SEEN Oxford – Secondary Education around Early Neurodevelopment.

Pre-pilot Teacher Pack

Contents:

1. Background:

Thank you for showing an interest in taking part in the SEEN Oxford pre-pilot. SEEN is a 1-year research project run by the University of Oxford's Psychiatry Department (Child and Adolescent Psychiatry Group). The project is funded by Kindred[2] . It aims to:

- Embed knowledge and understanding about why early child development is important through the delivery of curriculum materials around neuroscience and early child development in secondary schools.
- Determine the feasibility and acceptability of teaching the materials in secondary schools.
- Make recommendations relating to the teaching of neuroscience around child development for policy makers.

2. Project rationale:

The first 1001 days (pregnancy and the first two years of a child's life) is a critically important period for development that significantly influences a child's long-term health, well-being, learning and earnings potential. It provides the foundation for children's nascent emotional wellbeing, resilience and adaptability.

Sensitive and responsive parent-infant relationships have been shown to be pivotal for the development of infants' social, emotional, behavioural and cognitive outcomes. It is therefore essential to equip future parents with the knowledge and understanding of how their behaviour/parenting contributes to their child's future outcomes.

In addition to the human level/cost, there is also a compelling economic argument for investing in early childhood; James Heckman's Nobel prize winning work demonstrates that the earlier the intervention, the greater the benefit on children's lives. Thus, if learners begin to be equipped for parenting *pre-conception* this has the potential for enormous benefit. Prioritising the opportunities for maximising children's development during the first 1001 days is therefore beneficial to governments, businesses, communities, parents, caregivers and children alike.

3. Core content:

In collaboration with an expert advisory group from the field of child psychiatry, child development and the early years, a list of core curricular content has been devised. This core content forms the basis of the lessons and the knowledge and understanding about why early child development is important. Italics are used to indicate extension materials for more able students or where more time is available. The team are also working with an expert advisory group from the field of education (teachers, school leaders, curriculum development specialists and education advisors) to devise teaching and learning resources around this content.

1. The brain is made up of billions of interconnected neurons.
2. Genetics and environment both have a role to play in brain development; *epigenetics means that even the genes aren't fixed*.
3. New experiences can lead to new neural circuits being formed.
4. Circuits can be strengthened and weakened by individual experiences.
5. The ability of the brain to change throughout a person's life is called neuroplasticity.

6. The brain is particularly plastic, and therefore sensitive to experiences, in the early years (0-5) and adolescence (11-25).
7. Essential neural pathways are developed in the uterus and throughout the early years.
8. Babies are able to perceive and discriminate environmental stimuli in the uterus and throughout the early years.
9. Caregivers can improve long-term health outcomes by supporting brain development in the early years through:
    a. Responsive, reciprocal caregiver-child interactions (Serve and Return),
    b. baby talk,
    c. playful learning,
    d. developing executive function skills.
10. The early years period is a foundation for long term physical and mental health.
11. What happens in the early years is not deterministic.
12. Resilience is dependent on supportive relationships and developing skills.

4. Lesson outlines:

The content has been developed into 3 lessons, with an optional fourth lesson or homework task to reinforce learning.

Lesson 1 – Brain development in the early years (recorded lesson: https://youtu.be/H8yoGSUKh70)

This lesson introduces the neuroscience that underpins child development. It covers the rapid proliferation of neurons following conception. Both genes and the environment affect brain growth in the early years. Connections are made between neurons as babies are exposed to new experiences. These are strengthened or weakened depending on a baby's experience. The ability of the brain structure to change based on experiences, or neuroplasticity, is introduced.

Lesson 2 – Caregivers and the early years (recorded lesson: https://youtu.be/QJL-xcKa0mk)

Caregivers are the baby's main influencer of day-to-day experiences. Their actions directly affect brain development. Students will learn how a caregiver can ensure healthy brain development during the sensitive early years (conception to 5 years). This includes caregiver-child interactions; baby talk; playful learning and the development of executive function skills. The students have the opportunity to apply new knowledge and skills through a choice of activities. There is an option to extend this to an additional lesson or homework activity.

Lesson 3 – Brain development throughout life (recorded lesson: https://youtu.be/9ubzXpKZhBs)

Students will learn that a combination of principles from social science and neuroscience guide our understanding of early years development. This understanding can be used to ensure more favourable long term outcomes. Research from longitudinal studies shows the importance of the early years for health outcomes. The early years are not deterministic though – another sensitive period for brain development exists during adolescence. In addition, supportive relationships and the development of executive function skills can improve resilience at any life stage. The early years remain the period when the opportunity for improving long term benefits is greatest.

