



# FutureEd 2018 Summit

## Maximising the potential of the adolescent brain

Wednesday 7 February 2018, London, UK

Summit report and key messages



## About ...

### **Learnus**

Learnus is a community dedicated to bringing educators and those who specialize in the study of the brain, the mind and behaviour together in order to use the insights gained from high quality research to improve and enrich learning for all. It is our belief that learning and, by extension, teaching are at the centre of high quality education: understanding how we learn is at least as important as defining what we should learn.

### **Association of School and College Leaders**

The Association of School and College Leaders (ASCL) speaks on behalf of members and acts on behalf of children and young people. ASCL is Britain's leading professional body representing over 18,000 school, college and system leaders, across the UK, including primary schools, multi-academy trusts and those working across phases.

### **Centre for Educational Neuroscience (CEN)**

The Centre for Educational Neuroscience combines the strengths of three institutions – University College London, Birkbeck, and the UCL Institute of Education – to provide the foundation for a national centre for research and development in the field of Educational Neuroscience. By working together the objective is to develop this emerging discipline, using the combined strengths in neuroscience, child development, psychology, education research and their applications to education practise, in order to establish a dialogue between researchers and educationalists to bring about further translations of research into practise improving education and well-being across the lifespan.

### **UCL Institute of Education (IOE)**

UCL Institute of Education (IOE) is a world-leading centre for research and teaching in education and social science. Founded in 1902, it became a single faculty school of UCL and currently has more than 8,000 students and 800 staff. Ranked number one for education worldwide in the 2014, 2015, 2016, 2017 and 2018 QS World University Rankings, the IOE was awarded the 2015 Queen's Anniversary Prize. In 2014, the Institute secured 'outstanding' grades from Ofsted on every criterion for its initial teacher training, across primary, secondary and further education programmes. In the most recent Research Excellence Framework assessment of university research, the IOE was top for 'research power' in education.

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**The full report along with speaker presentations and video material of FutureEd 2018 is available on the Learnus website:**  
[www.learnus.co.uk](http://www.learnus.co.uk)

# FutureEd 2018: Executive summary

*“Adolescence is a period of life when the brain is changing in important ways: we should understand it, nurture it – and celebrate it.”*

Sarah-Jayne Blakemore 2018, *Inventing Ourselves*<sup>1</sup> page 202

## FutureEd 2018: What participants said...

*Excellent choice of speakers, all appropriate for those educating teenagers and great to have such diversity in regard to research / experience.*

*Aspects of motivation validated my understanding of intrinsic rewards for motivation – lots to think about.*

*Some thought provoking ideas e.g. getting students to lead as more likely to get other students to listen.*

*Good structuring of the day ....Variety of participants and the roundtable discussions.*

*Brilliant and novel. Loads of links to biology and psychology which is useful for my teaching.*

*Treat to be given the opportunity to discuss with a variety of people about the questions presented.*

*More suggestions from a classroom perspective. Interesting insight on what can be done at whole school / assembly point of view.*

## Introduction

Adolescence, usually taken to be between the ages of 11 and early 20s, is a major period of change for everyone: physically, physiologically, psychologically and socially. These so called ‘teenager years’ are often associated with excessive behaviours and account for over half the time young people spend in compulsory education. Therefore on 7 February 2018 Learnus and its partners<sup>2</sup> brought together teachers, school leaders, psychologists, neuroscientists, practitioners and researchers, to share ideas and explore questions such as:

- What makes teenagers tick?
- Why does their behaviour seem to be erratic at times?
- What does the research tell us about the adolescent brain?
- How can we maximise the potential of young people?

<sup>1</sup> Blakemore, S-J. 2018, *Inventing ourselves: the secret life of the teenage brain*. London, Doubleday

<sup>2</sup> ASCL, Association of School and College Leaders.  
Centre for Educational Neuroscience (CEN)  
UCL Institute of Education

## Summit themes

Using a combination of presentations and round-table discussions the day was structured to provide substantial opportunities for contributions from all participants. Three themes were developed during the day:

### 1. Engaging with the teenage brain

In engaging with the teenage brain it is essential to recognise adolescence as a crucial stage of development and that context matters. Although some behaviours are common across species, cultures and history, behaviours can change significantly especially in different social contexts. The size of the brain remains more or less the same during adolescence but research shows there are structural changes which influence the way in which the brain operates. These combined with hormonal changes impact on behaviour and there is evidence to suggest that adolescence may be a 'sensitive' period for particular types of learning. In the roundtable discussions, the potential of using peer influence to support and encourage learning become a particular focus alongside consideration of how to develop the 'whole school curriculum' in order to explore ways of reducing stress among students.

