

The  
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Foundation

# Languages, Mathematics and the Baccalaureate

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# FOREWORD

In the summer of 2003, a small group met several times at the Nuffield Foundation to explore an exercise which would amount to curriculum foresighting. The Tomlinson Working Group on 14–19 Reform, set up as an outcome of the Government paper, ‘14–19: Opportunity and excellence’, addresses the revision of the assessment and qualifications framework for 14–19 year olds, but more fundamental questions about the underpinning curriculum are outside its remit. Our conviction was that proposals to reform assessment can only be authoritative if they take account of the nature of the curriculum. This has two aspects. What are the implications for the curriculum of particular kinds of qualifications and assessment styles? And how does the nature of the curriculum shape the possibility of changes to the qualifications and assessment structure?

We did three things to explore these questions. We made an assumption about the general nature of the overarching diploma, the grouped award, likely to become the preferred option in reform of the 14–19 phase, and opted for a baccalaureate-type working model. We focussed on two curriculum areas so that the analysis could be at a level of detail which would allow us to move beyond generalities. And we chose language and mathematics. This was a pragmatic choice given that Nuffield is interested in both areas. But it was also based on the intrinsic interest of comparing two very different areas which also have striking similarities of essence and organisation.

Kathy Wicksteed and Geoff Wake prepared briefing papers on the implications of a Bac-type structure for the languages and the maths curriculum respectively. The two papers are written in the same framework to make the comparison between maths and languages easier. Their papers were used as the basis for a consultative seminar, involving mathematicians, linguists and others with a more general interest, held at Nuffield on 17 November 2003. Richard Pring acted as rapporteur for the meeting, bringing the two papers together in a synthesis of the main issues.

This publication consists of these three papers, revised following the consultative seminar. Those who contributed to the seminar and/or in other ways to the exercise are listed on page 24. We are indebted to them for their interest and enthusiasm and very grateful to the principals for their expert insights and their commitment to the project. Bringing together specialists from two such different subjects was an experiment, with a risk that discussions might not be productive. In the event, we need not have worried, and many commented on the value of comparing similarities and differences. We hope that the outcome is useful to the ongoing reform of 14–19 education, the parallel discussion of mathematics education post-14, and the vexed question of the centrality of languages in the 14–16 curriculum. We believe that the exercise also has a developmental value, providing a methodological framework which can be used for the similar analysis of other curriculum areas.

*Catrin Roberts*

*Nuffield Foundation, February 2004*

# LANGUAGES, MATHEMATICS, AND THE BACCALAUREATE

*Richard Pring, University of Oxford*

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## INTRODUCTION

The context of the seminar was the current Review of 14 to 19 education and training by the Nuffield Foundation and the review by the Tomlinson Working Group of the framework of qualifications within the 14 to 19 phase. One proposal being considered is that of a ‘baccalaureate-style’ system (whether or not that be the title given), in which there would be a unified and graduated framework of qualifications. Very often such a framework provides an overview and is thus, understandably, seen from a rather general, indeed utopian, perspective. After all, it is to be seen as a framework. But its value and effectiveness must ultimately be put to the test through its impact upon specific learning opportunities, often within recognised subjects. Hence the importance of this Nuffield seminar, which examined the framework through the perspective of modern languages and mathematics.

Nuffield had already funded an enquiry into the teaching of Modern Languages which had reported over three years ago. It was thought that the Tomlinson Working Group might provide an opportunity for the conclusions of the enquiry to have some influence. Certainly there would appear to be a need for it to do so. Preparation for higher education required Modern Language skills besides those required for a degree in Modern Languages, affecting many more students. And in this respect, the AS/A2 experience had been very limiting.

## MATHEMATICS

*Briefing paper by Geoff Wake, University of Manchester*

Whatever the framework of qualifications, mathematics must have central place within it – and not (as now) only for a few mathematically able. The justification for this is two-fold: first, the intrinsic value of developing a key aspect of the mind (what it means to think); second, its essential contribution to the social and economic life of the community and of each individual. Mathematical ‘literacy’ is a sine qua non of effective citizenship and economic power.

The review of 14 to 19 arrangements, therefore, provides an opportunity for reconsidering two things: first, the appropriate mathematics curriculum for the full range of ability and of aspiration; second, the appropriate assessment and qualifications to reflect the different kinds and levels of achievement. Central to such a reconsideration is the recognition of

the diversity, first, of interests, especially vocational, for which mathematical knowledge is wanted, second, of attainment, and, third, of the mathematical skills and knowledge relevant to a rapidly changing and technological society.

What would seem to follow from the attempt to ‘tailor’ courses to meet such diversity is a modular system. Such a modular system would build on the emphasis upon basic skills of numeracy and calculation, given in the National Numeracy Strategy and the Key Stage 3 Strategy. But it would ensure a ‘richer view of mathematics activity’ than had been encouraged by those strategies, encompassing:

- solving problems
- mathematical modelling
- mathematical investigation
- critical enquiry into the use of mathematics by other people
- understanding, explaining and constructing mathematical arguments
- understanding of the subject as a cultural endeavour.

Throughout, the utility and application of mathematics to everyday life would be emphasised.