5. Lesson resources:

Each lesson includes a full lesson plan, links to resources, worksheets, teacher guidance and additional sources of information. They have been designed so that they can be delivered in the classroom or via online lessons.

The lessons have been pre-recorded so they can be set for students to complete remotely without the input from teachers. There is a student instruction sheet to go along with each recorded lesson which individual students can complete and submit as evidence of having completed the lessons. These lessons use the foundation level tasks and do not include extension activities. These need to be set separately.

The following resources are available to support the lesson delivery (F = foundation level; H = higher difficulty content):

Lesson	Resource name	Notes
All	Teacher Pack	Full guide to the lessons, background, lesson plans, keyword glossary, curriculum links, additional reading etc.
1	Lesson 1 Pre-recorded lesson	Link to YouTube recording of the lesson.
	Lesson 1 Student instructions for pre-recorded lesson	Student sheet for use alongside the pre-recorded lesson that can be submitted to school as evidence of completion.
	Lesson 1 PowerPoint	Slides to guide the teacher or students through the lessons. Can be adapted for classes and differentiation.
	Lesson 1 Answers True False starter	UNICEF activity in case online version not working (answers).
	Lesson 1 Worksheet 1a (F)	A slightly easier version of the worksheet on the video.
	Lesson 1 Worksheet 1a (H)	A harder version of the worksheet on the video.
	Lesson 1 Worksheet 1b Epigenetics (H)	Extension activity for more able students.
2	Lesson 2 Pre-recorded lesson	Link to YouTube recording of the lesson.
	Lesson 2 Student instructions for pre-recorded lesson	Student sheet for use alongside the pre-recorded lesson that can be submitted to school as evidence of completion.
	Lesson 2 PowerPoint	Slides to guide the teacher or students through the lessons. Can be adapted for classes.
	Lesson 2 Worksheet 2a video notes	Links to videos for students, with space for notes.
	Lesson 2 Video teacher notes	Teacher guide to the videos, including guidance of main learning points.
	Lesson 2 Worksheet 2b playful learning	Two worksheets asking students to apply what they have learnt about playful learning.
	Lesson 2 Worksheet 2c playful learning	
	Lesson 2 Worksheet 2d public health leaflet	A more open-ended task asking students to use what they have learnt to design a public health leaflet (may require extra time or a homework).
	Lesson 2 Worksheet 2e top tips	A shorter task asking students to use what they have learnt to give advice to new parents or caregivers.
3	Lesson 3 Pre-recorded lesson	Link to YouTube recording of the lesson.
	Lesson 3 Student instructions for pre-recorded lesson	Student sheet for use alongside the pre-recorded lesson that can be submitted to school as evidence of completion.
	Lesson 3 PowerPoint	Slides to guide the teacher or students through the lessons. Can be adapted for classes.
	Lesson 3 Worksheet 3 brain and resilience video	Discussion questions for the video (also on ppt).
	Lesson 3 Recall Answers	Answers to the recall questions on the student questionnaire.
1,3	Research Survey Links	This file contains all research links for sharing with students and staff. The student ones are also within the lesson PowerPoints.

6. Optional teacher training:

The lessons have been designed for teachers to deliver in a facilitating role. Subject knowledge is not required. However, the SEEN Oxford team are happy to run an online teacher training or question and answer session for staff if this is helpful. Please contact seen@psych.ox.ac.uk for more information.

7. Specific research project requirements:

The aim of this pre-pilot is to determine the suitability of the resources for secondary schools and adjust or refine them based on feedback from students and teachers. We would greatly appreciate it if the opportunities could be made to collect some data. The ones in bold in the table below are the most important for us. We have tried to keep the number of questions to a minimum. Questionnaires are available for online completion. If you would prefer printed copies and a stamped addressed envelope for their return, please email seen@psych.ox.ac.uk.

Data collection	Objective	Approximate time to complete.
Student questionnaire 1 – complete before the lessons	**Establish current understanding.**	5-10 minutes
Student questionnaire 2 – complete during lesson 3	**Establish what the students have learnt and evaluate the lessons.**	8-12 minutes
Student questionnaire 3 – complete 4-8 weeks after the lessons	Establish how well embedded the learning was. Recall over time.	5-10 minutes
Teacher questionnaire – after teaching the lessons.	**Feedback and evaluation of the project and resources.**	10-15 minutes depending on detail given
Optional teacher focus group	Collect qualitative information to inform the evaluation and pilot resources.	TBC – let us know via the survey link if you are willing to be involved.
Optional student focus group	More qualitative feedback on the project and resources.	TBC – see note below*.