### 2. Motivating young people

Generating interest and motivation are significant factors in engaging with students and their learning. The use of extrinsic rewards (e.g. badges, stickers, money) can be beneficial but there is evidence that continued use of such rewards can undermine sustained motivation and learning, which generally depends on intrinsic motivation. Interestingly, evidence suggests that extrinsic rewards and intrinsic motivation use the same neural mechanisms suggesting that the two are linked. Although, it is not yet possible to demonstrate how the two are related (if at all), it is possible to argue that adopting approaches to pedagogy which help develop feelings of competence (self-efficacy), relatedness (belonging) and autonomy (self-determination and control) could have positive benefits in encouraging intrinsic motivation

### 3. Tackling evidence-based change in school

Adopting evidence-based approaches in schools is not a straight forward process, especially when the evidence from research is still evolving. Success could be recognised in a variety of ways, but to have the most chance of being effective the process needs to be planned as part of a whole school development plan with an expectation that it becomes part of the school culture. Activities should involve all groups in the school community, students, staff and parents in order to share understanding and the objectives. Initiatives may address a range of issues relating to different aspects of school life such as: inclusion (in and out groups), learning (metacognition) and relationships (trust). An important factor is the identification and definition of the problem that needs to be solved. Quick fixes don't exist so a cautious approach is needed, which takes a wider perspective of the learning experience of students and teachers and takes advantage of the breadth and depth of the high quality research that exists.

## Key messages

Inevitably the summit raised many questions but it also emphasised four important messages:

### 1. **The importance of lifelong learning**

One of the key findings of more recent neuroscientific research is the concept of brain plasticity and its ability to facilitate learning throughout life. In a world in which changes are taking place rapidly, maintaining the ability to learn becomes increasingly important. This underlines the importance of knowing how to learn as well as knowing what to learn.

### 2. **Adolescence is a crucial stage of development**

Adolescence is a time of significant change biologically, psychologically and socially during which young people make the transition from childhood to adulthood. Research is providing insights into the physical changes that occur in the brain and how these might correlate with known behaviours and to conditions such as mental health. The evidence also suggests that some types of learning (e.g. non-verbal reasoning) improve during adolescence. Together the findings challenge some current approaches to working with adolescents and need to be reviewed.

### 3. **There needs to be a re-balancing of the whole school curriculum, its emphasis and associated pedagogy**

Working with young people requires a variety of approaches that take into account not only the overall patterns of adolescent behaviour, but also individual needs and interests. Educationally this requires consideration of how best to re-balance the whole school curriculum of which, it must be emphasised, the National Curriculum is only part. Individually and collectively teachers might reflect on and modify their pedagogical approaches towards encouraging improved levels of intrinsic motivation.

### 4. **More effective models for managing the interfaces between research, policy and practice need to be developed**

Without doubt there are many teachers, researchers and others who are interested in the potential impact that the multi-disciplinary approaches advocated through educational neuroscience could have on maximising the potential of our young people. All recognise, however, there is much to do, both individually and collectively. In particular there is an urgent need to identify and develop improved models for managing the interfaces between the research evidence, policy and practice.

The development of human beings is a complex process both individually and in the way in which we interact with others, be they family members, friends, teachers, employers or members of our communities.. All stages of the development have their challenges but the period of adolescence can be particularly difficult, not only to understand, but also to live through. This summit was but one small contribution to developing a wider understanding of the factors that contribute to maximising the potential of the adolescent brain and, importantly, stimulating further thought and actions to do so.

# FutureEd 2018

## Maximising the potential of the adolescent brain

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*“The adolescent brain isn’t a dysfunctional or defective adult brain. Adolescence is a formative period of life, when neural pathways are malleable, and passion and creativity run high. The changes that take place in the brain during this period offer us a lens through which we can begin to see ourselves anew.”*

Sarah-Jayne Blakemore, 2018 *Inventing Ourselves*<sup>3</sup>, page 7

### Introduction: the challenge

Adolescence, usually taken to be between the ages of 11 and early 20s, is a major period of change for everyone: physically, physiologically, psychologically and socially. These so called ‘teenager years’ are often associated with excessive behaviours, including risk-taking, the desire for quick rewards, mood swings and anti-social antics. Together with changes in sleep patterns and attitudes to work and learning this can be a difficult time for both the young people themselves and those who come into contact with them, such as their parents and teachers, as well as their peers. Thus, given that the teenage years account for over half the time young people spend in compulsory education, there is a need to understand this stage of development better if we are to maximise their potential.

By bringing together teachers, school leaders, researchers and practitioners, this summit aimed to share and explore ways in which research and evidence about how we learn can be used more effectively to improve educational practice and make an impact on young people’s learning. In particular FutureEd 2018 aimed to address such questions as:

- What makes teenagers tick?
- Why does their behaviour seem to be erratic at times?
- What does the research tell us about the adolescent brain?
- How can we maximise the potential of young people?
- To what extent do we need to change approaches to teaching and learning?
- What practical actions are required in the short, medium and long term?

It is worth emphasising that there is no ‘silver bullet’ or ‘right’ answer to many of these questions but the expansion of, and appetite for, knowledge about mind and brain is increasingly being brought to bear on education.

The underlying purpose of the FutureEd summits is to bring together researchers and practitioners from different disciplines in order to consider the evidence and explore the insights and implications it might have in ‘real-live contexts’. This in turn is a contribution to the wider challenge of how the outcomes of such discussions, here and elsewhere, can best inform and improve policies and practices of:

- governments, in setting their education agenda;
- schools, in creating stimulating learning environments;
- teachers, in engaging and enthusing their students in learning;
- learners, in maximising their potential.