The recognition of the diversity of interest and of attainment would require a number of pathways through the phase, in place of the single pathway which currently leads from Key Stage 3 to GCSE and beyond. The single pathway simply cannot cope with this diversity, contributing to the relatively small number of students who continue with mathematics. And that diversity of pathways would reflect, in the qualifications system, different levels of entry and of exit (and, indeed, that is acknowledged in the tentative proposals of the Tomlinson Working Group). At the same time, equal status would need to be given to achievement at each level if students are to be encouraged to continue with mathematics even where their attainment is unlikely to be high.

The framework, though encouraging students with different interests in mathematics and with different levels of attainment to continue their studies, would at each level provide opportunities to exit with credit towards their qualification – or to continue to a higher level. Hence, two modules at each level would enable there to be both mathematical application (for instance for different vocational interests) and a continuing deepening of mathematical knowledge as a prelude to study at a higher level. Such a modular system, reflecting different levels and different applications of mathematics, would give the flexibility in design which is needed if the subject is to remain central to curriculum and qualifications for all.

Priority must be given to appropriate content and pedagogy rather than to assessment. Assessment should reflect, not shape, the kind of learning to be encouraged. A richer mathematical curriculum would be characterised by more active learning, enriched by the use of ICT. To this end, there needs to be greater emphasis upon teacher assessment, with implications for the professional preparation of teachers and the development of resources to be used by them.

## Comments made and problems raised in the discussion

There was general, if not unilateral, acceptance of the following issues.

- **Lack of mathematical skills and knowledge.** There is deep-seated concern over the number of students or employees who lack the mathematical skills and knowledge required for continued study or training. An example from a university pointed out that poor attainment in mathematics affects, not only degree courses in mathematics and physical sciences, but 70% of its courses.
- **Impoverished experience of mathematics.** The frequency and style of assessment, currently practised, encourage short-term objectives and teaching methods which impoverish the experience of mathematics. Portfolios of work reflecting problem-solving competency would be one way forward.
- **Motivation** in terms of relevance and utility too often overshadows the equally motivating force of interest (at all levels) in mathematical problem solving. And, indeed, what is seen by students to be ‘relevant’ is not as easy to determine as is often assumed.
- **Very able students.** In encouraging greater participation in mathematics, the ability level and the motivational needs of the most able must be met, with encouragement for the continuation of their mathematical studies into higher education. This has implications for both curriculum and assessment at ‘advanced level’.
- **Concepts of ‘individual pathways’ and ‘tailoring curriculum to individual needs’** require close examination. First, it would not be practically possible to ‘tailor’ to the needs of individuals as opposed to groups. Second, too much ‘tailoring to individuals’ would result in such a wide range of curriculum and assessment as to bewilder rather than help the users of qualifications.
- **Innovative teaching.** Given lack of consensus over which ideas constitute the core of mathematical learning, and the range of methods which effective teaching might employ, the framework should be broad and flexible enough to provide opportunities for professional innovation and experiment. At present, backed by Ofsted inspections, the curriculum is circumscribed and limiting
- **Equal status.** The virtue of having different pathways (reflected in different entry and exit points and in different units for vocational use) depends partly upon the granting of equal status to these different levels and units. But equality of status is not something which can be bestowed.
- **Modular framework.** Modules seem to be the obvious organisational framework within which flexibility of pathways can be managed. But there were serious objections. A richer mathematical experience would find room for trial and error, reflection, the struggle to understand, tentative conclusions – the kind of learning which short-term modules (rounded up with assessment of outcomes) obviates. (Reference was made to Daniel, early school-leaver, who remembered with regret ‘he were rushing me – there was a need to take my time’.)

• **Teaching quality.** The shortage of good mathematics teachers obstructs the universal development of more mathematically sound learning experience. Any framework has to take into account the wide range of teaching competence.

• **Logical structure of the subject matter** should not be ignored in the attempt to adjust mathematics to different needs. Mathematics at all levels requires the mastery of key ideas which remain the same whatever the application. What differs is the level at which such ideas might be grasped. And progression should be seen as a constant revisiting of those key ideas, but at an ever greater depth. ‘Application’ requires a grasp of ‘pure’ mathematics – although the application might provide a more practical context in which the key ideas can be understood.

## **MODERN LANGUAGES (ML)**

*Briefing paper by Kathy Wicksteed, Specialist Schools Trust*

The teaching of ML is justified in terms of:

- access to a different culture and a wider global understanding
- its usefulness for employment
- its enhancement of linguistic and intellectual development.

But the nature and importance of that justification has both changed and been enhanced by the changing multi-ethnic nature of our society. The language of minority ethnic groups should play a larger part in the opportunities opened up in the 14 to 19 phase because, in addition to the justification given above, they create a greater sense of cultural identity and self-respect amongst ethnic minority students.

Despite the reasons for enhancing the learning of ML, the number of students taking them has drastically declined, thereby jeopardising the study of ML at university – and thus making it even less possible to find the teachers qualified to teach ML in schools. The 14 to 19 review is seen as an opportunity to provide a radical review of ML teaching in order to reverse this downward spiral.

The first step is to acknowledge the wide range of attainment and interest at the age of 14, which should be reflected in a wider range of provision – different ‘entry points’, styles of teaching, contents and purposes. The second step is to provide a framework and credit system where the mere maintenance of language competence gets recognition, even where ML is not the main focus of the studies. The third step is to provide opportunities and credit within the framework for the commencement of new languages, even though these may be pursued at a relatively low level and related to a vocational need (such as for courses in tourism). The fourth step is to provide the opportunities both within and outside the classroom for practical development and application of language skills.

