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Ministry of Higher Education and Scientific Research

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TTU Course

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Lesson 07: Intelligence.

Introduction:

It is often taken for granted that academic success is the result of 'being clever' or 'bright' and that this is something you are blessed with – or not – at birth. Such thinking creates barriers to success. It leads students to assume, falsely, that they will either:

★ continue to do well academically, on the strength of being 'clever' alone, or

★ fail to achieve the highest marks because they are inherently less intelligent than others.

1- Am I intelligent enough for university?

This question haunts many students even if their grades are excellent. They worry that 'secretly' or 'deep down' they aren't clever enough to succeed.

It is very common for students to underestimate their potential or to lose confidence, especially if, as happens to most students at some point, they receive lower grades than they hoped for. Many students can remember an occasion in the past when someone such as a teacher or relative undermined their confidence in their abilities. Such memories can resurface, exercising a disproportionate power to undermine self-belief.

One reason students can become anxious about their capabilities is that they haven't been taught to evaluate their own work or to develop criteria for doing so. As a result, they feel prey to the whims of chance: good or bad marks and grades 'just happen', or depend on the luck of the draw of how 'naturally clever' they are or which tutor they get.

Such thinking leaves students feeling disempowered or adrift, even if their grades are good. They worry about their luck changing or suddenly being exposed as stupid. Anxiety can create a vicious cycle in which students:

★ can't settle down to study

★ can't concentrate or focus their attention

★ can't take in what they read

★ can't remember what they learnt

★ are reinforced in their suspicions that they 'really' lack intelligence.

This is very common, so it is important to look at what we mean by intelligence.

2- Intelligent study

Intelligent study means applying good strategies to study, appropriate to the academic level and to your own ways of learning. University level study makes greater demands, so requires new approaches. The right strategies and mentality can bring success to any student, whereas failure to apply these can result in any student under-achieving.

3- Ten different views of intelligence:

1 Intelligence is a general, underlying 'cleverness' which is fixed for life

Early psychologists believed each individual has a fixed, general level of intelligence, their *intelligence quotient* or IQ (Terman, 1975 [1916]; Spearman, 1927). A person who did well on one intelligence test would do well on others. If you performed poorly on one test, that suggested you were generally less 'bright'. More recently, psychologists and geneticists have used studies of identical twins to support the idea of general intelligence (Plomin and Deary, 2015). However, other psychologists have argued against the concept of general intelligence (Thurstone, 1960) and the roles of genes (Gardner, 1993).

Pairs of twins used in twin studies are often brought up in similar environments and, as they look the same, they might evoke similar responses in other people so that their experiences could be unusually similar. Environment and culture can contribute to intellectual performance. 'IQ' and academic achievement can change for societies, groups and individuals (Armor, 2003). In high income nations, IQ scores rose across the 20th century. Known as the 'Flynn effect' this seems to be linked to increased levels of mass education (Baker et al., 2015).

The *Raven's Progressive Matrices* test was designed to measure abstract reasoning ability with people of any language, age or culture. The test requires participants to choose one visual pattern from a selection of options in order to complete a visual sequence (see below).Scores for *Raven's* correlate strongly with those of other IQ tests, including language-based tests, appearing to support the idea of a 'general' intelligence.

However, although *Raven's* is meant to be culture and language-free, Asian children's scores, scaled according to age, rose by 15–20 points after they had lived for five years in Britain, a significant change (Mackintosh and Mascie-Taylor, 1985). This suggests that intelligence tests are just a snapshot of a person's experiences to date, within a given environment, rather than a good indicator of fixed potential.

2 There are different kinds of intelligence

Gardner (1993) argues that intelligence consists of separate independent systems that interact with each other. For Gardner, there are at least seven 'intelligences': each consists of abilities in solving problems or producing objects relevant to a person's culture and environment. Neuropsychology suggests that different cognitive abilities such as speech may be semi-separate 'domains' of ability, controlled by different circuits within the brain (Karmiloff-Smith, 1992). Some people show a weakness in one area such as a complete inability to recognise faces. Other people show poor development for most skills, but have an outstanding ability in one area such as drawing or mathematical calculation. This supports Gardner's view that intelligence is 'multiple' rather than 'general'. Research indicates that spatial abilities involve skills that can be differentiated from performance on other kinds of 'IQ' tests. Spatial abilities can be important predictors of success in science, technology, engineering and maths (STEM) study and other life outcomes (Rimfeld et al., 2017). It is obvious that most of the intelligences on Gardner's list can be developed. For example, people can attend workshops to develop interpersonal skills, and counselling or meditation to develop intrapersonal awareness. A scientifc way of thinking is formed through practice, training and exposure to the language and conventions of scientifc research. Skill in writing essays, reports or poetry can also be developed through training and practice.

