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The age of neuroeducation

Sasha Euler explores what science reveals about teaching and learning.

Most educators will, at some point in their professional lives, have experienced unmotivated students with no interest in the subject, or even in learning in general, students who resent school and who would rather be anywhere else but in class. As a consequence, many teachers can be heard to complain at length about how unpleasant their job is and how difficult it is to deal with students today – never considering that *they* might just be the primary cause of the situation.

Neuroscience, cognitive science and social and educational psychology are now able to greatly inform pedagogy and, as a result, teaching methodology and daily classroom management. In this article, I will discuss the role of the teacher in student motivation and learning. By doing so, I hope to pass on to the reader my enthusiasm for the greater transdisciplinary field of 'neuroeducation', an amalgamation of the scientific fields already mentioned, which has the explicit aim of improving classroom teaching and learning. While I, as an EFL teacher, am naturally thinking in the context of language pedagogy, the information in this article would apply to virtually any possible learning situation.

Before going into the actual arguments, the reception of past publications in the field makes it necessary to establish an important fact in order to avoid possible misunderstandings: the findings of neuroscience and related disciplines have not revealed anything that would necessarily lead to completely new teaching methods, ones which have never been considered before. We may assume that *great* teachers already intuitively know most of the factors unravelled by research. However, even for such people, the greater field of neuroeducation will still provide valuable insights into *how* and *why* things function the way they do.

The nature of learning and teaching

As a first step, let us discuss on a theoretical basis what makes teaching and learning so difficult. This will help establish how neuroscience and cognitive science can support the teaching–learning process. The dominant model in cognitive psychology, as reported by John Anderson, has been that of 'information processing'. According to this model, the teacher sends linguistically-structured elements of meaning, which are decoded by the student, linked to previous knowledge and, finally, processed. This image, however, is somewhat misleading in that it suggests a *knowledge transfer*, whereas knowledge is, more accurately, always a *novel creation*. In other words, instead of simply processing the message (eg an explanation or instructions given by a teacher, or something we read in a book), we link the raw content of the message to context information, our previous knowledge, subjective opinions and personal experiences and, based on all these factors, create a mental representation of the information we have received (which may resemble the original message more or less closely). This operation of knowledge creation, however, is not as automatic as it may seem and can only be carried out reasonably successfully if very particular conditions are met, these being:

- that the receiver has sufficient previous knowledge to be able to decode the information presented;

- that the receiver does not lack the necessary context to establish the meaning.

These factors will allow the receiver to construct knowledge. A good day-to-day example is a situation when someone tells us something and we think (and possibly say) *I see where you're going with this*. With our background knowledge and our knowledge of the context, we are able to understand the information and perceive the direction in which the speaker is taking the conversation.

These factors are the primary conditions of learning and retention. It does not take much to see how creating this 'effect' in our students' minds is necessary when teaching grammar, pronunciation or lexis. It also explains the power of 'discovery learning' – so important in language pedagogy. As Jeremy Harmer so eloquently puts it: '... *if students have to make decisions about the words and grammar they are studying – that is if their encounter with the language has some "cognitive depth" – they are far more likely to understand and remember that language than if they meet the new language passively.*'

Discovering new information by sorting out the 'mess' that real L2 language poses to learners, ie actually being able to explore the new language, may well lead to genuine understanding and retention because in the process of doing so, knowledge is actively constructed by the students. Obviously, the question then becomes what we can do as teachers to facilitate this process.

Four factors of successful teaching and learning

I would now like to turn to four general factors that greatly determine the success of the learning/teaching process.

1 The motivation and credibility of the teacher

Without going too deeply into the field of neuroscience, it is important to know that several centres of the brain help us analyse facial expression, prosody and posture within seconds. Based on this analysis, the motivation and credibility of a person are subconsciously determined. If the students' assessment of a teacher turns out negative (because the teacher is not sure about the subject matter and/or is not enthusiastic about their job), the

teaching/learning process will probably be seriously impeded. That is why we need to be grammar and pronunciation specialists, in addition to being good 'moderators' and 'speaking facilitators'. Or – the flip-side of the coin – it is why we need a good repertoire of useful and attractive teaching strategies for skills teaching, in addition to a thorough knowledge of language structure. Students expect that from us. And we know that they do. Students will notice if we are insecure, which creates tension, and if they realise that we do not have the right explanations or notice that we use the same tedious techniques time and again, they may be seriously discouraged and might even revolt (depending on the L1 culture). On the other hand, if we truly know our subject and can teach it well, we will be able to detect a satisfied light in our students' eyes. This is because they can sense our confidence, and they feel they are in good hands.

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2 Individual cognitive and emotional learning conditions

Every human being has certain innate qualities that differ from those of others, the three most important ones for the present analysis being the *operational patterns of the brain* (eg being good at remembering numbers, names, etc), *giftedness/talent* (eg having a facility for mathematics, languages or history) and *learning style* (eg visual, aural, reflective).

