Remember to Sleep. Sleep to Remember

As we approach half term, the mock examinations for Year 12 and 13 and the real things shortly after for both Sixth Formers and Year 11s, I thought it apposite to remind all of the learning community of sleep's cognitive benefits.

The biggest thing to help your child learn is to get into a very good sleep pattern.

Of course, I appreciate that all parents have been trying to do this since your children were two months old, but sleep patterns change, develop and become more challenging in teenage years.

It may come as a surprise, but as children go through teenage years, they become nocturnal. This applies to boys particularly; there is actually an evolutionary reason for this: hunting and gathering. Evolutionary biologists have discovered that teenage boys were usually the demographic sent out hunting at night- hardwired developmental traits are not erased in the blink of an evolutionary eye.

So in teenage boys, sleep patterns can switch. This applies less to girls; they are typically more set in their routines. Like with everything, there are exceptions of course.

We've always know that something special goes on when we sleep. We may know the old adage- '*early to bed, early to rise'* , but actual chemical reactions in the brain and their relation to how they improve learning when asleep have only been identified as recently as 2008 in the Academy of Neuroscience in Chicago.

The scientists in Chicago identified in the brain a chemical called acetycholine. Acetycholine is involved in a process called synaptic plasticity. Synaptic plasticity is the model which challenges the idea that the brain grows in childhood, develops in teenage years and then you're left with a final model as an adult. Synaptic plasticity indicates that your brain can continue to develop and grow in different ways as an adult; in short, that you can teach an old dog new tricks.

Acetycholine is a chemical which is released into the brain which not only enables the brain to develop and make new connections and new pathways between synapses but it is also connected to something called long-term potentiation.

Effectively, long-term potentiation increases your brain muscles

A muscle analogy for long-term potentiation would be that we could learn to create a better tennis stroke perhaps, by practising day in, day out on the court, and certain muscles would grow and develop to allow that to happen, but in addition you need to develop your body so that you can not only learn one new stroke, but 10 new strokes.

However, acetycholine isn't around in your brain in great quantities, particularly during the day when it's actually suppressed. It's suppressed by serotonin and norepinephine- stress chemicals.

These stress chemicals get in the way of learning- but during sleep they are lowered. During the sleeping state, serotonin and norepinephrine levels go down, and acetycholine kicks in. Part of the reasons for these chemicals to be supressed is that when you're dreaming, if you're being, say, chased by a bear and serotonin and norepinephrine are flooding your brain, then you would wake up very…overstimulated; in fact, you won't stay asleep, you would wake up and start running around. So, it has to be supressed and this is the time learning takes place. This is bad

news for us teachers- we thought it takes place in the classroom- it actually takes place when your kids are asleep!

To be more precise, it actually takes place during REM sleep- that stage of sleep where you get the rapid eye movement- the dreaming state.

I don't know if you know, but the dreaming part of sleep only kicks in half way through the night. I am sure some of you may have seen the app or even may have it on your phones which track your REM sleep.

There's a problem with this though, this valuable stuff called acetycholine is not actually released into the brain until the last stages of REM sleep. So you go in and out of this dreaming state in the last third of your night's sleep. But it's only in the last third of **that** which acetycholine is released.

So what's the take home from this?

Well, it's no good getting 6 hours sleep or less.

For children of school age, 8 hours sleep is the absolute minimum. Not just for health, but for learning.

If homework gets in the way of sleep, it gets in the way of learning. So we must not only remember to sleep, we must sleep to remember. If not, any learning done during the day and during homework time is likely to be lost.

Here is a quote from the presentation to the neuroscience conference in Washington in 20009: '*The absence of chemicals norepenhrine and serotonin, serves a unique function for memory, giving REM sleep a singular role in learning, it is not replicable by more waking practice'* What that means is if you don't get that late surge or REM sleep, you can't make up for it by just doing more practice of the thing you're working on next day.

In practical terms, children don't always get 8 hours sleep, sometimes because of things beyond anyone's control. Does it matter? Can we make up for it? The answer is yes- to a point. It can be made up for; it's not permanent. But it takes months to make up for several nights of lost sleep.

Remember though, lack of sleep not only damages immediate learning, it also stops long term potentiation, which acetycholine also helps with, so that sleep is not only crucial for the learning from the day before, but if it's missed, you progressively damage the brain's ability to learn.

Learning, emotion and sleep are interconnected.

So what can you do to help at home?

1) Sleep patterns. Routines. Any of you who have that already, a hearty, 'Well done – congratulations!' Children taking a bath, drinking milk, reading a bedtime story- all these things which you may well do already can help with this before bed.

2) No screens in the bedroom. Studies have shown that the effects of an Ipad or computer in 90 minutes to 2 hours before sleep damaged circadian rhythm. This is to do with the proximity and intensity of the light source, which convinces the brain that it is daytime and the stimulation of the interaction with the game makes it hard to sleep. The TV is ok- the light is more distant, more passive and does not have the same damaging effect.