The framework of 14 to 19 should be so constructed as to enable progression from different entry points to different exit points, where ML might be seen as a main focus of interest, or as an ancillary to other (such as vocational) interests, or as a competence to be

maintained. Such progression should provide opportunity for choice (at different stages) and for different rates of progress. Furthermore, whatever the level and purpose, equality of status must be given to the different pathways. But there are problems.

First, ML are often seen to be more difficult than other subjects – and therefore to constitute a greater risk for the investment of time. Hence the need for the framework:

- to signal the importance of ML by giving credit to achievement and maintenance at different levels,
- not to differentiate ML from mathematics and English by making it optional from the age of 14,
- to ensure that the ‘difficulty level’ of the standards to be achieved is no greater than that in other subjects.

Second, the dualism between ‘academic’ and ‘vocational’, between ‘pure’ and ‘applied’, has caused the neglect of ML for vocational purposes.

The following solutions were suggested. First, language provision might be conceived in terms of a three-dimensional matrix – with the complexity of language (presumably the basic vocabulary, grammar and syntax) in the vertical dimension, the topics or functions of language learning in the horizontal dimension, and the different languages in the third dimension. Second, there should be a reappraisal of the balance of the ‘four skills’ (listening, speaking, reading and writing), with greater concentration upon task oriented communication skills. Third, there should be more teacher-led assessment based on learners carrying out real tasks. Fourth, the use of ICT should assist wider communication and the personalisation of learning

### **Comments made and problems raised in the discussion**

There was general, if not unilateral, acceptance of the following issues.

- **Research needed.** The briefing paper showed the need for a more detailed review of research prior to any radical changes, especially on different learning styles, motivations and interests which affect the learning of ML, on strategies for overcoming the perceived difficulty of learning ML, and on the reappraisal of the balance of focus equally upon the ‘four skills’.
- **Compulsory qualification.** The importance of ML would be signalled if the Bac. required a qualification in ML, however low. That could be achieved by the opportunity to recommence ML after a break – when an original lack of interest might be overcome.
- **Continuity post-14.** The good intentions of the KS3 framework are jeopardised by the making of ML optional post-14, thereby diminishing its importance in the minds of students, and by making it compete with other options. The reasons for not continuing are exacerbated by the fact that (unlike in mainland European universities) competence in ML is not required for entry to higher education, and that ML departments are being closed through lack of support and students. However, lessons should be drawn from Wales where Welsh is taught to KS4 and where it will be compulsory in the Bac. which Wales is developing.

• **Equal status.** The different pathways and the different levels should, it is argued, be given equal status. However, status is not something which can be bestowed. Therefore, credit within the framework for language maintenance or for vocational relevance needs to reflect a range of difficulty and purpose. Not all can have equal value within the credit system.

• **Flexibility in progression.** For some, more time is required for reaching certain standards and overcoming difficulties. The framework must allow for different paces in progression – which may not be easy in a constraining modular system.

• **Viability.** The viability of ML becomes more problematic the more it becomes optional, because there may not be enough students to warrant groups with different levels of attainment and different academic and vocational interests. Perhaps one solution, apart from making it compulsory, is to reconsider the institutional framework in which ML is to be studied.

• **Teacher assessment.** There needs to be a greater emphasis upon ‘assessment for learning’ with a greater role for teachers, and more resources and support to enable them to do this.

## CONCLUDING COMMENTS

### Assumptions

First, the papers on languages and maths both assume that the 14 to 19 review by the Tomlinson Working Group will provide an opportunity for a radical examination of the place of mathematics and modern languages in the curriculum from age 14 onwards. In other words, it would be seen as a lost opportunity if a new framework assumed that the continuity of teaching within subjects would remain roughly as it is – a mere shifting of the chairs ...

The second assumption of both papers was that there would be a Baccalaureate kind of qualification (or an overarching Diploma), along the lines of the interim report of Tomlinson, with different levels of entry and of exit (‘entry’, ‘foundation’, ‘intermediate’ and ‘advanced’). It was assumed that this framework, standardised within a subject and across subjects, would provide different pathways for students, who would be working at different levels in those subjects and who would be able to maintain their subject interests even where those subjects were not their main focus of study.

The third assumption was that the various pathways through these levels, combining the academic (or general) with the vocational, would be given equal status

The fourth assumption was that the Government must get it right this time.

However, it is not clear that these assumptions are compatible, at least within the time-span of the Tomlinson review. Many of the problems and possible solutions raised in the seminar require much more time for a review of what research says on such matters as:

- students' vocational interests and the relevance of different contents to those interests,
- the changing kinds of mathematical competence required for employment and effective citizenship,
- the best learning strategies in modern languages,
- the most effective use of teacher-led 'assessment for learning' and how that might be moderated for a contribution to the credit system within the framework (reference was made to previous, well-researched examples of CSE moderation in the 1970s),
- the requirements of higher education for different courses, not only those leading to degrees in mathematics and ML,
- philosophical analysis of what are the key ideas in 'thinking mathematically' at different levels or 'modes of representation' (put Bruner on the reading list of the Tomlinson Working Group).

When Government is espousing 'evidence-based policy and practice', it would be unfortunate if recommendations made by Tomlinson affecting practice did not take into account the available evidence. And no doubt what is true of mathematics and ML is equally true of other subjects. Without regard to such evidence, the Government is unlikely to 'get it right this time'.

