. In order for thinking and practice to develop, it would be key to have engagement and input from both sides (state and independent).

As part of our 'test' of these networks, we wanted to try and identify the factors that contribute to these being effective and successful as well as find the barriers and constraints and see if these could be overcome. We wanted to then use this learning to go forwards, with the aim of further developing and scaling these if found to bring real benefits for practitioners.

### How these subject networks would operate

In the main, we envisaged that interactions between teachers would take place online although there was no restriction on this and these could be supplemented by face-to-face sessions too where felt to be beneficial. We engaged with two IT partners: Google and Microsoft 365, and tested their respective e-platforms with our subject networks to explore any potential benefits of one over the other. The subject groups were free to choose which they tested. Three groups (English, Biology, Physics) chose the Google e-platform while two groups chose Microsoft 365 (Maths, Chemistry). A project landing page was specifically created for each e-platform and from these each subject group could navigate to their respective sub-pages or 'working areas'. These online spaces were introduced and demonstrated to each subject group when they met together for a cross-sector 'subject development CPD day'. During this one day face-to-face meeting, the teachers considered emerging findings from our research in specific relation to their subject and discussed and debated what they felt were the key priorities and concerns they wanted to work on in their network groups. In addition, they used this opportunity to share with each other examples of high challenge resources and/or approaches that they have found to be effective with their own students. Besides the invaluable peer-led CPD element of these sessions, they were also found to be important for further developing their professional relationships with each other. Having established this personal connection with the others in their group, and a mutual professional trust, this seemed to then encourage teachers to engage and contribute in the online setting for their respective subject network.

## What did these online networks look like?

### The Google e-platform



Using 'Google sites' (part of the Google Apps for Education suite of tools), a general project landing page was created for the three subject groups testing the Google e-platform:



Diagram 1: Google subject networks' project landing page

From this page, teachers could navigate to their subject area using the tabs in the far left-hand column as well as being able to access a range of information under additional tabs such as 'Project Documents' and 'Latest Press Debates and Articles'. Each subject area was initially set up using the same format although these could be changed at any time according to each subject group's needs and preferences. Each subject area displayed contact details for individual members of the group as well as ways to easily communicate and collaborate with each other, e.g. a group email address; a communal Drive where documents and materials could be created, stored, shared with the rest of the group; a Hangout function for real-time instant messaging chats or face-to-face video calls. In addition, a Google+ (G+) community was set up for each subject group. The nature of a G+ community is much like existing social networking platforms such as Facebook and thus it was envisaged that communications and activities here would happen in a rather dynamic and likely asynchronous fashion. An example of a G+ page is shown here:

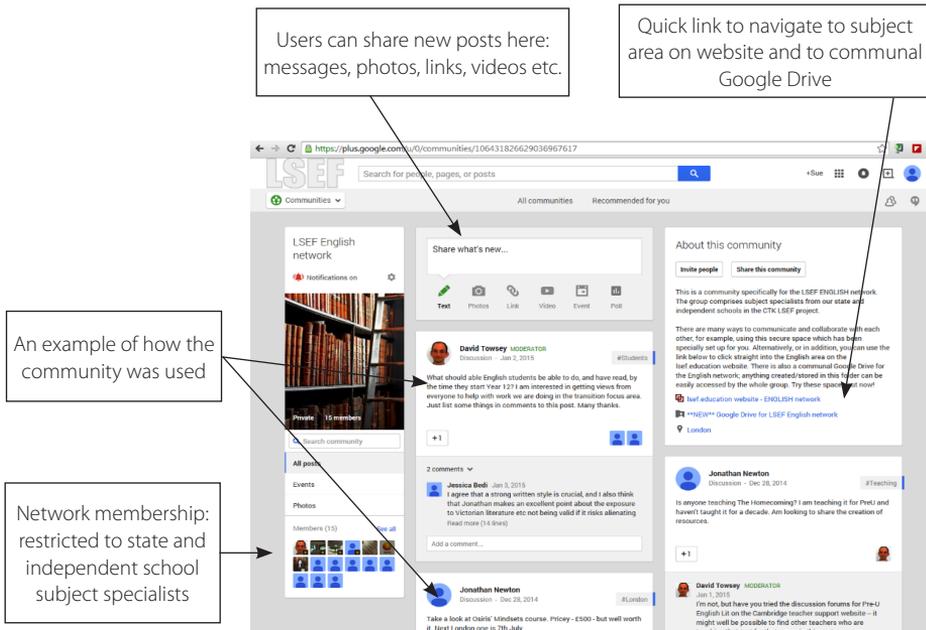


Diagram 2: Example of a subject network’s Google+ (G+) page

**The Microsoft 365 e-platform**

On Sharepoint (the website feature of Microsoft 365), a project-specific landing page was created for the Maths and Chemistry groups. Sharepoint is organised around a tiled interface whereby each tile acts much like an area under which different items can be stored; these can be accessed by clicking on the different tiles.