*Organising a student focus group is quite complicated due to the GDPR and safeguarding issues involved with an online group. A member of teaching staff would need to be present during the online meeting. Please let us know if you and some of your students would be willing to have a meeting with a researcher from the SEEN Oxford team.

8. Lesson 1: Brain development in the early years

Pre-lesson questionnaire:

Please ensure that students have completed the anonymous baseline questionnaire before starting the lessons. This could be done in the lesson before starting, or at the very start.

They will be asked a few multiple-choice questions about early brain and child development. They are not expected to know the answers and they should feel comfortable answering “I don’t know” rather than guessing. We hope to establish what they actually know, rather than what they can guess. Feel free to use the following script to introduce the project. There are slides available if you want to display this. The

questionnaire is available via the link given below. If you would like paper copies, please contact the team on seen@psych.ox.ac.uk.

"You are about to take part in some lessons developed by Oxford University as part of the SEEN Oxford Project. This stands for Secondary Education in Early Neurodevelopment. The lessons will cover the importance of brain development and caregiver–child interactions in the first 5 years of a child's life. Only a few schools are involved in this research project which aims to inform the future learning of young people across the country.

You will be asked to complete a short, anonymous questionnaire before starting the lessons, and the same questionnaire in the last lesson of the set (3 or 4 lessons in total). Please answer the questions honestly. If you do not know the answer simply choose the "I don't know" option rather than feel you need to guess. The information you give us is anonymous and cannot be traced to you personally.

Oxford University will use the information to help us work out the suitability of the lessons for secondary school use."

Student questionnaire 1 (before/ start of lesson 1):

https://oxford.onlinesurveys.ac.uk/pre-pilot-pupil-survey-pre-lesson

Overview

This lesson introduces the neuroscience that underpins child development. It covers the rapid proliferation of neurons following conception. Both genes and the environment affect brain growth in the early years. Connections are made between neurons as babies are exposed to new experiences. These are strengthened or weakened depending on a baby's experience. The ability of the brain's structure to change based on experiences, or neuroplasticity, is introduced.

Lesson 1 learning objectives:

- Describe the process of brain development in the early years.
- Explain the importance of genetics and the environment in brain development.
- Define neuroplasticity and how it relates to early child development.

Core content covered:

1. The brain is made up of billions of interconnected neurons.
2. Genetics and environment both have a role to play in brain development. *(Higher: Epigenetics means that even the genes aren't fixed).*
3. New experiences can lead to new neural circuits being formed.
4. Circuits can be strengthened and weakened by individual experiences.
5. The ability of the brain to change throughout a person's life is called neuroplasticity.
6. The brain is particularly plastic, and therefore sensitive to experiences, in the early years (0-5) and adolescence (11-25).

Keywords:

- **Core:** brain, neuron, neural connections, neuroplasticity, genes, environment, sensitive periods.
- **Additional:** neural circuits, pruning, proliferation, epigenetics, epigenetic factors.

Recording: https://youtu.be/H8yoGSUKh70

Lesson plan:

Introductory activity (0-5 minutes) - amazing babies!

Hands up! The aim is to have the whole class put their hand up for at least one of the following (making a personal connection to the learning):

- Do you have a sibling aged 0-5?
- Do you have regular contact with a child aged 0-5?
- Maybe you have a cousin? Niece or nephew? A neighbour?
- Put your hand up if a good friend in this class has a sibling aged 0-5 in their household that you see (under normal circumstances)

Ask the students "What can babies do?". You could show a clip of babies here. Search for your own or use one of these links: (Laurie, age 3 days) https://youtu.be/7aTPV-cT4Ik or (Iris, 7 weeks) https://youtu.be/fDVI09uqTD0

You have two options following on from the video:

a) Use the UNICEF quiz to explore the amazing things a baby can do (word copy available) - https://www.unicef.org/parenting/child-development/baby-development-quiz
b) Listen to the students' ideas, before going through some of the things that babies can do – they are quite incredible really! Use the lesson PowerPoint to guide this.

Main activity 1 – brain development

Use the slides to introduce the basic structure of the brain. This covers the connection of neurons in the brain, proliferation (cell growth) and pruning (the loss of connections and pathways that are not used), and the role of genes and the environment (including experiences).

Watch the video on "experiences build brain architecture" https://www.youtube.com/watch?v=VNNsN9IJkws

Hand out the worksheet and ask students to complete it based on what they have seen on the video. You may choose to play the video a second time. The final activity on the worksheet is more open-ended and challenging. There is a more difficult (H) and easier (F) version of Worksheet 1a.