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<sup>3</sup> Blakemore, S-J. 2018, *Inventing ourselves: the secret life of the teenage brain*. London, Doubleday

## Themes of the summit

The programme (see appendix ?) for FutureEd 2018 was structured in order to encourage debate between the different communities of people represented. Thus in addition to the four presentations, time was set aside for 3 structured roundtable discussions in which participants were asked to consider several questions (see Appendix 2). In addition to this report, slides from the presentations and some video materials are available on the Learnus website ([www.learnus.co.uk](http://www.learnus.co.uk)).

Three themes, as reported below, were developed during the day:

1. Engaging with the teenage brain.
2. Motivating young people.
3. Tackling evidence-based change in school.

### 1. Engaging with the teenage brain

A key message running throughout the day was the importance of 'context'. Our engagement with adolescents, whether as teachers, parents or researchers does not take place in isolation of other factors. As Geoff Barton highlighted in his opening remarks, we have to think of preparing children and young people for the whole of their lives, which maybe for nearly 100 years. In other words we should be giving due emphasis to 'lifelong learning' and considering adolescence in that context. How does it fit into the overall learning experience? To what extent does it build on what has gone before and how well does it prepares young people for the future? He then widened the context to argue for the value of creativity, which will become increasingly important as robots take over an ever-widening range of tasks. If this is the world young people are going to encounter, we need to understand how best to prepare them for it.

The importance of context was an underlying theme of the keynote presentation by Sarah-Jayne Blakemore. She challenged the widely held stereo-typical view of 'teenagers', emphasising that adolescence is a unique period of biological, psychological and social development. The evidence indicates that some adolescent behaviours are common, for example, across:

- species, e.g. adolescent mice drink more alcohol when they are with their peers;
- cultures, e.g. sensation-seeking behaviour peaks in the late teens across a range of different cultures;
- history, e.g. even Socrates (469BC to 399BC) complained about the behaviour of the youth in his day!

Social contexts can significantly alter adolescent behaviour, e.g. their level of risk-taking, is strongly influenced by the presence of peers. Many adolescents are hypersensitive to social exclusion and so will take actions that they hope will reduce this. Thus for many young people their teenager years can be very stressful. More fundamentally, many mental health problems appear to take root during adolescence, further underlining the need for greater understanding of 'teenage' behaviour, its possible neurological causes and ways in which it might be responded to.

Contrary to what was the 'accepted' view as recently as the late 20<sup>th</sup> Century, the brain does not stop changing in late childhood. Indeed the adolescent brain goes through significant



developmental changes. Although the size remains more or less the same during adolescence, evidence shows that there are structural changes which influence the way in which the brain operates. The pre-frontal cortex, which is a major site controlling cognitive processes (e.g. reasoning) and complex behaviour such as the assessment of risk, for example, is still maturing until mid-twenties. Two processes referred to as 'synaptic pruning' and 'myelination' affect not only the physical structure of the brain but also impact on how it operates. Synaptic pruning reduces the number of connections between nerve cells (grey matter) while myelination creates sheaths (white matter) around the axons of the nerve cells thus strengthening the connections and improving the efficiency with which impulses are transmitted around the brain. Measurements indicate that grey matter declines by 1.5% per year during adolescence while white matter increases by 1.0% per year.

Just as the brain continues to develop structurally there is evidence that adolescence might prove to be a 'sensitive' period for particular types of learning. For example, non-verbal reasoning improves over the period of adolescence. This is not to say it can't take place earlier, but suggests that in general non-verbal reasoning can continue to improve into adulthood. Findings such as this also raise the question of what other types of learning might improve during adolescence, but much more research is needed.

Highlighting the need for more research emphasises two crucial points about understanding the context of the evidence and knowledge that is available. The first is the obvious one that studies conducted under controlled conditions, whether in a laboratory or in the field, do not reflect the 'real-life' situations of learning environments, be they in school or elsewhere. The second point, that can't be emphasised too strongly, is the fact that research findings reflect evidence at the population level, not for individuals. While the overall trends can be identified and used as a starting point for interpretation and further action, there remain large levels of individual variation. Thus, as every teacher knows only too well, individual children develop at different rates and react to events in different ways.

Not surprisingly, the issue of 'context' and the issue of variation between individuals were carried through into the round-table discussions. Having acknowledged many of the practical issues of day-to-day life in school - time, resources, restrictions arising from the curriculum and accountability regimes – participants focussed in on the social impact on adolescent behaviour and its potential impact on learning. In particular there was a view that more proactive approaches were needed in order to use peer influence more effectively and encourage positive outcomes. Examples were shared of how schools are using students to support younger students by leading study skills sessions, running anti-bullying campaigns and working with those who need additional learning support mainly with literacy and numeracy.

Building on the theme of 'peer influence', the discussions further explored ways in which this might be used to have a more positive impact. Specifics were suggested, such as: using YouTube videos of teenagers to present particular views on topics; adopting policies which focus on positive behaviours rather than confronting negative ones; actively recognising and taking note of different perspectives (the teacher isn't necessarily always right); and identifying and working with influential students.