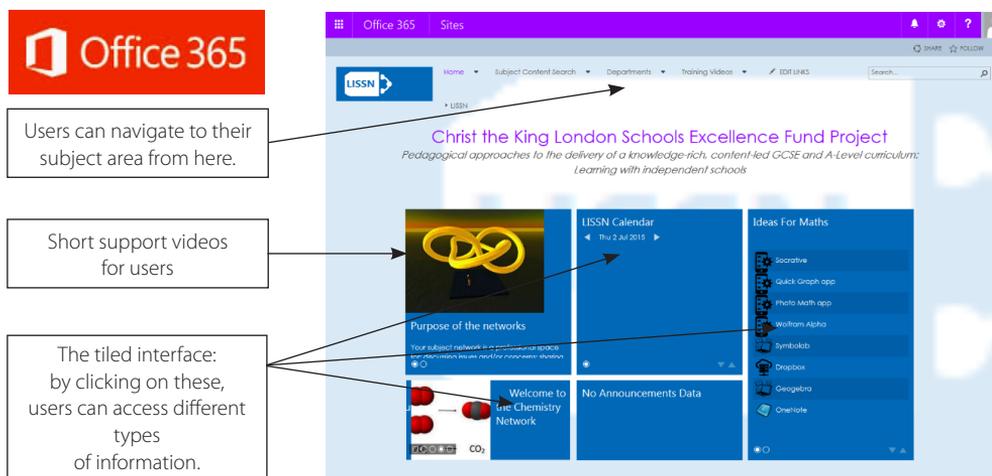


Diagram 3: Microsoft 365 (Sharepoint) networks’ project landing page

From this landing page, users could click into their subject area and there they could operate in similar ways to users of the Google e-platform: they could create, upload and share materials. These items were organised under four tiles: 'documents'; 'pictures'; 'media' and 'links' (each of which acts like a folder). Underneath the tiles, users could post comments, which others might respond to and this function was comparable to the G+ communities created for the subject groups in Google. Users also had the option to start discussions, to post questions to their group etc.

### **So, how did teachers use these networks?**

The project set out with a vision for how these subject networks could be used and the different ways in which they might best support the professional development of our teachers. From the outset, we had considered the likelihood that each network would develop and operate differently, for example, some networks might use some of the tools available but not use others, or they might choose to use the same tools but in different ways for different purposes. As anticipated, this was what happened. For example, one group utilised their online network largely in the way envisaged. They used their subject area on the Google website to collaborate and share materials with each other under the foci that they had agreed between themselves as areas of interest, concern, need for them and their subject; they used their G+ page to develop a professional community within which they engaged in discussions, sought assistance and guidance, kept each other up-to-date on ideas, activities and opportunities such as forthcoming CPD events. Other groups used the e-platform differently, for example, one group felt that a lack of high challenge resources was the priority concern for them and therefore they predominantly used their network to build up a bank of materials that could be accessed by everyone in their group.

Based on our testing of these cross-sector subject networks, we believe we have learnt a great deal about what works and also what is needed to effectively create networks that have genuine value and purpose for teachers. We are now further developing these subject networks and working on scaling these up so that this proven source of peer-driven CPD provision can be made available to many more London schools and teachers in the state and independent sector.

**To find out more, or to join these networks, please contact Dr Sue Sing: [s.sing@ctksfc.ac.uk](mailto:s.sing@ctksfc.ac.uk)**

## CASE STUDY 2:

### Teacher Exchanges

#### Overview

In Phase 2 of our project, we continued to explore more deeply what seem to be best practice teaching and learning strategies at Key Stage 4 and 5 in our five subjects. Based on what we had learnt in Phase 1, we now wanted to apply some interventions to try and address issues and concerns identified in our data and those arising from the discussions held by each group in their subject networks. One of our 'tests' involved small groups of teachers from each subject network undertaking a one-day teacher exchange, to try and answer the following research question: Would an independent school lesson work in a state school, and vice versa? Our aim was for teachers to try particular approaches to gauge their relative effectiveness and then consider what we could learn from all of this.

<b>The suggested framework for the teacher exchanges</b>	
▶	Test with 2 classes in each setting (the classes taught would match teacher's own key stage specialism, i.e. state KS4 teachers would teach KS4 classes in the independent school; independent school teachers would teach both KS4 and KS5 in the state schools)
▶	Teachers would use their teaching style in the 'other' setting, i.e. state in independent and independent in state, using their usual teaching approaches
▶	'Usual classroom teacher' would observe and make notes on how students appear to be engaging with/ receiving the particular approach
▶	'Exchange teacher' would write own feedback and reflections on the experience, e.g. what worked well; what didn't; on reflection, how elements might be adapted to better suit the students/ the setting etc.
▶	Students asked to provide feedback also

All of this data would then be used to consider the 'effectiveness' of each lesson, from both a teaching and learning perspective.