Mark the worksheet and address any misunderstandings. Answers are available on the PowerPoint for self or peer marking. If there is enough time, invite students to share their explanation of the house building analogy with the whole class.

Main activity 2 – neuroplasticity

Ask students what they understand by neuroplasticity. Watch the Sentis clip which describes neuroplasticity: https://www.youtube.com/watch?v=ELpfYCZa87g

Background – brain development is dependent on both the genetic make-up of an individual and the environment they are exposed to. In the past, people thought that the brain was fully developed quite early in life and remained fixed. Over the past 20 years or so, benefitting from new technologies such as fMRI (functional magnetic resonance imaging) scans, scientists have realised that the brain has the ability to change, grow and restructure throughout life. This is called neuroplasticity. There are two particularly

sensitive times in brain development, when experiences are most likely to shape the brain. These are 0-5 years and adolescence. The sensitive periods will be revisited in lesson 3.

Main activity 3 (optional extension) – epigenetics

This extension activity is for more able students with good literacy skills. The worksheet summarises the work of Weaver et al and the effects of mothering styles on stress levels in pups. It is a reading comprehension style worksheet with further reading linking epigenetics to child development.

Plenary and progress check

A short activity to recap the keywords and their definitions from this lesson. Differentiated options exist on the PowerPoint.

9. Lesson 2: Caregivers and the early years

Overview:

Caregivers are the baby and child's main influencer of day-to-day experiences. Their actions directly affect brain development. Students will learn how a caregiver can ensure healthy brain development during the sensitive early years (conception to 5 years). This includes caregiver-child interactions; baby talk; playful learning and the development of executive function skills. The students have the opportunity to apply new knowledge and skills through a choice of activities. There is an option to extend this to an additional lesson or homework activity.

Learning objectives:

- Describe the importance of early years development for long term health.
- Describe how parents and caregivers can support brain development in the early years.

Content:

1. Many essential neural circuits are developed in the uterus and throughout the early years.
2. Babies are able to perceive and discriminate environmental stimuli in the uterus and throughout the early years.
3. Caregivers can improve long-term health outcomes by supporting brain development in the early years through
    a. Responsive, reciprocal caregiver-child interactions (serve and return),
    b. baby talk,
    c. playful learning,
    d. developing executive function skills.
4. The early years is a foundation for long term physical and mental health.

Keywords:

- **Core:** caregiver, early years (0-5), brain development, neuroplasticity, neural circuits, playful learning, baby talk.
- **Additional:** serve and return interactions, contingent responsiveness, executive functions.

Recording: https://youtu.be/QJL-xcKa0mk

NOTE: This lesson has a lot of content in the main part. Keep the introductory activity short and quick. There is an option to extend this lesson (to give students a chance to complete their task) through a homework or optional extra lesson). In this pre-pilot, there are several options for the main activity. Choose the ones that you think are most suitable for your class. We would really like feedback on how you make your choice.

Lesson plan:

Introductory activity (0-5 minutes) - the role of a caregiver

Ask students – What do caregivers do to promote healthy development from conception (start of pregnancy)? Small group or pair discussion before feedback back to the class. Take ideas from young people. The main point to get across: the baby is a responsive individual from day 1 (or in the uterus) and interactions with their environment have an immediate impact on brain development.

Prompt slides included in the PowerPoint for teacher use.

The term **caregiver** is being used to be as inclusive as possible. It includes parents, siblings, grandparents, other close family members, key workers involved in child care, babysitters, friends - anybody who has regular contact with the child (aged 0-5). Many resources in the field focus on the role of parents, but the principles are the same for any member of that child's community, so we encourage you to use, and define, this broader term with the students.

There is an option here to watch a video with some ideas if you plan to take two sessions to deliver this lesson: Brain matters – 5 things parents can do. (4 mins 37s)
https://www.youtube.com/watch?v=k1hNZhH9bRg

Ask students to recall the 5 things after the video and record these on the board.

Main activity 1 – introduction to the task and research

The early years are crucial for long term health outcomes. Students are going to find out what caregivers can do to ensure that a child's experiences support brain development (link to lesson 1). They will watch 4 videos to research this and will then complete a task (teacher to choose an appropriate task).

Research – what can a caregiver do to support child development? There are 4 films to watch (each is 2-3 minutes long). Students need to record, after each video, what the caregiver can do to support child development. There is a worksheet that can be given to students, with the film links and space for notes. There is also a **teacher sheet,** giving background to the films and suggested points the students might identify as being important.