It was also felt that there was a need to revisit the concept of the whole school curriculum and the attitudes and values which underpin it. Without doubt the highly focussed attention

given to examination grades and narrow academic progress is considered to be a contributory factor in creating tensions and stress. In turn this was felt to have an impact on mental health and well-being. Although this is currently a high profile topic, there is still much to be learnt. At the very least there it needs to be acknowledged as a major risk during adolescence and needs to be addressed. Again participants felt there was a need to find ways of engaging more positively with their students, helping students manage their lives more positively and using peer support more effectively. Strategies based on 'growth-mind set' and 'metacognition' were proposed as possible starting points for improving outcomes for adolescents. Evidence suggests that there is no simple relationship with academic achievement emphasising the need for more research.

## 2. Motivating young people

Implicit in many of the first session of round-table discussions was the need to motivate adolescents and generate their interest in learning, not purely in academic terms but more widely in developing life skills. This led naturally into the focus of the second presentation by Kuo Morayama who explored, as he put it, the 'Promises and perils of rewards: the role of intrinsic motivation in education'. The role of rewards is a contested topic with much of the research having been done on the effects of extrinsic rewards. The evidence indicates that extrinsic rewards do indeed help in consolidating memory and learning. Brain studies suggest a neural pathway which involves the striatum and the hippocampus regions of the brain and the activation of the neurotransmitter dopamine. However, there is also evidence that continued use of the extrinsic rewards can undermine longer term interest in learning the subject as the motivation switches to simply collecting more of the rewards – stickers, badges, money etc.

In addition it appears that the use of extrinsic rewards to encourage consolidation of learning tends to result in retention of 'boring' information rather than 'interesting' topics. In other words the benefits of the rewards do not seem to have stimulated curiosity or interest in the material in question. This would suggest that intrinsic motivation has not been triggered to any great effect. It further implies that if students are interested in something the importance of extrinsic rewards is minimal which further suggests that developing intrinsic motivation through stimulating curiosity and building interest results in more sustainable learning.

At this point it is important to note that the neuroscience indicates that responses to both extrinsic and intrinsic stimuli use the same neural mechanisms. Thus implying a close relationship between the two and the possibility that by judicious use of extrinsic rewards it might be feasible to trigger intrinsic motivation and thereby gain the benefits of sustainable learning. Although there is little or no research into this at the present time, it is possible to argue that the social context and pedagogical approaches adopted will be important. In particular the development of feelings such as competence (self-efficacy), relatedness (belonging) and autonomy (self-determination and control of situations) would play a part in developing intrinsic motivation. (See presentation slides for more details). Such conditions resonate strongly with the evidence from Sarah-Jayne Blakemore's presentation underlining the importance of social context and the way in which adolescents relate to the world around them.

Although the proposition that using extrinsic rewards as a route to developing intrinsic motivation is seductive, it created concerns in the round-table discussions; as one group put it very simply, “Transition from extrinsic to intrinsic is hard!”. There was a great deal of discussion around issues such as: the type of rewards and their suitability for all students; the consistency with which rewards are used by different adults; whether they should be using rewards or punishments; and, importantly, clarity about exactly what the reward was for (e.g. behaviour, effort or academic performance). It was accepted that responses to rewards were very individual so that students react in different ways; even to the extent that a punishment might be seen as a reward if the individual simply wanted some attention – particularly from their peers.

Most schools have a rewards system at some level, but there was little discussion as to how effective such approaches appeared to be. It was noted that in several schools, the effectiveness of the system was perceived to decline beyond Year 8 (12-13 year olds) but for the majority of students this did not appear to be replaced by greater intrinsic motivation. It is just “un-cool” to be seen to be receiving rewards. Similarly, where there appeared to be some motivation from students, it wasn’t necessarily transferred from one subject to another or one activity to another. Much concern was expressed about the ‘slippery’ nature of ‘interest’ and ‘motivation’ and as such the lack of clarity as to how to address the problem.

More constructively, a thread of some discussions explored how intrinsic motivation might be developed, arguing this should be encouraged from an early age through pedagogical approaches aimed to engage students’ curiosity and positive attitudes to learning. Such approaches would endeavour to encompass the feelings of competence, relatedness and autonomy and build a sense of personal connection and control of the material being studied. Although this view was widely accepted, it was noted that some current practices (in part imposed due to perceived accountability requirements) actually conflict with such approaches. For example the expectation that teachers should make a lesson’s learning objectives explicit at the outset (often getting students to write them down at the start of a lesson) virtually kills opportunities to pique students’ interest or stimulate their curiosity. It also minimises any sense of ‘ownership’ students might have of the learning that might follow. Learning objectives used in this way furthermore squeeze the creativity of teachers, making their job even more difficult.

### **3. Tackling evidence-based change in school**

Adopting evidence-based approaches in schools is not a straight forward process, especially when the evidence, such as that being generated in the field of educational neuroscience, is still developing.

The majority of schools now use pupil performance data much more effectively now than in the past, helping them (both schools and pupils) identify where there are short-comings which need to be addressed to meet the required (accountability) standards. However, such approaches can become too focussed and, it can be argued, too often add to the problems experienced by adolescents and not necessarily contribute to maximising their learning.