### What we and our teachers learnt from these exchanges

A total of **27** lessons were taught by 13 teachers across the five subject groups, in the state and independent schools:

- **15** lessons in independent schools
- **12** lessons in state schools

LESSONS TAUGHT						
		Independ teaching KS3 STATE	Independ teaching KS4 STATE	Independ teaching KS5 STATE	State teaching KS4 INDEPEND	State teaching KS5 INDEPEND
SUBJECT	ENGLISH		1	1	1	2
	MATHS		1	2	1	2
	BIOLOGY				1	1
	CHEMISTRY	1		2	2	2
	PHYSICS	2		2	2	1

#### INDEPENDENT school teachers - *teaching in state schools at KS4 and KS5* (KS3 lessons excluded from analysis)

- Tested for English, Maths, Chemistry and Physics
- Across the board, approaches used worked well for the four subjects taught at KS5
- Involved a pedagogy of:
  - high expectations
  - strong pace
  - less scaffolding
  - use of (access to) good resources for stretch and challenge
  - less varied teaching and learning approaches
- More mixed picture for approaches used with KS4 classes – generally, the younger year groups struggled with the faster pace employed. There were indications that students lacked resilience and academic confidence to move beyond their comfort zone.
- Noticeable differences in levels of interest and engagement according to pedagogical approach used. Many students appeared to respond positively to interactive, hands-on approaches but some students struggled with the increased concentration time required for more didactic approaches.

**STATE school teachers - *teaching in independent schools at KS4 and KS5***

- Tested for English, Maths, Biology, Chemistry and Physics
- Approaches used at KS5 for English, Biology, Chemistry and Physics mostly worked well
- Involved a pedagogy of:
  - good pace and not feeling 'rushed'
  - high level challenge – teacher able, confident and comfortable to deviate from 'the plan', to adapt lesson accordingly to ensure provision of adequate and appropriate stretch and challenge for large cohort of highly able students
  - high expectations
  - real world connections
- BUT
  - observing teacher and students reported too few opportunities or requirements to write or record their learning to assist them in the longer-term
  - KS5 Maths approaches worked less well for students: the 'exchange teacher' reflected that the pedagogy used lacked appropriate pace and sufficient challenge. Additional reflections questioned the limitations for learning where a 'ceiling' is placed on challenge. Lesson also seemed to include too much unwarranted scaffolding, e.g. lengthy explanations and over-emphasis on consolidation
- KS4 approaches appeared to also work well across the subjects taught
- Involved a pedagogy of:
  - teacher taking more personalised approach (resulting in students feeling that the teacher was accessible)
  - use of varied activities
  - practicals where students could become involved and test for themselves
  - pair and group work, which enabled students to share and gain ideas from one another
- At KS4 and KS5, students demonstrated strong academic resilience and seemed very 'adult' in their approach to learning, e.g. they were undeterred when something did not work first time. They were highly engaged and motivated to learn and were keen to be involved in their learning, e.g. as seen in predominantly discussion-based lesson, which relied heavily on student input.

Overall, based on what is a relatively small data sample gathered from this research activity, we feel that the key learning that arose gives way to suggestions for consideration rather than firm conclusions about which approaches work and which were perhaps less effective; we would therefore advise that the findings below be viewed accordingly.

It appeared that a KS5 independent school lesson can and does work for state school lessons in English, Maths, Chemistry and Physics and that this pedagogy tends to involve some or all of the following key traits: **high expectations; strong pace; less scaffolding; use of (access to) good resources for stretch and challenge; less varied teaching and learning approaches**. On the whole, KS5 students in the state schools showed a thirst and hunger to learn and relished the challenge of learning something new. However, some students continued to want more teacher support before engaging. Such pedagogical approaches seemed to be less effective with KS4, where these younger students appeared to struggle with the faster pace of lessons. They were also observed as less motivated to engage when learning involved more traditional methods, e.g. writing/recording learning.

The KS4 and KS5 state school approaches tested in independent schools also seemed to prove effective across the majority of subjects, and in some cases appeared to result in higher levels of engagement than seen by their usual classroom teacher. The pedagogical approaches employed tended to involve some or all of the following key traits for KS4: teacher taking more **personalised approach** (this resulted in students feeling that the teacher was accessible); use of **varied activities; practicals** where students could become involved and test for themselves (as opposed to 'being given' the knowledge); **pair/group work**, which enabled students to share and gain ideas from one another. The KS5 approaches were successful across the three Science subjects and involved some or all of the following traits: **good pace** and not feeling 'rushed'; **high level challenge** – the teacher being able, confident and comfortable to deviate from 'the plan', to adapt lesson accordingly to ensure provision of adequate and appropriate stretch and challenge; **high expectations; real world connections**. Although the pedagogy employed for KS5 Maths was felt to be less successful, nonetheless a great deal was learnt from these experiences which has enabled us to move forwards positively. On the whole, students in the independent schools demonstrated a willingness and enthusiasm to engage with new approaches (where these varied from their usual lessons), a resilience to persevere in their learning with no expectation to 'be given' the knowledge and high level engagement in order to progress and capitalise on any learning opportunities.