The four films clips are:

1) Serve and return interactions: https://www.albertafamilywellness.org/resources/video/serve-and-return

2) Baby talk: https://www.unicef.org/parenting/child-development/baby-talk-class

3) Playful learning: https://vimeo.com/505601316/cde3ca6023

4) Executive function and self-regulation:
https://www.albertafamilywellness.org/resources/video/executive-function

There are different ways to do this depending on the resources you have available, how you are teaching (online, in class) and the ability, skills, and size of your group. For example:

1 An individual task using ICT facilities. Students work independently to watch the videos and research the caregiver's role.
2 A teacher facilitated individual task. The teacher rotates through the videos, showing each to the whole class and then giving them time to write notes, or discuss their learning on that area before moving on to the next.
3 A group or class activity. The teacher shows each video and asks students to share their ideas afterwards (small group or class discussion). An appointed student, teacher or TA keeps a record of the group's ideas.

Main activity 2 – Application of knowledge

Ask students to complete one, or more of the following:

- Child observation – use what you have learnt to complete a child observation task.
- Produce a public information leaflet - the kind of information that would be given out in an antenatal appointment (pregnancy appointment with GP).
- Top tips! - Students compile a list of top tips for caregivers. Each tip should be a piece of advice to help caregivers promote child development, e.g. 'speak to babies using a sing song voice.'

You might opt to extend this task to an additional lesson or ask work to be completed as homework.

Plenary and progress check

Ask students to consider 3 things they will do differently the next time they interact with a 0-5 year old (for example the child they identified at the start of lesson 1 – a sibling, relative, friend).

Additional teacher guidance:

The following are suggested tips that caregivers can do to ensure a child's experiences support healthy brain development:

1. Be curious about what is catching the baby/child's interest and attention.
2. Show babies/children that you are interested in their activities through your eye gaze, voice and actions.
3. Use serve and return interactions (contingent responsiveness).
4. Let the child explore and play independently in a safe environment.
5. Make everyday activities a learning opportunity.
6. Extend play through suggestions that respond to the child's interest.
7. Read with the baby/child in a way that encourages interactions around the story.
8. Using a sing song voice when talking to a baby.
9. Exaggerate facial expressions when interacting with a baby.
10. Take part in make believe play.
11. Give the child an opportunity to learn executive function skills such as planning, organising, decision making.
12. Avoid using devices (e.g. phone) all the time when with the baby / child.
13. Keep the child safe (or examples of how this can be done).
14. Provide the child with good nutrition.
15. Reduce toxic stress (prolonged adversity) wherever possible.
16. Keep healthy in pregnancy.

10. Lesson 3: Brain development throughout life

Overview

Students will learn that a combination of principles from social science and neuroscience guide our understanding of early years development. This understanding can be used to ensure more favourable long-term outcomes for an individual. Research from longitudinal studies show the importance of early years for health outcomes. The early years are not deterministic though – another sensitive period for brain development exists during adolescence. In addition, supportive relationships and the development of executive function skills can improve resilience at any life stage. The early years remain the period when the opportunity for improving long term benefits is greatest.

Learning objectives:

- Recognise the importance of early years for long-term health outcomes.
- State when brain development is most sensitive to experience.
- Describe what can be done to enhance resilience across the life course.

Content:

1. The early years period is a foundation for long term physical and mental health.
2. What happens in the early years is not deterministic.
3. Resilience is dependent on supportive relationships and developing skills.

Keywords:

- **Core:** health outcomes, longitudinal studies, resilience, supportive relationships
- **Additional:** executive functions, toxic stress,

Recording: https://youtu.be/9ubzXpKZhBs

Lesson plan:

So far students have learnt that:

- The brain is at its most sensitive during the early years

- Caregiver interactions with a child can affect early brain development

This lesson we will look at how this impacts outcomes later in life.

Introductory activity – longitudinal evidence linking child development to health outcomes.

Brain development during the early years forms the foundations for long term physical and mental health outcomes. This activity encourages students to consider some evidence to support the science being covered in the lessons.

Scientists use longitudinal studies to investigate the long term impact of interventions. A longitudinal study is a **research** design that involves repeated observations of the same variables (e.g., people) over short or long periods of time (i.e., uses **longitudinal** data).

This starter activity looks at data from the ABC study (Carolina Abecedarian Project) which started in the 1970s in North Carolina, USA. The participants were from deprived families and tracked from pregnancy through to adulthood. The results included in this lesson were taken when the participants were 35 years old.

Half of the children were randomly assigned to the 'intervention group', and half to the 'control group'.