### **Achievements of the review**

Both subjects saw in the Tomlinson review an opportunity for an enhanced place in the educational experience of all students through such proposals as:

- credit given to subject maintenance or to the ancillary study of the subject to support an academic or vocational interest
- different levels of entry and exit, with due credit being given
- an emphasis upon applied studies.

### **Problems to be faced**

First, it was constantly pointed out that any framework has to be broad and flexible enough for greater teacher-inspired design of the curriculum and assessment of student performance. And that arose from several considerations:

- There simply is not the knowledge and wisdom 'at the centre' to be able to say exactly what should be learnt by all students, at what pace and by what means (the example was given of the unanticipated consequences of 'disapplying' ML from the National Curriculum after KS3).
- If there is not universal agreement over the central core of a subject (the key ideas), then it is difficult to assume that there could be such agreement in the central shaping of the curriculum.

- Teachers need to adapt both the learning experience of the students and their own ‘assessment for learning’ to the students’ needs and vocational interests.

Hence, beware of too narrow and rigid a standardisation within the framework.

Second, although modular arrangements were often seen to be the way to implement a more flexible system with several pathways for progression, modules tend to be restrictive, not conducive to certain styles of learning, foreclosing that ‘struggle to understand’ by responding to short-term objectives.

Third, the different pathways seem to assume clear distinctions between the ‘academic’ and the ‘vocational’ and between the study of a subject in its ‘pure’ form and the ‘applied’ study of the subject. But these distinctions are more blurred than the purported framework would suggest. What constitutes thinking mathematically is the same whether the study be ‘pure’ or ‘applied’. And, likewise, the skills required in the study of a ML have a certain commonality across an understanding of literature and doing business.

Fourth, the many pathways require an equality of status between them and between the levels. But, as was pointed out, equality of status cannot be bestowed – it must be earned, often within deep-seated traditions which attach greater importance to some activities rather than to others.

Fifth, ‘tailoring to individual needs’ sounds ideal, but, if it is not to remain a utopian dream, much more needs to be said about, first, how individual needs are to be identified, and, second, the practicalities of doing this where such diversity has to be catered for.

# LANGUAGES AND THE BACCALAUREATE

*Kathy Wicksteed, Specialist Schools Trust*

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## **RATIONALE FOR LANGUAGES WITHIN THE 14–19 CURRICULUM**

Language learning serves three broad purposes: it is a gateway to another culture, it is a practical skill for lifelong use, and it enhances overall linguistic and intellectual development. Many would argue that knowing a foreign language is part of what it means to be educated, or, in the words of the National Languages Strategy document, ‘an essential part of being a citizen’<sup>1</sup>, and that it enhances quality of life.

Language learning also brings wider benefits for young people: it often provides them with their only opportunity to meet young people from other countries; it helps develop broader communication and social skills; it enhances their employability; and it provides insights into the nature of language and the roots of the English language. For children whose mother tongue is not English, formal learning of their first language helps them to access the wider curriculum and raises their self-esteem and aspirations.

Globalisation means that businesses and other employers increasingly need foreign language skills at all levels, in a range of languages broadly reflecting the spread of languages across the world. In a knowledge economy which relies heavily on communication, high levels of linguistic skill are essential. In addition, there is a pressing need for young people to become globally aware. A society in which young people are engaged in learning a wide range of foreign languages is less likely to foster xenophobic attitudes, and the inclusion of languages within the curriculum is often the catalyst for an international ethos across the school or college.

We are still in a position where some languages are treated as of higher status than others. Many of Britain’s ethnic minority languages still lack a good range of learning resources, and too often their teachers do not have access to the same professional development opportunities as teachers of European languages. In many schools, community language classes take place outside normal lesson times or are not available. These facts should give us pause for thought. It is hard to see how we can create a society of mutual respect if this respect is not extended to the languages our children speak. It would help to counter prejudice if the languages of our significant minority communities, such as those of the Asian subcontinent, became mainstream choices for all young people.

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<sup>1</sup> Languages for All: Languages for Life, A Strategy for England, DfES 2002, page 5.

The number of students continuing with language learning post-16 has declined rapidly over the last ten years, and the now optional status of languages for 14 to 16 year olds in England is already leading to lower participation rates post-14. A key goal of a new qualifications framework for languages is to reverse this decline, through bringing a fresh approach to course content and structure and to the place of languages within the framework as a whole.

## **LEARNERS' NEEDS OF THE SUBJECT**

Young people start the 14–19 phase with different levels of attainment, talents, interests and preferred learning styles. The current languages curriculum is strikingly poor at catering for these differences. With the introduction of optionality, the curriculum also fails to recognise the mismatch between what young learners are likely to choose to study at 14 and what their needs might be in relation to adult life. In this respect, languages are similar to subjects such as mathematics which would not be a popular choice if set alongside 'easier' subjects.

If pupils' needs rather than immediate preferences are to be met, some level of compulsion will be essential. In preparing students for the realities of the workplace, it is hard to justify tourism or business courses that do not require any foreign language competence. Many others following more general programmes will find language skills to be of equal importance in later life. There is a real risk that if a free market applies to languages post-14, middle class children will be unaffected while the education of disadvantaged children is diminished. Indeed, the evidence is that this has begun to happen.

To meet the needs of their future education and adult lives, the vast majority of young people at 14 need to improve their competence in a language they have been learning, so that they can communicate more confidently and flexibly, and do not lose the competence they have already acquired. Not to do this would greatly reduce the usefulness of their prior learning. Different learners will have strikingly different needs in terms of styles, levels and pace of learning; there is a danger of simplifying the choice into the need for basic, concrete communication on the one hand and for specialist preparation for advanced study on the other; such dualism in the past has limited opportunities for progression.