## CASE STUDY 3:

### KS5 Scholarship Graduate Programme

- an example of how we applied our learning practically

#### Purpose & focus of the programme

Some of our early emerging findings had suggested that, in addition to the teaching and learning experience in the independent schools, there are a number of factors that play an important part in goal setting and establishing norms. For example, we identified that peer group identity and expectations have important roles to play in student success. As a way of testing these key elements and factors, we introduced a new programme in September 2014 in our own three state sixth form colleges (*Christ the King; Christ the King; St Mary's and Christ the King: Aquinas*), which tried to replicate some of these features to see if they could be successfully applied with our most academically-able learners in a state school setting. And, if they could, would they have a positive impact on students' motivation, commitment, their outcomes and aspirations? The programme was called the Scholarship Graduate Programme and was aimed specifically at students with an average GCSE score of 7.0 and above and who had achieved A\* and A at GCSE.

Potential students and their parents were invited to a special admissions morning where the academic aims of the programme were set out and expectations with regard to their commitment to the full programme were made clear. During that session, students were also required to sit a written examination. At the end of the morning, they and their parents were asked to reflect on the implications of becoming part of the programme. Those who wished to be considered were then required to make a separate application. The programme required students to:

■ Choose at least 2 facilitating subjects
■ Commit to 4.5hrs A level study + 1hr taught seminar per facilitating subject
■ Achieve a minimum target grade A*, A or B
■ Study an additional A level: Cambridge Pre-U Global Perspectives
■ Engage in a super-curriculum programme for at least 2 subjects in the Spring & Autumn terms
■ Form part of a discrete group, with an assigned study room
■ Participate in a weekly working lunch
■ Work with an academic mentor
■ Follow a bespoke academic progression & careers programme
■ Apply for a prestigious university summer school

#### AIMS OF THE PROGRAMME

The overall aims of our programme were to:

1. extend these KS5 students' experiences and knowledge beyond their in-class learning
2. raise students' ambitions at KS5
3. raise their aspirations for applying to competitive, leading universities

HOW MANY STUDENTS WERE INVOLVED IN THE PROGRAMME IN 2014-2015?

No. of students beginning programme	No. of students completing year 1 of programme (2014-2015)	Completion rate
22	20	91%

## ...so, HOW SUCCESSFUL WERE WE IN ACHIEVING OUR AIMS?

At three points over the year (at the start of the programme, mid-way through and at the end of the year), we asked an independent evaluator to gather data from the staff and students involved in the programme (through group and one-to-one discussions) to try to gauge how it was being received and how far it was achieving its aims. In addition, students' progress across the year was tracked and their university choices monitored.

Their overall feedback is presented below:

INITIAL PHASE ASSESSMENT		MID-PHASE ASSESSMENT	END-OF-YEAR ASSESSMENT
STUDENTS' FEEDBACK	TEACHERS' FEEDBACK	STUDENTS' FEEDBACK	OVERALL
<b>POSITIVE IMPACT:</b>	<b>POSITIVE IMPACT:</b>	<b>POSITIVE IMPACT:</b>	<b>1 hr taught seminars</b>
<ul style="list-style-type: none"> <li>■ <b>Increased academic challenge</b></li> <li>- through subject knowledge being explored in more depth</li> </ul>	<ul style="list-style-type: none"> <li>■ <b>Stronger rapport with students</b></li> <li>- knowing them better &amp; and much quicker</li> <li>- ability to more readily identify &amp; address their needs</li> </ul>	<ul style="list-style-type: none"> <li>■ <b>1 hr taught seminar has:</b></li> <li>- improved understanding of subjects</li> <li>- increased engagement with subjects</li> </ul>	<ul style="list-style-type: none"> <li>■ consistently, students spoke positively about these extra sessions</li> <li>- although we have identified issues for future consideration</li> </ul>
<ul style="list-style-type: none"> <li>■ <b>Stronger rapport with teachers</b></li> <li>- from additional teaching &amp; contact time</li> </ul>	<ul style="list-style-type: none"> <li>■ <b>Development of co-teacher/leadership skills</b></li> <li>- e.g. taking the lead; class organisation</li> </ul>	<ul style="list-style-type: none"> <li>■ <b>Perceived positive impact on grades</b></li> </ul>	<b>Working lunches</b> <ul style="list-style-type: none"> <li>■ mid-phase, some students reported mild frustrations they were not able to attend subject workshops for their other subjects because of the clash with these sessions</li> <li>■ at end-of-year, some students spoke particularly positively about great discussions &amp; speakers at these lunches</li> </ul>
<ul style="list-style-type: none"> <li>■ <b>Increased confidence</b></li> <li>■ <b>Development of oral skills</b></li> <li>- felt to be beneficial in longer term</li> </ul>	<ul style="list-style-type: none"> <li>■ <b>High levels of engagement – teacher's questions seldom met with silence</b></li> <li>- felt to be due to 'critical mass' of similar ability, like-minded students</li> </ul>	<ul style="list-style-type: none"> <li>■ <b>Strong teacher-student rapport</b></li> <li>- leading to increased confidence to contribute in lessons, &amp; more resilient, risk-taking behaviour, e.g. contributing without certainty of being correct</li> </ul>	
<ul style="list-style-type: none"> <li>■ <b>Academic competitiveness &amp; encouragement</b></li> <li>- from peer group support &amp; being with like-minded peers</li> </ul>	<ul style="list-style-type: none"> <li>■ <b>Students as positive academic role models to students in mainstream classes</b></li> <li>- benefit of seeing peers' high level work &amp; their engagement with, &amp; commitment to, their studies</li> </ul>	<ul style="list-style-type: none"> <li>■ <b>Continued collegial support &amp; academic encouragement from peer group</b></li> <li>- this had also extended into their mainstream lessons as well as beyond the classroom</li> </ul>	<b>Cambridge Pre-U Global Perspectives course</b> <ul style="list-style-type: none"> <li>■ despite earlier concerns about its usefulness &amp; relevance for their other subjects, by end-of year students felt really appreciative of the benefits gained including skills developed &amp; knowledge learnt</li> </ul>
<ul style="list-style-type: none"> <li>■ <b>Positive impact on academic studies</b></li> <li>- generally, felt to be the case (although not formally assessed at this stage)</li> </ul>			