Although such data analysis is important, there is a strong case for other forms of research-based evidence being used to underpin improvements in practice. This doesn’t mean simply

picking up the latest journal article and trying to implement its findings; education is littered with such false starts that have resulted in, at best, poor practice. A more cautious approach is needed, which takes a wider perspective and endeavours to take advantage of the breadth and depth of the high quality research that exists and is relevant to the questions that that are being asked.

In her presentation Martina Lecky reflected on how in her school research on mind, brain and education is being used to influence their work in trying to maximise the potential of all their students. In particular she highlighted the fact that they were trying to adopt a whole school approach which included everyone, not just a group of interested teachers. Engaging students in the enterprise is an important part of the approach by using a combination of assembly time and student conferences alongside smaller group activities. A wide range of issues are addressed exploring in addition to enhancing learning (e.g. improving memory) social matters (e.g. the impact of 'in and out groups'), behaviour (awareness of behaviour especially the concept of shared responsibility), and life-style (e.g. the importance of sleep and its impact on learning), all of which had been raised at different points during the earlier sessions of the summit.

In the light of the presentation on 'rewards' it was interesting to note that the school ran a 'randomised-reward' system which focussed on behaviour and attendance and involved the accumulation of points over time and the chance of winning a bigger prize (e.g. shopping vouchers, excursions and iPads). Building the element of 'chance' into the reward scheme reflected evidence that adolescents often respond to uncertainty in a positive way in 'search' of the 'bigger' prize. Evaluation of the impact of such schemes would be very valuable in understanding not only the effects of 'rewards' but also on implications for implementation in 'real-life' situations.

Effective teaching and learning are at the heart of a school and Martina Lecky's presentation illustrated this using the example of cognitive acceleration in science. Based on research initially conducted in the 1990s, this approach involves the use of cognitive conflict (challenge) and metacognition with students to address problems, particularly in science. It is interesting to note that this approach highlights two particular issues that need to be taken into account in making judgements as to its effectiveness. The first is the difficulty of when any effect (positive or negative) can be identified. In this case the original research found only small effects immediately, but significant impact was noted 1 or 2 years later. The second difficulty it highlights is the faithfulness of implementation. The controlled and supported nature of the research project cannot be maintained and therefore variations in implementation develop, which may hinder the impact. Both issues need to be part of a wider discussion on the benefits and limitations of evidence-based / research approaches to teaching and learning and their implementation in the classroom.

In part, introduced to encourage wider discussion and understanding of 'what the research tells us' and 'what we can do with it', Martina Lecky set up a reading group for staff to share their ideas and reactions to specific papers and books which report findings from educational neuroscience. Such discussions are not restricted to teaching and learning, other characteristics of organisations are important if they are to function effectively. "Trust" being one such feature highlighted in the developing field of occupational psychology that could have implications for schools as they endeavour to build stronger relationships between students and staff.

As demonstrated by the contributions to the roundtable discussions, other schools are exploring how they might build on the insights gained from neuroscience and the related cognitive disciplines. While there are teachers who want to be 'told what to do' as a result of the research, for others the sense was that a better understanding of the processes going on in the brain enabled them to reflect on how they can work with the processes of adolescent development rather than against them. Involving the students and their parents was considered an important element of this overall approach, so that they too had a better understanding of some of the behaviours that are displayed.

Although concerns were expressed about lack of time, resources and, in some situations, support from senior management teams, there was enthusiasm for finding out more in e.g. in relation to group behaviour and how it might be better 'managed'; exploring the effect of 'gamification' of rewards; and the relationship of adolescents and their use of mobile phones.

The wish to find out more was backed-up by a desire to do more original research in schools, as well as to investigate ways of using the findings of existing research on a day-to-day basis. A note of caution was expressed with regard to the quality and reliability of research conducted by teachers in schools as a result of not only the constraints listed above, but also a lack of training and experience in conducting research, whether it is 'action research', or 'a controlled trial'. Examples of efforts to address such concerns e.g. research learning communities', setting up research schools, and researchers in residence, were noted. However, it was emphasised that any developments need to be part of the school development plan and become central to the whole school culture to be effective in changing teacher behaviour.

## **Reflections and key messages.**

FutureEd 2018 concluded with a presentation from Sophie Scott on communication and the role of laughter. Using this relatively new area of research she reminded participants of the basic emotions everyone experiences, such as anger, surprise, happiness, fear and sadness and argued that laughter belongs in the same category. Each of these plays a role in the way we feel and how we communicate with each other, yet can be overlooked. Laughter is particularly interesting in that it can be regarded as an 'invitation to play' and 'as a way of closing distance between us, for feeling better, together'. Furthermore we tend to laugh more with other people, especially those we know, and it can become contagious. In short laughter can help bring people together and ease tensions.

Although it wasn't planned to link directly to 'education' or specifically the 'adolescent brain', this final presentation provided food for thought. It reminded us that the challenges involved are complex, multi-faceted and multi-layered and that relationships involve basic emotional instincts as well as outward expressions of attitudes and demeanour. This complexity is familiar to anyone working with other people and adolescents in particular. In other words in attempting to maximise the potential of the adolescent brain we need crucially to take note of the basic emotional context of their development as well as the intellectual, social and biological changes.