The intervention group took part in a special childcare programme from the age of 8 weeks until they started school. This treatment involved an educational component involving games which focused on language development, emotional development and cognitive skills. There was a focus on caregivers having intensive one-on-one and small group interactions with the children. There was also healthcare and nutrition support provided as part of the childcare programme.

The Nobel prize winning economist, James Heckman, was also involved with the project and his work demonstrates that the earlier the intervention, the greater the benefit on children's lives.

There are two versions of the activity in the lesson PowerPoint (an easier and more complicated version) with some answers to the questions posed on the starter slides. Choose the version you want to use with your class and hide or skip the other slides.

Main activity 1 – the science of resilience

Ask students what is meant by the word resilience. There is an opportunity here to link to aspects of PSHE/Character/PDP education. Explain that the last two lessons have focused on brain development during the early years. Whilst you have just been looking at evidence for the importance of the early years, there are other sensitive (neuroplastic) periods in life. The early years are not deterministic. This was also shown in the study by the variable data for example, rather than 100% risk for control groups and 0% risk for the interventions.

Explain that they will be watching a video and afterwards will be discussing the following questions:

- What factors affect brain development?
- What is meant by toxic stress?
- What is meant by resilience? What can we do to help to build resilience?
- When are the brain's two main periods of sensitivity to experience?

Depending on how you want to run this session, you might share the questions before the video, read them through, and ask students to jot notes down as the video goes.

Watch the video – Brains: journey to resilience (7mins 44s)

https://www.albertafamilywellness.org/resources/video/brains-journey-to-resilience

The video covers the science of resilience. "In a world where human brains inch across snowy landscapes, where perils lurk in every shadow, one community will rally behind a struggling brain – and just might change the world in the process. Learn about the resilience scale in this scientifically rigorous (and cinematically epic) resource". created by the AFWI in consultation with the Frame Works Institute and the Harvard Center on the Developing Child.

Following the video, allow students some time to consider the questions. This can be done individually, in pairs, small groups or a whole class discussion (or a combination).

Plenary – progress check and evaluation exercise

This activity forms part of the evaluation of the lessons (student learning and evaluation of the resources). Please make sure that this is completed in silence on their own so we have their answers. Tell them not to worry – there is no consequence for getting things right or wrong; they will not be tested on the material covered in these three lessons.

The questions can be done directly online using the link below. If you would prefer to do this on paper and send it back to us in Oxford, then please email the project team at seen@psych.ox.ac.uk

Knowledge recall and evaluation link:

https://oxford.onlinesurveys.ac.uk/pre-pilot-pupil-survey-post-lesson-

Feel free to go through the answers with the class afterwards to reinforce their learning. These are available from the document 'Lesson 3 Recall Answers' in the resource pack.

Post lesson knowledge recall.

If possible, please ask students to complete a follow up quiz 4-6 weeks after the lessons have been taught. The link for this third student survey is:

https://oxford.onlinesurveys.ac.uk/pre-pilot-pupil-survey-follow-up

11.Teacher questionnaire

After completing the last lesson, we are asking teachers to complete a short online survey. This is how the team will get feedback on the lesson content, design, engagement level of students and acceptability of the curriculum content for a secondary school setting. We are happy to be guided by the teachers, especially in this pre-pilot phase. Feel free to be a critical friend on the appropriateness of the materials, and any changes you feel should be made.

If you prefer, or feel able to spare the time, we would really like to get together a group of teachers who have taught the lessons for a more detailed online focus group discussion. If you are willing to take part, or would prefer to give feedback on the phone, then please choose the option to share your email with us via the main teacher survey. Or using the following link (https://oxford.onlinesurveys.ac.uk/pre-pilot-teacher-contact-details).

The link for the teacher questionnaire is:
https://oxford.onlinesurveys.ac.uk/pre-pilot-teacher-survey

12. Safeguarding young people

In the design of these lessons, every effort has been made to ensure that the materials are suitable for a universal audience. The content focuses on the science behind brain development and the positive things that caregivers can do to support child development. However, you may have young people in your class who have had difficult experiences during their early life. Or young people who simply reflect on their own

personal experiences in an overly critical way. Below are some suggestions for teachers in dealing with this if it arises in a lesson.