CHALLENGES:	CHALLENGES:	CONCERNS:	A 'critical mass' of similar ability, like-minded students
<ul style="list-style-type: none"> <li>■ <b>Personal time management</b></li> <li>- coping with increased workload &amp; meeting short deadlines</li> </ul>	<ul style="list-style-type: none"> <li>■ <b>Greater consideration for pitching realistic expectations</b></li> </ul>	<ul style="list-style-type: none"> <li>■ <b>Improved understanding &amp; increased engagement confined only to those subjects with additional 1hr taught seminar</b></li> <li>- desire for this to be extended to include the other subjects in their study programme</li> </ul>	<ul style="list-style-type: none"> <li>■ students have valued being grouped with students who share similar levels of academic ability and motivation</li> <li>■ they have found the assigned study room hugely beneficial as it has given them a quiet place to work</li> <li>■ in the main, students reported that the strong group dynamic has provided them with a continued source of academic support &amp; competitiveness, encouragement &amp; friendship</li> </ul>
<ul style="list-style-type: none"> <li>■ <b>Extra time commitment</b></li> <li>- needed for the programme, but only remarked on by small number of students who, nonetheless, felt positive about the longer-term benefits of being involved</li> </ul>	<ul style="list-style-type: none"> <li>■ <b>Period required for re-consideration and adjustment</b></li> <li>- to develop clearer plans for Term 2</li> </ul>	<ul style="list-style-type: none"> <li>■ <b>Discomfort with teachers' &amp; peers' expectations of them</b></li> </ul>	
	<ul style="list-style-type: none"> <li>■ <b>Impact on 'premature' exploration of A2 syllabus</b></li> <li>- through exploring subject knowledge more deeply in AS year</li> </ul>	<ul style="list-style-type: none"> <li>■ <b>Cambridge Pre-U Global Perspectives course (mandatory) felt to be onerously time-consuming, with negative impact on other subjects being studied</b></li> </ul>	
<p><b>SUGGESTED ADJUSTMENTS:</b></p> <ul style="list-style-type: none"> <li>■ <b>more specialist support &amp; guidance for academic progression and career choices</b></li> <li>■ <b>inviting professionals to offer 'a day-in-the-life' insights into different careers</b></li> </ul>	<ul style="list-style-type: none"> <li>■ <b>1hr taught seminar creating extra homework for teachers but not for students</b></li> <li>- our data suggests that teachers need to be demanding more from highly able students</li> </ul>	<ul style="list-style-type: none"> <li>■ <b>Variable attendance at, &amp; commitment to, working lunches in Term 2</b></li> <li>- some concerns that attendance was preventing students from accessing additional academic support for their other subjects</li> </ul>	<p><b>Impact on motivation &amp; engagement</b></p> <ul style="list-style-type: none"> <li>■ unsurprisingly, motivation levels varied across the cohort across the year</li> <li>■ despite this, most students seemed to take a longer term view of the programme, which helped them to balance out the challenges of increased workload &amp; time commitments</li> <li>■ the stronger rapport between teacher &amp; students had increased students' self-confidence &amp; willingness to contribute in class &amp; take risks in their learning</li> </ul>
		<ul style="list-style-type: none"> <li>■ <b>Workload &amp; time management remained a challenge for some students</b></li> <li>■ <b>nonetheless, motivation continued to be high &amp; the majority of students were persevering</b></li> </ul>	<p><b>Impact on retention &amp; commitment</b></p> <ul style="list-style-type: none"> <li>■ 22 students began the programme in September 2014</li> <li>■ 20 students remained with the programme for the whole year = 91% 'completion rate'</li> </ul>