Inevitably the summit raised many questions, but it also emphasised four important messages:

**a. The importance of lifelong learning**

One of the key findings of more recent neuroscientific research is the concept of brain plasticity and its ability to facilitate learning through life. The type of learning that takes place may differ and the ease with which it takes place may vary but the crucial fact is that it can take place across a range of areas at any time in a person's life. In a world in which changes are taking place relatively rapidly, maintaining the ability to learn becomes increasingly important in order to function, as well as to make the most of opportunities that are available. This underlines the importance of knowing how to learn as well as knowing what to learn.

**b. Adolescence is a crucial stage of development**

Adolescence is not 'just a phase they are going through and they'll come out of it'. It is a time of significant change biologically, psychologically and socially during which young people make the transition from childhood to adulthood and from being heavily dependent on others to being more independent and taking control of their lives, within the context of their peers. Research is providing insights into the physical changes that occur in the brain and how these might correlate with known behaviours and to conditions such as mental health. The evidence also suggests that some types of learning (e.g. non-verbal reasoning) improve during adolescence. Together the findings challenge some current approaches to working with adolescents, which perhaps need to be reviewed.

**c. There needs to be a re-balancing of the whole school curriculum, its emphasis and associated pedagogy**

Working with young people requires a variety of approaches which take into account not only the overall patterns of adolescent behaviour, but also individual needs and interests. This is essential in order to accommodate the wide range of individual variation and the specific environmental and social factors that influence the ways in which individual react to different actions and events. Educationally this would require consideration of how best to re-balance the whole school curriculum of which, it must be emphasised, the National Curriculum is only part. More immediately it suggests that individually and collectively teachers might reflect on and modify their pedagogical approaches towards encouraging improved levels of intrinsic motivation.

**d. More effective models for managing the interfaces between research, policy and practice need to be developed**

Without doubt there are many teachers, researchers and others who are interested in the potential impact that the multi-disciplinary approaches advocated through educational neuroscience could have on maximising the potential of our young people. All recognise, however, there is much to do both individually and collectively. In particular there is an urgent need to identify and develop improved models for managing the interfaces between the research evidence, policy and practice.

The development of human beings is a complex process at the individual level as well as the way in which we interact with others, be they family members, friends, teachers, employers

or members of our wider community. All stages of the development have their challenges but the period of adolescence can be particularly difficult, not only to understand, but also to live through. This summit was but one small contribution to developing a wider understanding of the factors that contribute to maximising the potential of the adolescent brain and, importantly, stimulating further thought and actions to do so.

## APPENDICES

### Appendix 1: FutureEd 2018: programme

- 09.30 Registration and refreshments
- Chair: **Iroise Dumontheil**  
Reader in Cognitive Neuroscience, Department of Psychological Sciences, Birkbeck, University of London. Member of Centre for Educational Neuroscience (CEN) London
- 10.00 **Opening remarks**  
**Geoff Barton**, General Secretary, ASCL
- 10.15 ***Inventing ourselves – the secret life of the teenage brain***  
**Sarah-Jayne Blakemore**, Professor of Cognitive Neuroscience, Deputy Director, UCL Institute of Cognitive Neuroscience.
- 11.15 Round-table discussion 1: ***Engaging with the teenage brain***  
[Refreshments available]
- 12.00 Question and Answers with Sarah-Jayne Blakemore
- 12.30 **LUNCH**
- Chair: **Michael Thomas**, Director of the Centre for Educational Neuroscience, Professor of Cognitive Neuroscience at Birkbeck, University of London.
- 13.15 ***Promises and perils of rewards - the role of intrinsic motivation in education***  
**Kou Murayama**, Associate Professor, Department of Psychology, University of Reading.
- 13.50 Round-table discussion 2: ***Motivating young people***
- 14.25 Question and answers with Kou Murayama
- 14.40 ***A school perspective: reflections on changing culture***  
**Martina Lecky**, Headteacher, Ruislip High School
- 15.10 Round-table discussion 3: ***Tackling evidence-based change in school***
- 15.35 Question and answers with Martina Lecky
- 15.45 ***Communication and laughter***  
**Sophie Scott**, Professor of Cognitive Neuroscience, Deputy Director, UCL Institute of Cognitive Neuroscience
- 16.25 Closing remarks
- 16.30 Safe journey home



## Appendix 2: FutureEd 2018: Round-table discussion questions

The roundtable discussions are a key part of the summit. Each group includes participants from different sectors in order to ensure alternative perspectives are brought to the deliberations. The overall purpose is to ensure a productive discussion and the tasks/questions are simply nudges to help focus thinking – they certainly are not rigid. We are trying to draw out the different perspectives and how it might be possible to promote a better understanding of the issues and to identify appropriate actions to address them.

Following the presentation each table group is invited to:

1. share their reactions, agreements and disagreements to any points made during the presentation.
2. explore the questions (see box below)
3. for the plenary Q and A, session identify:
  - a. ONE question the group wishes to raise in the Q & A session with the speaker, and
  - b. individually identify something that you will reflect on for your practice in future.

### Round-table discussion 1: *Engaging with the teenage brain*

1. What are the implications for education of our increasing understanding of the adolescent brain?
2. How can society and schools provide an environment in which adolescents can thrive and maximize their potential?
3. How can mental health problems be prevented (or at least minimized) in adolescence?