- If students would like to talk to somebody then they should be signposted to relevant support in school; this might be their form tutor, head of year, school counsellor.
- At the end of each lesson there is a slide "If you would like to talk to someone about how the lesson today has affected you, please speak to ***" We suggest you edit this slide to signpost students to the support structures in place at your school, including relevant email addresses.
- Keep the focus of the lesson on what can be done to support development. The young people are entering, or in, another sensitive period for brain development. Encourage them to think about what they can do now to stay healthy in the future (supportive relationships, practise skills, reaching out for adult support during difficult times)
- Remind them about the non-deterministic nature of the early years (or tell them this will be discussed in lesson 3) and that what happens in the early years is not the only factor affecting long term health outcomes.
- If necessary, be clear about confidentiality and your responsibility to pass on information to the safeguarding lead if you feel the young person or someone they know is at risk.
- It can be powerful for students to feel their concerns are being heard and difficulties not dismissed. Sadly difficult early experiences are remarkably common, but reassure students that many factors influence individual outcomes and remind them about how development can be supported.

If you have had students who struggle with the lesson content, we would appreciate you feeding this back to us in the staff survey or by email seen@psych.ox.ac.uk Our preference would be by email, so that we can confirm the details with you rather than via the anonymous teacher questionnaire.

13.Keyword glossary

Brain – The organ of the body responsible for coordinating responses including thoughts, emotions and behaviours.

Brain development - The process of the brain growing, changing and restructuring throughout a person's life, starting at conception.

Caregiver – anybody who is caring for another. In this context it is whoever is looking after a child between 0-5 years e.g. a parent, keyworker, or family member e.g. young person looking after a young sibling.

Contingent responsiveness - A caregiver noticing a child's verbal cues and/or actions and responding in a timely and appropriate way through eye contact, words, sounds and/or physical interaction. Appropriate would mean that the caregiver's response matched the baby's signals in terms of the emotional content, level of energy etc.

Early years – The period of a person's life lasting from conception to 5 years of age.

Environment – In this context, the experiences, relationships and surroundings which affect a child's development.

Epigenetics – Epigenetics involves genetic control by factors other than an individual's DNA sequence. Epigenetic changes can switch genes on or off and determine which proteins are transcribed.

Epigenetic factors - The factors which can influence which genes in someone's DNA sequence are switched on or off. Examples include early life stress, physical exercise and sleep.

Executive functions - The 'air traffic control system' of the brain which allows us to organize information and regulate our behaviour. This includes short term memory, flexibility in thinking, prioritising, planning ahead, coping with frustration and following rules.

Genes – The unit of inheritance which is passed from biological parents to offspring which determine some characteristics of the offspring.

Health outcomes – The changes in mental and physical health throughout someone's life which are affected by their genes and environment.

Longitudinal studies - A type of research design which involves repeated observations of the same participants at multiple points in time. Some studies observe participants across their whole life span.

Neuron - The main type of cell found in the brain and spinal cord.

Neural connections - The point of contact between neurons through which one cell sends a chemical signal to the other.

Neural circuits (or pathways) - Groups of interconnected neurons which carry out a specific function when activated.

Neuroplasticity or brain plasticity - The ability of the brain's structure to change and grow during a person's life because of their experiences.

Playful learning - The learning that happens due to new connections forming in the brain during play.

Proliferation - The formation of new connections between neurons.

Pruning - The fading away of connections in the brain which are not used.

Resilience - A relatively positive outcome despite a given set of adverse experiences. It emerges through the interaction of risk and protective factors inside and outside the child, for example genetics and supportive relationships.

Sensitive periods - The periods of time in a child's life when their brain is most sensitive to being influenced by environmental factors.

Serve and return interactions - A metaphor that can be used to describe Contingent Responsiveness.

Supportive relationships - In this context, a relationship between a child and caregiver where the caregiver provides physical and emotional support to the child which helps them to develop and grow and helps them to manage stressful experiences.

Toxic stress - The harmful type of stress which happens when a person experiences repeated negative experiences and no supportive caregivers are around to buffer the body's response. This type of stress disrupts a child's brain development.

14.Links to other curriculum areas.

Make links to other topics and learning to help young people make connections. Below are some suggestions from KS3 (additional links exist with biology KS4):

- **Cells, tissue, organ** – specialised cells. Neurons are an example of specialised cells that students might have learnt about. The brain is made up of billions of neurons (as many as 100 billion).

Students may be familiar with the structure of a neuron. The myelin sheath improves efficiency of impulse transfer and myelination increases over childhood and adolescence. This is a major component of white matter in the brain (white = fatty material). Cell bodies of neural cells contribute to the grey matter seen on MRI scans of the brain.

- **Human reproduction** – the importance of fetal development (the fetus depends on the mother for providing a safe environment in which to grow, e.g. good nutrition). Brain development starts soon after conception. When the baby is born it still requires considerable care but is very responsive to the environment. Puberty – entering a period of considerable sensitivity – brain plasticity during adolescence – proliferation and pruning is taking place during this period too.