			<ul style="list-style-type: none"> <li>■ although some programme elements were mandatory, students' attendance at some fluctuated across the year, e.g. the working lunches</li> <li>■ despite this, the high 'completion rate' suggests students had remained invested for the programme's overall longer-term gains</li> </ul>
	<b>SUGGESTED ADJUSTMENTS:</b>	<b>ADDITIONAL COMMENTS:</b>	<b>Impact on student aspirations</b>
	<ul style="list-style-type: none"> <li>■ <b>1hr taught seminar was being used for varying purposes</b></li> <li>- this should be reviewed to agree a consistent, most effective use of this extra time investment</li> </ul>	<ul style="list-style-type: none"> <li>■ <b>at mid-year stage, students' completion of our internal subject assessments found that approximately were on track and just over ½ of subject review grades were in-line with expectations</b></li> </ul>	<p>* informal feedback from ¾ of the cohort indicated almost every student intended to apply to one or more Russell Group universities including Oxford &amp; Cambridge</p> <p><b>Impact on outcomes</b></p> <ul style="list-style-type: none"> <li>■ we have achieved some outcomes for teachers &amp; students but, perhaps unsurprisingly, after just one 'trial' year, we cannot yet confidently claim to have achieved all our intended outcomes</li> <li>■ but, teachers &amp; students generally remain supportive of the programme &amp; its ethos; also, much has been learned about how to adapt our strategies &amp; approaches in order to try &amp; further improve in this next year</li> </ul>

# Our research methodology & approaches:

**HOW** did we 'do' our research project?

**WHY** did we 'do' it this way?

**WHAT** did this look like in practice?

## **OUR RESEARCH METHODOLOGY:** *How did we 'do' our research project and why did we 'do' it this way?*

To gather the data for our project, we intentionally chose an **action research approach** because we were keen to ensure a strong CPD focus for the teachers involved. Action research principally involves **practitioners researching and reflecting on their own professional practice** in order to try and address identified issues. We felt this was a strong fit for what we were trying to achieve because, in essence, it positioned teachers centrally in the research. For us, this enabled us to conduct 'research with' our teachers, which we hoped they would find empowering, as opposed to having 'research done to' them, which we felt would fail to acknowledge the relevance and significance of their professional expertise. A fundamental part of what we were trying to achieve was to **increase teachers' understanding** about what is needed to best support students to work to A/A\* level. In turn, we were trying to **increase their professional confidence levels** to put all of this into action. We therefore felt there was no better way to achieve these goals than to put the teachers at the heart of what we were doing: we wanted to bring teachers together from state and independent schools and find ways for them to collaborate, to share and to develop each other professionally and so that state school teachers could experience first-hand what is needed and what works (as well as what doesn't!) – to test this, feel and see it for themselves! We wanted to provide all the teachers with both the opportunities and the research tools to be able to meaningfully compare, contrast and self-reflect on their everyday teaching practices and to use their cross-sector peers' practices as a sort of springboard against which they could bounce their ideas and thinking. The teachers were supported throughout this process, through research training provided to all participants at the outset and via ongoing support that was available at every stage; this included teachers being supplied with supporting guidance notes and research documentation for every activity they undertook.

## **OUR RESEARCH APPROACHES:** *What did this look like in practice?*

**In Phase 1 of our project**, we organised for all our participating teachers to undertake two one-day research visits to each other's schools so that state school teachers made visits to independent schools and vice versa. For the second visit, wherever possible, we arranged for teachers to go to different schools to the one(s) they had been to previously, which we felt would provide them with a broader set of experiences. During both visits, every teacher observed lessons of their specialist subject being taught; the second visit also included opportunities to speak with students and staff. The number of lessons observed on each occasion varied for each teacher, for each subject, within and between schools as this was largely dependent on timetabling allowances and constraints on those particular days; this therefore explains the disproportionate number of lessons observed per visit, per subject, per key stage, per school and type of school (for a full overview of all of our research activities completed and the data gathered, please see [Document 10](#)).

**For some teachers' first visits**, sometimes the lessons they observed fell outside of their own key stage specialism; again, this depended on timetable schedules in each locale on the specified visit days. It could be argued that teachers should have focused only on lessons matching their key stage specialism as the relative gains would inevitably outweigh the 'losses'. And, on the one hand, this makes very good sense. But, on the other hand, the key aim of these observation visits was to gather data that would allow us to build as full and as rich a picture as possible of the teaching and learning of English, Maths, Biology, Chemistry and Physics at Key Stage 4 and Key Stage 5. Intentionally, the focus of these first visits was left reasonably open because we wanted to capture as much information as possible about the nature of teaching and learning in each setting and because, quite simply, we did not know what this was going to look like! Also through these research experiences, what we really wanted to try and understand was what pedagogical practices for all independent school pupils, not just the most able, looked and 'felt' like and, for us, there was no reason to believe or assume that Key Stage 4 and 5 practices there would simply correlate with the established practices often used and required in the state sector at those particular key stages. Although this might have been the case, we wanted to see what the data would show us! But, to help ensure the task remained manageable and was not too unstructured, we asked teachers to try to describe (but not judge...) what they saw under the following three key headings: teaching (and resources); learning and engagement (and resources); classroom management. In addition, they were invited to write any overall thoughts and reflections they had after each lesson.