### Round-table discussion 2: *Motivating young people*

1. What are the advantages of using rewards (stars, points, etc.) to improve pupils' learning and behaviour?
2. What are the potential downsides of giving rewards to students? / What are the indications that rewards might be being counterproductive?
3. How can we support pupils' intrinsic motivation in educational settings more effectively? / Can you give examples of good practice you are aware of?

### Round-table discussion 3: *Tackling evidence-based change in school*

1. Can you share good examples of how schools have promoted a discourse on neuroscience amongst staff and/or students?
2. Do you feel there is an appetite in schools for staff to conduct action research on neuroscience?
3. Are there specific topics you and your colleagues would be particularly interested in conducting research on? / How might you look to address these?
4. Teachers clearly require practical applications to empirical research; how might such applications and their implementation be addressed by academics and teachers more effectively?

## Appendix 3: FutureEd 2018: Presentation Abstracts

### **Inventing ourselves – the secret life of the teenage brain**

***Sarah-Jayne Blakemore***

Adolescence is a period of life often characterised by behaviours that, prima facie, are irrational, such as seemingly excessive risk-taking and impulsivity. However, these behaviours can be interpreted as adaptive and rational if one considers that a key developmental goal of this period of life is to mature into an independent adult in the context of a social world that is unstable and changing. Social cognitive processes involved in navigating an increasingly complex social world continue to develop throughout human adolescence. In addition, the brain undergoes reorganisation during the second decade of life, which might reflect a sensitive period for adapting to the social environment.

### **Promises and perils of rewards - the role of intrinsic motivation in education.**

***Kou Murayama***

To motivate pupils, is it a good idea to give rewards (e.g., gold stars, points, praises) to students in education? A number of studies in neuroscience suggest that the answer is yes. Rewards shape our decision making process, and recent neuroscience research has also shown that rewards can facilitate long-term learning consolidation. However, the educational reality is not that simple. Here, I argue that educators and teachers should also pay attention to pupil's "intrinsic motivation", which is the motivation to engage in activities for the pleasure and the value derived from the activities themselves. Intrinsic motivation supports pupils' autonomous learning and self-regulation, being the basis for independent learners. Critically, our neuroimaging research indicates that rewards could undermine people's intrinsic motivation, suggesting the potential danger of the over-reliance of rewards in the context of education. At the same time, rewards and intrinsic motivation seem to be supported by the common neural basis, suggesting the possibility that we can transform reward-based motivation (often called "extrinsic motivation") to intrinsic motivation by providing certain supports to pupils.

### **A school perspective: reflections on changing culture**

***Martina Lecky***

The presentation will consider from a headteacher's perspective how to embed a discourse on the emerging field of educational neuroscience at a school-based level as well as how to promote the importance of empirical evidence to inform best practice. It will include how to develop students' awareness of the changes occurring during the adolescence stage of brain maturation.

### **Communication and laughter**

***Sophie Scott***

Human adults normally consider laughter to be important in expressing amusement, and to be associated with jokes and comedy, but laughter is a predominantly social expression, associated with making and maintaining social bonds. I will explore the evolutionary history of laughter, its neural basis and the ways that it is used in adult social and emotional processing.

## Appendix 4: FutureEd 2018: Speaker biographies

**Geoff Barton** is ASCL General Secretary. He studied English and Linguistics at the University of Lancaster, then trained to teach at Leicester University. From 2002 to 2017 he was headteacher of King Edward VI School, Bury St Edmunds, a comprehensive school of 1650 students. He is a Founding Fellow of the English Association and writes for a range of newspapers and journals. He has worked with various organisations, including the Department for Education, on leadership and literacy. Geoff was a longstanding member of ASCL Council, former chair of its Pedagogy Committee, is Patron of the English and Media Centre, and a 'Leading Thinker' for the National Education Trust. He became General Secretary of ASCL in April 2017. @RealGeoffBarton

**Sarah-Jayne Blakemore** is Professor in Cognitive Neuroscience at UCL. She is Leader of the Developmental Cognitive Neuroscience Group and Deputy Director of the UCL Institute of Cognitive Neuroscience. Her group's research focuses on brain development in human adolescence. Professor Blakemore studied Experimental Psychology at Oxford University and then did her PhD at UCL and a postdoc in Lyon, France. Between 2003 and 2016 she held a series of Royal Society Research Fellowships at UCL. Professor Blakemore has won several awards for her research, including the British Psychological Society Spearman Medal 2011, the Royal Society Rosalind Franklin Award 2013 and the Klaus J Jacobs Prize 2015. Professor Blakemore is actively involved in public engagement with science activities and has an interest in the links between neuroscience and education. She sat on the Royal Society BrainWaves working group for neuroscience, education and lifelong learning and the Royal Society Vision Committee for Science and Mathematics Education. She worked with the Company Three on their play, *Brainstorm*, written and performed by teenagers, which was shown at the National Theatre in London.