As learners move through the 14–19 phase, the work-related uses to which they will put their language learning are likely to become clearer, so that some of them will benefit from moving from a general to a more vocational emphasis, whether or not they also move to a more complex level of language. Some will wish to continue their learning in higher education, either as a specialist subject or alongside another vocational or academic programme, at varying levels depending on their prior attainment. Some students will relish an opportunity to start one or more new languages, for any of the above purposes or for interest and enjoyment. Some others may want to continue to learn a second language started when younger or a home language; others will leave school at 16 and will benefit from an opportunity to keep their language fresh through work-based learning. The diversity of these needs suggests that a new 14–19 Diploma should offer

flexible options in relation to the number and choice of languages, levels, skills focus, pace and content.

What all learners have in common is the need for their level of competence at 19 to be of real use to them in their lives. This requires the acquisition of tools for independent language use – sufficient control of linguistic structures for the contexts in which they will operate, communication skills, and learning skills so that they can improve their own competence to meet future needs<sup>2</sup>. Most importantly, students need to hone and test their linguistic and intercultural skills in real situations outside the classroom. Overcrowded syllabuses and practical constraints make this difficult to achieve; but if it became the cornerstone of 14–19 pedagogy it would have great transforming power.

## **PROGRESSION**

Key questions that need to be addressed in relation to the new framework are:

- How to keep language study as a mainstream choice post-14 and to encourage far more students to continue their learning post-16
- How to ensure that students can follow a smooth learning pathway before, during and after the 14-19 phase
- How to balance the need for coherence with the need for a choice of pathways and different rates of progress
- How to ensure that all types of course have equal status within an inclusive approach to curriculum design.

## **Clearing a space for language learning**

To encourage young people of all abilities and aspirations to continue to learn a language, languages must have the same status in the framework as other subjects and be fully integrated into learning programmes. Incentives for completing courses must have credibility at all stages through the phase, for courses at all levels however combined.

Because of their perceived difficulty, languages are vulnerable if the space for them in the curriculum is too small or too large. If too large, students may fear that they will perform less well than if they chose an ‘easier’ subject. If too small, students may feel that the accreditation will not be worth the hard work involved. The structure of a Diploma will need to take careful account of the choices that will be likely to compete with languages and how its positioning will affect its perceived status.

## **A smooth learning pathway**

To ensure strong participation at 14+ and 16+, the curriculum must build on prior attainment in a way that is accessible to the majority of learners. There is ample evidence that it is more difficult to gain higher grades at GCSE in languages than in other subjects, and the hiatus between GCSE and AS level is a significant barrier to transition from

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<sup>2</sup> These aspects are well supported by the new Key Stage 3 Modern Foreign Languages Framework, and the extension of its influence to the 14-19 phase would be welcome.

intermediate to advanced level. Removing this barrier entails a substantial repositioning of languages at advanced level. The new curriculum must provide high-status language courses that are attractive and accessible to the majority of advanced learners, instead of a stark choice between somewhat daunting advanced study and low-status courses which have no value for university entrance.

In higher education, languages as part of other degree subjects are booming while specialist language courses struggle to survive. More accessible advanced language courses could increase take-up of single and joint language degrees. If necessary an enhanced prior experience such as a six-week stay in the foreign country could be required for single degrees.

### **Vertical and horizontal dimensions to learning**

A language course can be viewed as a matrix, with the complexity of language in the vertical dimension and the topics or functions in the horizontal dimension. While this is a crude analysis, it provides a simple way of placing courses into a single overarching framework. To these two dimensions can be added a third representing different languages. An inclusive and flexible languages curriculum would allow progression in all three dimensions. Further subdividing courses into content/function-based modules would enable students to gain credit for partial course completion.

### **A choice of pathways**

Following the introduction of primary languages and the Key Stage 3 Modern Languages framework, it is likely that students at 14 will be ready to start courses at all levels from entry to advanced, some having already reached intermediate level after seven years of language learning. It will be important therefore to allow students to spend different lengths of time in moving up the levels, and to make progression pathways available for each type of course – for example, enabling a student to keep a business focus throughout. The three-dimensional model would accommodate this.

The current sharp divide between vocational and general courses may not be helpful. A less polarised approach would promote equality of status between the two types of course and could bring to both the strengths of each. Language learning adds significant value to work-related courses. At present, vocational language courses are peripheral in the 14–19 phase, and not always well-linked to their associated courses. The new framework must ensure that applied learning is of equal weight and quality, offers equal choices of languages, levels and progression routes, and is well-integrated with accompanying work-related learning.

The options available to students could be extended further by making use of the new Language Learning Ladder<sup>3</sup> to accredit courses that fall outside the main pattern of provision, including shorter courses and online learning.

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<sup>3</sup> The scheme is currently being developed by the DfES as part of the National Languages Strategy.

## STYLES OF LEARNING, PEDAGOGY AND ASSESSMENT

The pedagogical needs of language learners of all abilities in the 14–19 phase are similar to those in other subjects: they are increasingly competent at directing their own learning and need opportunities to work independently and creatively; they need to see the purpose of what they are learning and to relate their learning to real life; the skills taught need to match those that will be of most use to them for work or leisure; they need to be engaged by their learning; and they need their language learning to reflect and support their other learning as far as possible. These needs are not well met at present.