**For the second visits**, however, we specifically asked each school to organise, wherever possible, for the teacher-researchers to only observe lessons matching their key stage specialism. We made this particular request because, following our preliminary exploration of the data from the first visits, in-line with our inductive analytical approach, we felt it was now appropriate for teachers to take a more focused approach in their observations. Our analysis had revealed a number of emerging themes and sub-themes, which seemed to warrant further exploration, and so it was these that we asked the teachers to think about more deeply in these next observations.

**In Phase 2 of our project**, we turned our attentions to trialling a number of interventions with our highly able students that we devised based on what we had learnt from the data gathered in Phase 1. Our testing of these interventions was aimed at helping us to think even more deeply about the practices and approaches that make the difference for high level achievement at Key Stage 4 and Key Stage 5. In the main, we asked our teachers, in their subject groups, to undertake three research experiences to try and answer the following research questions:

RESEARCH EXPERIENCE BEING TESTED	RESEARCH QUESTION
<b>RESEARCH EXPERIENCE 1:</b> Cross-sector teacher exchanges	Would a independent school lesson work in a state school, and vice versa?
<b>RESEARCH EXPERIENCE 2:</b> Working together to develop high challenge resources	Is it possible to develop a resource that will successfully engage students in both the independent and the state sector?
<b>RESEARCH EXPERIENCE 3:</b> Super-curricular activities (extension/enrichment activities that are off-spec)	What can we learn from each other about how to provide super-curricular activities to develop and enrich learning?

Again, to help ensure these activities remained manageable, we provided the subject groups with a proposed framework for how they could work on each of these activities. In some instances, teachers took a pragmatic approach by choosing to adapt our suggestions in slightly different ways to find a closer fit with the areas of focus they were already working on as a subject group. Besides this making really good sense, also this seemed to be an excellent reflection of these teachers' sense of empowerment as the researchers (rather than being 'the researched'...) in our study, which is what we were striving to achieve through our use of action research approaches. Just as they had done for their previous research experiences, we asked the teachers to record their reflections from each activity as well as consider what had worked well, what had worked less well (and why), and what adaptations they feel could be appropriate for taking any of this learning forwards as part of our future practices.

#### Additional data

In addition to all of the data gathered by our teachers from these observation visits, we were also able to glean valuable insights from the following additional data:

DATA TYPE	FOCUS & PURPOSE
▶ Teachers' responses to a specially-created <b>TEACHER SURVEY</b>	<ul style="list-style-type: none"> <li>- each teacher was asked to complete this survey twice during the lifetime of the project</li> <li>- questions were aimed at gauging their understanding and levels of confidence around teaching to A/A*</li> </ul>
▶ Students' responses to a specially-created <b>STUDENT SURVEY</b>	<ul style="list-style-type: none"> <li>- a sample of highly able A level students from each participating state sixth form college and independent school was asked to complete this survey twice during the lifetime of the project</li> <li>- questions were aimed at gauging their levels of academic confidence around their A level studies and better understanding the strategies they use to approach their learning, which they find useful and how, in their view, they might be better supported to achieve at the highest level</li> </ul>

▶	Teachers' testing of specially-created <b>ONLINE SUBJECT NETWORKS</b>	<ul style="list-style-type: none"> <li>- each teacher was assigned membership to their subject-specific online network; in total, five had been developed (one per subject) for our project</li> <li>- we asked teachers to test these to see whether they could effectively support the sharing and collaborative development of each other's pedagogy and subject knowledge expertise - for teachers working in different schools and cross-sector</li> <li>- these networks were aimed to be networks run by teachers, for teachers</li> </ul>
▶	Teachers' reflections shared at <b>SUBJECT-SPECIFIC CPD SESSIONS &amp; REFLECTION DAYS</b>	<ul style="list-style-type: none"> <li>- at these meetings, teachers had opportunities to share reflections on their research experiences and what they had seen and learnt</li> <li>- they were also encouraged to draw on this learning when reflecting on and discussing the emerging findings from the data</li> <li>- the teachers used all of this learning, combined with their professional experience, to narrow down and agree key areas of concern and interest that they felt were particularly pertinent and timely for their subject, - they then tried to work on these areas together through their online network activities</li> </ul>

For a full overview of all of our research activities completed and the data gathered, please see [Document 10](#).