'Difficult' learners are usually victims of a neglect of these personal, innate conditions. It is a simple fact that some students learn languages more easily than others. More importantly, some learners are better able to accomplish 'chunk learning' and may be able to absorb language implicitly, while others need linguistic explanations, briefly and astutely presented. Even more importantly, not everybody

benefits from writing (even if it greatly helped the *teacher* teaching a given class), while others struggle to learn by listening (even though this *should* be the ideal way, given the aural/oral quality of modern classrooms). Also, some learners prefer a *global* approach of 'let's learn things as they pop up, it will eventually all make sense' (as long as they see the big picture), while others prefer an *analytical* approach and need to go step by step, with everything carefully constructed in a 'logical' sequence (which may annoy global learners). And some learners especially benefit from a good combination of different approaches. Howard Gardner did some impressive work here with his theory of Multiple Intelligences.

So, if students are so different, how can we teach them all in the same class? First of all, rapport between the teacher and the students and the general classroom climate may be more important than anything else. It is crucial to value the students as they are, to talk to them and give them the reassurance that not being as fast as someone else is completely natural. As regards teaching strategies, it may be possible to offer different task options, or to address different learning styles at the same time. If a class is given a diagram plus an oral explanation plus written examples, some students will immediately start thinking about the diagram, others will carefully follow the explanation, while yet others may ignore both and figure it out from reading the examples. In subsequent group tasks, these talents (or 'intelligences' in Gardner's terms) will unite, and everybody will be able to share insights from their own perspective.

3 A positive and motivational classroom climate

A good classroom atmosphere has tremendous motivational power. Student motivation – which has both affective and cognitive dimensions – is not some mystical thing that it is up to the students themselves to create. It is, to a large extent, determined by feedback, assessment and the atmosphere created by the teacher. As Zoltán Dörnyei puts it, '*the motivational dimension of classrooms can offer teachers very powerful tools to combat a range of problems, from student lethargy to an unproductive classroom climate*'.

As a first step toward utilising this power, the learning situation has to be

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made attractive to the students. If the previous two factors are heeded, the students will feel that they are in good hands and that they are valued as individuals. Also, and as a result, they will have the perception they are actually making progress – all potentially making the English classroom a very attractive place to be in. To further facilitate a good classroom climate, students need positive feedback. It is not just that everyone likes to be praised. Learning a language is a very difficult business, and it has often been argued that we may subconsciously encounter some kind of

> Learning a foreign language is a highly personal matter, and students need the teacher to provide some genuine emotional support and guidance

identity conflict when communicating in a new tongue. In pedagogical psychology this is often linked to the concept of 'ego permeability', ie remaining open to new information and concepts and thus allowing new knowledge to pass the 'defences' of our personality. The bottom line is that learning a foreign language is a highly personal matter, and students need the teacher to provide some genuine emotional support and guidance.

On a more general basis, creating the feeling that something pleasant or useful is being learnt is very important, as is making sure that there is neither too much stress, nor no stress at all, both of which can kill motivation. It is well known in psychology of motivation that we need challenges. Without them, we will not put enough effort into the learning process. However, these challenges need to be achievable and should not lead to constant frustration.

Another related factor is assessment, especially as regards schoolchildren. It is imperative that assessment should be transparent and rule-based so that the students know *precisely* what they got a grade for and how they could have done better. It is also necessary to use the full spectrum of grades (many teachers are very reluctant to assign the highest possible marks). If the students feel that assessment is arbitrary, or if some marks seem impossible to get however hard they try, they will lose trust in their teacher. I have seen classes where the students rejected an otherwise good and enthusiastic teacher simply because they considered his grading unfair.

4 Previous knowledge

Information seems to be stored in the brain in modules (some researchers have used metaphors like drawers, networks or data highways). If there are no modules that can be used in the construction of knowledge, ie if there is no information on the topic already there, new information will fall through the memory net. This is because no bridges can be built between the new information and existing knowledge. Learning by heart (eg of grammar rules or $L1 = L2$ vocabulary lists) bypasses this process and can be useful for exams, but it does not lead to long-term retention.

It is, further, important for teachers to ensure that all students are in the same boat and that new information is thoroughly introduced, ideally very illustratively, and with sufficient opportunities for exploration and discovery provided, as described above. Any students who are slightly more advanced than the others will still benefit from this way of introducing information as it may offer an interesting new perspective. However, if some students are clearly well *above* the level of the others, they will benefit from being given more challenging tasks to engage in, and if some students are well *below* the rest of the class, they would benefit from some self-study tasks that the teacher offers for support and spends a couple of minutes whenever needed to discuss with the students. In either case, a good deal of teacher sensitivity is called for, but the point I am trying to make here is that going the 'extra mile' for our students (from showing enthusiasm and preparing especially good explanations or materials, to having more challenging tasks at hand or providing special help to weaker students) *will* be appreciated. This will not only be reflected in the students' learning progress, but also in the overall classroom climate, which will feed back into the learning process and allow our students to progress even more.

Needless to say, these four factors must go hand in hand with a culture of acceptance and encouragement in the classroom, in which students feel free to explore and, in doing so, are able to build real competence.

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This article discusses the role that neuroeducation can play in understanding the nature of teaching and learning and the problems that can occur in the classroom. An appreciation of the four factors listed here, which are all well researched and neuro-psychologically explainable, can not only greatly enhance success in learning, but can also make day-to-day classroom interaction more pleasant, with the students significantly more motivated, happy and willing to learn. Neuroeducation is, of course, no miracle cure, but it is my most profound hope that this article will encourage you to explore such neuro-psychological factors further, in order to work toward a new culture of truly humane teaching and learning. **ETp**

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