Engaging adolescents so that they are able to achieve their potential as language learners is very challenging. Crucially, they need to find meaning and relevance in the contexts in which they practise their language skills. An approach which has been largely overlooked in England is to integrate language learning with other curriculum subjects; where schools are experimenting with this, for example in specialist Language Colleges, motivation has increased. Similarly, communication with young people in other countries has been shown to be extraordinarily effective in bringing learning to life, with email now well-established and videoconferencing becoming an increasingly realistic option.

These considerations suggest a number of desirable characteristics for language courses within a new 14–19 framework.

**A flexible approach to course requirements** that allows teachers and students to choose from a number of options and to adapt the course to their own circumstances and the purpose for which they are learning.

**A new approach to course content** so that all content has depth and can bear the weight of the time spent on it; informs and inspires; is linked to students' other learning; and leads to motivating tasks requiring imagination and creativity, independent thinking, active participation, and the practical application of skills central to language competence.<sup>4</sup>

**A reappraisal of the balance of the 'four skills'** to reflect desired outcomes more closely.<sup>5</sup>

**Medium and long-term assignments** that enable learners to direct their own learning with their teacher's support.

**Communication with native speakers for real purposes**, such as through work experience in an international company or a project with a partner school abroad.

**Use of communications technology for learning**, to personalise learning, access resources such as digital audio and video and the internet, and communicate with pupils in other countries.

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<sup>4</sup> GCSE and Entry level courses typically cover trivial topics which for GCSE repeats work done previously. In contrast, AS and A-level topics are demanding for 'average' advanced learners.

<sup>5</sup> GCSE and many other courses give equal weighting to the 'four skills' of listening, speaking, reading and writing and assess them separately. This structure takes little account of how language is used in real situations. A reappraisal of effective learning and real communication is likely to lead to a primary role for speaking and a secondary role for the other three skills.

**Teacher-led assessment based on learners carrying out real tasks.** This is commonly the model in vocational courses but not general courses. Assessment of this kind facilitates assessment for learning, ensures a closer relationship between what is learned and what is assessed, and tests a more complex set of skills than is possible in examinations.

## CONCLUSIONS

In the 14–19 phase, a broadly common approach to language learning (what one might call ‘introductory learning’) needs to divide into a number of pathways to meet a range of needs. Most people will not pursue formal language learning beyond the age of 19; it is therefore the phase in which learners must move from rehearsal to performance. It must also provide a solid stepping-stone for further study.

This is also the phase when students are able to drop some subjects in order to spend more time on others. It is therefore crucial that the place of languages in the framework encourages participation, and that courses fit well with students’ other learning and their eventual aspirations. It is unlikely that this can be achieved without rules of combination coming into play. Many would argue that language learning should be compulsory until students leave school, not least to avoid creating a divide between the kind of education received by the privileged and that received by the poor.

The new framework is an opportunity to establish a level playing field between languages by providing better support for non-European languages, and to encourage much wider study of the languages of England’s significant minority communities and other world languages which are currently under-represented.

Some specific features for languages within the 14–19 framework are likely to be helpful in order to achieve these goals. Each requires further investigation beyond the scope of this paper.

- A flexible qualifications structure allowing a choice of language courses at all levels and for a range of purposes.
- Smooth, manageable progression between levels.
- Space for language courses within the mainstream curriculum, and rules of combination which ensure that young people’s future needs as well as current preferences are met.
- A teacher-led approach to course design and assessment.
- The possibility of ‘horizontal’ progression to develop skills in new functional contexts.
- A rapprochement between vocational and general courses with equal status, access and challenge for both.
- Effective integration of language courses with their associated vocational courses, and links between general courses and students’ other learning.
- A pedagogy that prioritises communication for real purposes and international experience.
- Non-trivial course content that encourages active and creative learning.
- Availability of online learning and use of the Language Ladder to extend the range of languages available.

# MATHEMATICS AND THE BACCALAUREATE

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## **RATIONALE FOR MATHEMATICS WITHIN THE 14–19 CURRICULUM**

Mathematics has traditionally held an important place as one of the core subjects throughout compulsory schooling. This recognises its central role in allowing individuals to function effectively as learners, citizens and workers, as well as recognising mathematics as a discipline with a rich historical and cultural foundation worthy of study in its own right.

Policy-makers acknowledge the importance of mathematical knowledge, skills and understanding to workers and citizens in ensuring that the nation has a well-educated workforce and is well-placed to remain economically competitive. This is important across many employment sectors and for workers of different skill levels. At the highest levels, it is important that we produce individuals who collectively are able to use advanced mathematics to investigate and make sense of phenomena across almost all areas of professional and social life.

Individuals therefore need to have the opportunity to study mathematics to ensure that they have access to employment. However, they also have a, perhaps more fundamental, right to access to mathematics which allows them to take a critical view of the world in which they live. Whilst it is easy to suggest that being a consumer (shopping, banking and so on) and a critical user of statistical data such as that presented by the media and government requires only a restricted set of basic mathematics, competence in these areas often demands skills across a wider range of mathematics than might at first seem necessary (such as use of graphical thinking or proportional reasoning). This has recently become more important as the use of technology has led to a great increase in the amount of quantitative data and information we meet on a day-to-day basis in work and at home.