- **Humans as animals** – what makes us humans? *Homo sapiens* is the thinking human and our brains have a particularly large cerebral cortex. Links can be made to childbirth in mammals. Most mammals give birth to relatively independent offspring, but not humans. Human babies are still developing and need care for many years after birth. Humans have evolved this way as a result of other biological features (bipedalism, small pelvis in females, large brains). Crucial development therefore continues in the years following birth.

- **Social and emotional learning (PSHE, character, relationships education)** - the importance of supportive relationships cannot be underestimated. The relationship between the primary caregivers who are available and responsive to an infant's needs allow the child to develop a sense of security. In evolutionary terms, the basis is that the 'genetic parent' looks after the child to increase the likelihood of survival of the genes in the next generation and the child relies on the parent for care, sustenance and protection. This results in a bond forming between the two. The extent and nature of this bond, e.g. how secure it is, will have a major effect on the child's development. Secure relationships throughout life are important for developing resilience.

- **Social and emotional learning (PSHE, character, relationships education)** - resilience and learning the skills that improve resilience to deal with challenging events and circumstances. Many of the skills taught through PSHE/character education/PDP, such as organisation, time management, attentional control, emotional regulation, decision making, moral and ethical decisions, are considered executive functions. Whilst these skills can be taught, the brain foundations for good executive functions are developed in the early years, when caregivers have considerable influence over their development.

15.Additional information sources.

Brain development and the early years

- **The Oxford Brain Story** – our team is working in partnership with the Alberta Family Wellness Initiative to share knowledge about the science of brain development for families and professionals.

You will recognise some of the clips from the lessons, but this page links to more information and films. https://www.oxfordbrainstory.org

- **Brain matters** – various short videos on brain development from conception. These are good additional videos that students may want to watch (or teachers for additional background information) Scroll to the bottom of the page. (Note - there is a full documentary covering all aspects of neuroscience and child development. https://brainmattersfilm.com/category/resources/brain-science/
- **What is epigenetics and how does it relate to child development? -** a leaflet that describes what epigenetics is and why it is important for the early years. https://developingchild.harvard.edu/resources/what-is-epigenetics-and-how-does-it-relate-to-child-development/

The caregiver's role

- **BBC Education's *Tiny Happy People*** – an initiative providing a range of free digital resources designed to support parents and carers in developing children's language from pregnancy to the age of four. https://www.bbc.co.uk/tiny-happy-people
- **The Royal Foundation early years programme** – the Duke and Duchess of Cambridge support a programme of activities around the early years. A couple of their '5 big questions' have been used in the student evaluation questionnaire for this project. We can then see if young people think the same as the adults who completed the survey. https://royalfoundation.com/programme/early-years/
- Brain architecture (includes adversity and toxic stress) (2.35) https://www.albertafamilywellness.org/resources/video/brain-story-concepts-brain-architecture
- **Brain matters** – A short video (4:40 mins) called '5 things parents should do everyday' https://www.youtube.com/watch?v=k1hNZhH9bRg
- **UNICEF** brain development – UNICEF's page for parents about child development https://www.unicef.org/parenting/child-development

Early Years are not deterministic

- BBC article on new brain cells being made throughout life https://www.bbc.co.uk/news/health-47692495

Research Articles (with open access links)

- 'Epigenetics programming by maternal behavior' by Weaver et al. (2004) - https://www.researchgate.net/publication/8487300_Epigenetic_Programming_by_Maternal_Behavior
- 'Caring relationships: the heart of early brain development' by Lally & Mangione (2017) - https://www.naeyc.org/resources/pubs/yc/may2017/caring-relationships-heart-early-brain-development
- 'Early childhood investments substantially boost adult health' by Campbell et al. (2014) - https://www.researchgate.net/publication/261186767_Early_Childhood_Investments_Substantially_Boost_Adult_Health/link/00b7d53658a1a257ed000000/download
- 'Supportive relationships and active skill-building strengthen the foundations of resilience' by the National Scientific Council on the Developing Child (2015) - https://developingchild.harvard.edu/resources/supportive-relationships-and-active-skill-building-strengthen-the-foundations-of-resilience/

- ‘Connecting the brain to the rest of the body: early childhood development and lifelong health are deeply intertwined’ by the National Scientific Council on the Developing Child (2020) - https://developingchild.harvard.edu/resources/connecting-the-brain-to-the-rest-of-the-body-early-childhood-development-and-lifelong-health-are-deeply-intertwined/