#### ■ Teachers' responses to a specially-created teacher survey

- each teacher was asked to complete this survey twice during the lifetime of the project
- questions were aimed at gauging their understanding and levels of confidence around teaching to A/A\*

#### ■ Students' responses to a specially-created student survey

- a sample of highly able A level students from each participating state sixth form college and independent school was asked to complete this survey twice during the lifetime of the project
- questions were aimed at gauging their levels of academic confidence around their A level studies and better understanding the strategies they use to approach their learning, which they find useful and how, in their view, they might be better supported to achieve at the highest level

#### ■ Teachers' testing of specially-created online networks

- each teacher was assigned membership to their subject-specific online network; in total, five had been developed (one per subject) for our project
- we asked teachers to test these to see whether they could effectively support the sharing and collaborative development of each other's pedagogy and subject knowledge expertise - for teachers working in different schools and cross-sector
- these networks were aimed to be networks run by teachers, for teachers

#### ■ Teachers' reflections shared at subject-specific CPD sessions and reflection days

- at these meetings, teachers had opportunities to share reflections on their research experiences and what they had seen and learnt
- they were also encouraged to draw on this learning when reflecting on and discussing the emerging findings from the data
- the teachers used all of this learning, combined with their professional experience, to narrow down and agree key areas of concern and interest that they felt were particularly pertinent and timely for their subject, - they then tried to work on these areas together through their online network activities

- [JAN] Project launch with Heads & schools @City Hall
- [FEB] Project launch with state & independent school Project Links & teachers
- [FEB&APR] State & independent school lesson research visits 1&2
- [MAR-APR] Baseline state & independent teacher survey
- [MAY-JUN] Baseline KS5 state & independent student survey
- [FEB&JUN] Wider school research visits 1&2
- [JUN] Reflection & Sharing Day with teachers
- [JUL] Reflection & Sharing Day with Project Links

## PHASE 1

Jan - Aug 2014

## PHASE 2

Sept 2014 - May 2015

- [SEP] St Catherine's Catholic School joins project
- [SEP-JUL] Start of KS5 Scholarship Graduate Programme intervention
- [OCT] Meeting with subject facilitators
- [OCT] Visit to knowledge-rich schools in USA
- [NOV-APR] Start of KS4 state school interventions
- [NOV] Subject Development Day meetings
- [NOV] Testing begins of online subject networks
- [JAN] Planning begins for Exchange Day research activities
- [JAN-MAR] Exchange Day research activities for all subject groups
- [FEB] Appointment of UCL IOE external evaluation team
- [APR] State & independent teacher survey follow-up
- [APR-MAY] KS5 state & independent student survey follow-up

- [MAY-end] Pre-dissemination meeting with state & independent school Project Links
- [JUN] Project Dissemination Conference and launch of The London Brokerage at City Hall
- [SEP] Submission of final report to GLA
- [BEYOND] Longer-term sharing & dissemination

## PHASE 3

June - Sept 2015

## PHASE 1 research activities completed

Activity	Participants involved	Purpose	Data gathered
<b>TWO scheduled research visits</b> <i>per teacher-researcher</i>	State ► Independent Independent ► State	To observe their specialist subject being taught	Visit 1: 176 sets of notes Visit 2: 112 sets of notes
<b>TWO wider school research visits</b> <i>(conducted by Project Links)</i>	State ► Independent Independent ► State	To learn about whole school practices adopted by each institution	12 reports completed
<b>Phase 1 subject-specific teacher survey</b>	ALL State ALL Independent	To compare perceptions, understanding & experience	38 completions
<b>Phase 1 student survey</b>	ALL KS5 State ALL Independent	To compare attitudes, motivations, perceptions, aspirations	328 completions
<b>Reflection &amp; sharing day meeting</b>	ALL State ALL Independent	To discuss experiences & reflect on emerging findings	Reflections & feedback recorded

## PHASE 2 research activities completed

Activity	Participants involved	Purpose	Data gathered
Visits to knowledge-rich schools in US	Member of project Steering Group	To learn more about knowledge-rich curriculum approaches	Insights fed into Phase 2 of the project
Subject-specific CPD days	ALL State ALL Independent	To discuss & agree focus areas for their online subject network (based on emerging findings)	Reflections, feedback & agreed directions recorded
Subject-specific online networks	ALL State ALL Independent	To share & develop subject & pedagogy expertise	Nature & purpose of use reviewed betw. Autumn 2014 – Summer 2015
Exchange Day research activities	ALL State ALL Independent	To test series of interventions for providing high level stretch & challenge to A/A*; to reflect on their utility & effectiveness	27 direct teacher exchanges
			6 groups of teachers collaboratively developing & testing resources
			2 groups of teachers testing super-curricular approaches
Chromebook trial	6 state & independent teachers	To explore different ways of working for teaching & learning	Chromebook trial usergroup forum
Phase 2 subject-specific teacher survey	ALL State ALL Independent	To compare perceptions, understanding & experiences & consider any changes	33 completions (87%)
Phase 2 student survey	ALL KS5 State ALL Independent	To compare attitudes, motivations, perceptions, aspirations & consider any changes	175 completions (54%)