It is clear, therefore, that society needs mathematically literate citizens, and that workers and individuals have a right to mathematics as knowledge that prepares them for their roles as both workers and citizens. The development of a new framework of 14–19 qualifications allows us the opportunity of reconsidering not only qualification and assessment but also the mathematics curriculum on offer. For example, the rapid and relatively recent development of technologies, such as calculators and computers, results in shifting emphases and needs within the discipline. Such developments are occurring so quickly that current mathematics curricula do not cater for present and future needs: our understanding of what these needs are may not even be well-founded.

## LEARNERS' NEEDS OF THE SUBJECT

At age 14 learners are widely spread in terms of their attainment in mathematics and this widens as their age increases. Also, as learners get older, their interests diversify and individuals become more narrowly focused in their studies as they develop career aspirations and goals.

All learners, therefore, should have access to a course of mathematics at a level appropriate to them and which allows them to develop in their different roles as students of other subjects, as citizens and as future workers. To ensure that a course of study can be tailored to meet the needs of individuals as well as groups of learners most effectively, it is likely that a range of modules of study at different levels will need to be developed. As well as each of these allowing students access to mathematics they can apply appropriately, there could still be room for all to gain some appreciation of mathematics as a discipline in its own right.

The pre-14 mathematics curriculum has recently been greatly influenced by key stage testing, and most recently by the National Numeracy Strategy and the Key Stage 3 Strategy. This has resulted in a strong emphasis on basic skills with number and calculation in the primary years, and in the early secondary school years on skills and techniques across a wider range of mathematical topics. A redesign of the 14–19 curriculum allows an opportunity to promote a richer view of mathematical activity. As well as ensuring facility with an appropriate base of mathematical skills and techniques, the units of study should ensure that mathematical activity encompasses:

- solving problems
- mathematical modelling
- mathematical investigation
- critical inquiry into the use of mathematics by other people
- understanding, explaining and constructing mathematical arguments
- understanding of the subject as a cultural endeavour.

Students are often most motivated in their study of mathematics (and other subjects) when they can see an immediate, or potential, use for what they are learning. It seems essential, therefore, that realistic application of mathematics should be included in the units of study developed. Allowing flexibility in focus of this application would encourage teachers to motivate the learning of individuals and groups of students. This could be achieved by designing units of study that encourage students to apply mathematics in a range of contexts that are motivating to them, for example in specific areas of their other studies.<sup>6</sup>

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<sup>6</sup> Recently introduced Free-Standing Mathematics Qualifications allow this for post-16 students who confirm this increased motivation and perception of relevance of the subject.

## PROGRESSION

The current single pathway leading from the Key Stage 3 Programme of Study through GCSE to AS and A2<sup>7</sup> is unsatisfactory for many, if not the majority, of learners. There is growing evidence that mathematics, as it is currently formulated, is becoming increasingly unappealing to a substantial number of students. For example, at GCSE approximately 50% of students gain a higher grade (A\* to C). Of these only about one-seventh pursue their study of the subject to AS, with a substantial number of these dropping the subject before completing the full A-level.<sup>8</sup> Other qualifications in mathematics, perhaps more appropriate to the needs of individual learners, have been designed in the past, but have had difficulties becoming established in the current framework where GCSE and A-level dominate.

A redesign of the 14–19 mathematics curriculum provides the opportunity to develop a new framework of mathematics units through which learners could progress to clearly useful endpoints, taking into account their ability, interests and aptitudes. This redesign should ensure that all qualifications at a particular level (that is Entry, Level 1, Level 2, or Level 3) are accorded the same status. It is important that this framework recognises that a substantial and increasing number of students elect to focus their studies in ‘vocational’ areas. Units of study should therefore allow students to value the relevance of mathematics in their pursuit of these courses.

It seems desirable that, although the units of study available in any 14–19 mathematics framework should allow an individual student to follow a ‘pathway’ that is tailored to their own needs and mathematical development, there should not be a proliferation of mathematics qualifications. This is essential for schools and colleges that will have to work to provide courses and organise assessment, and for employers and higher education admissions tutors who need to have an understanding of, and confidence in, the framework. A single framework of mathematics qualifications should ensure that problems of status, such as those experienced by the Key Skill ‘Application of Number’, may be prevented.

At any level, there is a need for mathematics qualifications to serve two purposes: as an end-point of study for some and as a stepping stone to further study for others. This suggests that there should possibly be two modules at each level: one with a primary focus on application of mathematics and the other more suited to the study of the subject as a discipline in its own right. It would be important that these two units were not hierarchical (students should be able to study either one before the other or both at the same time) and afforded the same status. This, of course, would provide a challenge for those charged with designing an appropriate framework, but it is to be hoped that no problems would be insurmountable.

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<sup>7</sup> Other mathematics qualifications exist (eg Free-Standing Mathematics Qualifications and mathematics units associated with vocational qualifications) but the described route is the pattern for the majority of students.

<sup>8</sup> For example, of the 67,000 students sitting AS Mathematics in 2002 only 56,000 went on to complete the full A-level in 2003 (data from Joint Council for General Qualifications).