**Iroise Dumontheil** is a Reader in Cognitive Neuroscience in the Department of Psychological Sciences, Birkbeck, University of London. She obtained a PhD from the University of Paris VI and then was a postdoc in labs in London, Cambridge and Stockholm. She is a member of Centre for Educational Neuroscience and the Centre for Brain and Cognitive Development. In 2015 she received the Spearman Medal, an early-career British Psychological Society award, and in 2017 the Elizabeth Warrington Prize from the British Neuropsychological Society. Her research focuses on the typical development of social cognition and cognitive control during adolescence and their functioning in adulthood. Her studies combine a variety of methods to study brain and cognitive development including functional and structural neuroimaging, behavioural assessments, and genetics. She is interested in the impact of cognitive training, from computerised games to mindfulness meditation practice, on adolescent cognition, as well as the potential implications of neuroscience research for education.

**Kou Murayama** is Associate Professor in the School of Psychology and Clinical Language Sciences in the University of Reading and Distinguished Guest Professor at the Hector Research Institute of Psychology and Education in the University of Tübingen. His research focuses on human motivation and metacognition from multidisciplinary perspectives, integrating educational psychology with cognitive psychology, social psychology, and neuroscience. He receives several early career awards in multiple disciplines, including the Richard E. Snow Awards for Early Contributions from American Psychological Association,

F. J. McGuigan Early Career Investigator Prize from American Psychological Foundation, and Transforming Education through Neuroscience Award from Learning & the Brain. He is also the recent winner of the prestigious Leverhulme Research Leadership Award. He contributes to a number of book chapters on motivation and neuroscience, including *Oxford Handbook of Human Motivation* and *Cambridge Handbook on Motivation and Learning*. This summer, his research team will have an exhibition on the topic of intrinsic motivation and curiosity in Science Museum in London as part of “Live Science Project”, with the aim to share his research with museum visitors. HP: [www.koumurayama.com](http://www.koumurayama.com)

**Martina Lecky** joined Ruislip High School in September 2011 as headteacher. Prior to taking up this position, she was deputy headteacher of The Grey Coat Hospital, an all girls’ school in central London. She worked at the school for eighteen years from 1993, which included a Fulbright Exchange year to America between 2002 and 2003. Her Doctorate in Education, awarded by King’s College, London, in December, 2012, was on teachers’ professional development in the context of the Cognitive Acceleration through Science Education (CASE) project. She is currently a member of the Let’s Think Council and also one of the Let’s Think Forum’s trustees. Since joining Ruislip High School, Martina has introduced Let’s Think English, Mathematics and Science to the Key Stage 3 programmes of study. In addition, a Let’s Think Science network was established with neighbouring schools in the borough of Hillingdon. More recently, Martina has set up a neuroscience reading groups involving leaders from local schools. This led to a conference on *the teenage brain* being held at Ruislip High in November 2017 which hosted over 300 delegates. Martina is keen to promote the discourse of educational neuroscience in schools, in particular evidence-based examples to inform practice.

**Michael Thomas** has been Director of the University of London Centre for Educational Neuroscience since 2010. This is a cross-institutional research centre which aims to advance translational research between neuroscience and education, and develop practical applications within education. In 2003, Michael established the Developmental Neurocognition Laboratory within Birkbeck’s world-leading Centre for Brain and Cognitive Development. The focus of his laboratory is to use multi-disciplinary methods to understand the brain and cognitive bases of cognitive variability, including developmental disorders and individual differences. Within educational neuroscience, his work includes understanding the role of inhibitory control in children’s science and math learning, investigating the influence of cell phone use on adolescent brain development, linking findings on sensitive periods in brain development to their educational implications, and building links between genetics, environment and education in children’s developmental outcomes. His work on developmental disorders includes current projects on childhood development in Williams syndrome, Down syndrome, Fragile X, and autistic spectrum disorder. In 2006, his research lab was the co-recipient of the Queen’s Anniversary Prize for Higher Education, for the project “Neuropsychological work with the very young: understanding brain function and cognitive development”. Michael is a Chartered Psychologist, Fellow of the British Psychological Society, and Fellow of the US Association for Psychological Science.

**Sophie Scott** is Professor of Cognitive Neuroscience, Head of the Speech Communications Group and Deputy Director at UCL’s Institute of Cognitive Neuroscience. She received her PhD in Cognitive Science at UCL in 1994 before going on to work in Cambridge at the MRC Cognition and Brain Sciences Unit and returned to UCL as a Research Fellow in 1998. She is a member of the British Psychological Society, the Society for Neuroscience, the cognitive

Neuroscience Society and the Experimental Psychology Society. She was elected a Fellow of the Academy of Medical Sciences in 2012 and a Fellow of the British Academy in 2016. Sophie's research investigates the neural basis of vocal communication – how our brains process the information in speech and voices and how our brains control the production of our voice. Within this, her research covers the roles of streams of processing in auditory cortex, hemispheric asymmetries and the interaction of speech processing with attentional and working memory factors. Sophie is also interested in the expression of emotion in the voice. In particular, her research in recent years has focused on the neuroscience of laughter. Sophie is known for her public engagement work and was featured in a September 2013 edition of the BBC Radio Four programme *The Life Scientific*. In March 2014, she was invited to give a Friday Evening Discourse at the Royal Institution on the science of laughter and in December 2017 Sophie delivered the Royal Institution's annual Christmas Lectures.