Mathematics is often seen as a difficult subject to study when compared with others, and as it becomes more abstract is perceived to have little relevance to students. Careful design of units of study and supporting resources may help overcome some of these problems (see below) but thought will also have to be given to the size of units of study. In their design, careful consideration will need to be given to the time and space that students will need to have allocated for learning new skills and techniques, and particularly for learning how to apply these. In units of study where the focus is application this will become an increasingly important factor. Another issue that needs to be considered carefully is that of progression from one level to the other; the current problems facing those who move from study of GCSE to AS need to be eradicated. At Level 3 there is probably a need for an additional ‘pure’ or ‘theoretical’ mathematics unit to cater for the most mathematically able students wishing to progress to mathematics, and perhaps science, degrees at the most selective universities. It therefore appears that it will be useful if a restricted number of qualifications is available at each level (for example, at Entry Level a single qualification, at each of Levels 1, 2 and 3, two qualifications and perhaps an additional qualification at Level 3). To allow flexibility it may be possible that at each level these qualifications may be built from a range of units of study more akin to the modular structure in the current A-level than the one-size-fits-all GCSE. Overall this structure would allow learners, as they reach the end-point of their study of mathematics, to shift their focus towards application of the subject.

## **STYLES OF LEARNING, PEDAGOGY AND ASSESSMENT**

The implementation in classrooms of current 14–19 curriculum specifications is driven by assessment promoting teaching and learning that almost always focuses on the relatively narrow practising of mathematical techniques for the forthcoming examination. This leads to an impoverished mathematical experience for the majority of students. At Key Stages 2 and 3, mathematics teaching is currently greatly influenced by the respective National Strategies which have promoted a narrow view of not only what mathematics is, but also the style and structure of mathematics lessons. The classroom practice of secondary school mathematics teachers has recently been adversely influenced by Strategy ‘messages’ as well as by the national testing at the end of each key stage (including GCSE).

The development of new 14–19 courses allows us the opportunity of ensuring that students experience some of the richness of mathematics, encompassing all the elements identified in above as being important.

This redesign affords the opportunity to reformulate mathematics lessons so that they become an active learning experience for students, perhaps with the subject being reconceived as being more of a ‘laboratory’ discipline where the use of ICT (particularly graphic calculators and computers) becomes commonplace and students are involved in sustained activity. Feedback from students suggests that this use of ICT will prove motivating and may also more realistically reflect the world of study and work beyond school and college.

The pattern of assessment is absolutely crucial in determining what happens in implementing courses in classrooms. The current assessment burden is too great for students and is also detrimental to their experience of mathematics. The development of more appropriate assessment should take into account not only learning outcomes but also learning experiences. The type of activity identified as appropriate mathematics in the 14 – 19 phase leads to the conclusion that all mathematics qualifications should include a substantial element of teacher assessment. However this should not be conceived in the narrow sense of ‘coursework’ which is seen as ‘bolt-on’ in current qualifications; rather it should become assessment of the actual course. This would represent a considerable shift from current practice and has implications for the professional development of teachers.

Mathematics qualifications are not only seen as being indicators of ability in the subject, but are also traditionally used by selectors in education and the workplace as an indicator of general ability. Therefore, to ensure public confidence, it is likely that the proposed teacher assessment will need to be complemented by an element of external assessment. However, the overall assessment of mathematics qualifications should not contain two elements (teacher and external assessment) in tension and conflict, and it is important that the assessment associated with mathematics is considered as part of the overall assessment burden for students when arriving at models of assessment across the 14–19 framework as a whole.

A substantial shift in teaching, learning and assessment has massive implications for both the initial training of new entrants to the teaching profession and the continuing professional development (CPD) of existing teachers, as well as for the development of appropriate resources. There are emerging plans to establish a framework that will promote CPD both nationally and at a local level. The development of teaching and learning resources that clearly promote the vision of the new courses needs to be at the core of this CPD activity. The resources produced need to integrate the use of new technology fully in students’ learning as well as allowing teachers to present high quality and motivating lessons incorporating the use of, for example, video images linked with software (including spreadsheets, graph-plotting and dynamic geometry software) that show mathematics as a modern and dynamic subject relevant to the needs of young learners.

## **CONCLUSIONS**

The development of a new framework of 14–19 qualifications allows the unique opportunity of revitalising and repositioning mathematics as a subject of great interest and value to students. It is essential that this development be undertaken in a way that motivates students and captures their interest. Because of the traditional importance and emphasis given to mathematics in the compulsory curriculum, it would be easy to repackage what exists and is well-known and understood, without reassessing the current position of mathematics in the world of workers, students and citizens.

It is likely that strong arguments will be put forward for the study of mathematics to be compulsory for all engaged in 14–19 study. Evidence from recent experiments with Application of Number as a Key Skill suggests that this route can easily lead to problems. A more attractive option might be to have one coherent framework of mathematics qualifications, so that individual learners can select the pathway through this which is most appropriate to their needs.

This paper raises some of the issues that the development of a 14–19 framework of mathematics qualifications must address and suggests that further consideration needs to be given to the following.

- How to ensure that students experience a rich mathematical diet.
- How an appropriate balance between study of applications of and ‘pure’ mathematics can be achieved.
- The degree of flexibility that can be achieved by allowing selection of different routes through units of study within a framework that is also understandable to users (including employers and higher education admissions tutors).
- How to ensure that units of study can be combined to provide an end-point of study for some and preparation for further study for others.
- How to cater for the most mathematically able students at each level.
- The most appropriate form of assessment that shifts the balance to assessment of learning by the teacher and reduces the overall assessment burden on the student.
- How to update the curriculum so that it more accurately reflects how mathematics is used in our rapidly changing and technological society.

## THE NUFFIELD FOUNDATION

### AN ENGLISH BACCALAUREATE – WHAT DOES IT MEAN FOR LANGUAGES AND MATHEMATICS?

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