3 Intelligence can be developed

In Japan, the Suzuki Violin Talent Education Programme has trained many children to play the violin to virtuoso level. The programme begins with exposure to music soon after birth and involves daily practice from an early age. Even the less remarkable students perform to a level that in other cultures would be considered that of a child prodigy (Suzuki, 1969; Gardner, 1993). Similarly, children exposed to several languages from an early age tend to become multilingual quite naturally. People who start later in life can also develop into good violinists or linguists. The Suzuki Programme suggests the importance of the belief that *anyone* can learn to a high standard, as well as showing the role of environment and practice in developing skills. Excellence need not be the preserve of the few. Just as we would not, in general, expect excellent violin playing from somebody who rarely played the instrument, we would not expect outstanding intellectual performances from people whose minds are not regularly challenged by ideas and problems. University provides part of that necessary stimulation. As you go through your course, the language and thinking styles of your subject will become part of your own thinking processes and linguistic expression

4 Intelligence depends on life opportunities

As the Suzuki example illustrates, life opportunities can make a signifcant difference. Academic intelligence may be fostered by opportunities such as these:

★ easy access to books, equipment, and appropriate teaching

★ sufcient time to study, think or practise

★ stimulating conversations that require active engagement and reflection

★ validation by people who are important to you, of your specifc learning interests, whether for geometry, philosophy or *cordon bleu* cookery

★ being part of a culture that values academic intelligence.

There are ways in which you can increase these opportunities, such as by making use of library and online resources, through courses and study, and even through your choice of newspaper, radio and other media. If you did not have ideal opportunities for learning when young, or if you were not then ready for these, it might take some time and work to catch up but it can be done. It *is* done, every year, by thousands of mature students.

5 Intelligence depends on what is needed and relevant in the culture

According to this view, intelligence is not just something that individuals carry around in their heads, but depends on what a society regards as important, and the way this is made tangible through its labour requirements, social structures, technologies, education, communications, networks – everything needed for the society and culture to continue. Intelligence is not measured in isolation as individual, but is seen as a *social* phenomenon (Vygotsky, 1978; Resnick, Levine and Teasley, 1991). For example, the intelligence needed in industrial settings is different from that required for a rural economy or life in the mountains or desert. Similarly, the education valued for girls, or for the youngest child within a family, has often varied from that valued for boys or for older siblings. Children adapt to what is expected of them. Sternberg (1985) described intelligence as being, in part, a sensitivity to the environmental context. This can apply to learning contexts also. One learning environment might match what a person is used to, making learning easy. For another person, the same environment and teaching methods might not work. Some people learn best in quiet stillness; others find that sitting quietly is a torture. Some find it difficult to learn from books, and learn better by ear. One student learns best when the curriculum is highly structured; another when it is flexible and offers choice about what they study, when and how.

If you did not do as well at school as you might have done, it may be worth reflecting on how *you* learn best – then compare this with the way you were taught. You might also consider what you were good at when you were a child, and what you valued as important. Were your interests shared and valued by the people around you – your teachers, parents and friends? If not, this could have made learning more difficult for you. Are the things you value *today* shared by the people around you? Do they understand and support your desire to study? If not, as an adult, you can now take responsibility for setting up the right environment for yourself as a student. You might need to find suitable times and spaces for your study on campus or at home. You can organise information in a way that suits your learning preferences, such as by converting information to colourful charts or podcast recordings – whatever works for you. On the whole, your lecturers will not be able to create the ideal environment *for* you, as each person's needs will be different. So it's up to you to look after your own needs.

6 Intelligence is about applying what you know to new contexts

Sternberg (1984) emphasised that any skill is made up of underlying processes and sub-skills; he saw intelligence as the ability to transfer those skills easily when confronted with a new task. What is important is not just that you are able to perform a given task, such as making a pancake or writing an essay, but that you are able to apply what you know to new situations, such as making a cake or writing a report. However, it is not necessarily an easy matter to transfer a skill from one learning situation to another. Research into mathematical problem solving suggests that for skills to be transferred from one problem to another, the student has first to be helped to identify their common features and the underlying principles in solving that kind of problem. If students can recognise that two problems have similar underlying structures, they can apply the principles for solving one problem in solving the other. Also, unless the teacher makes the link between the old and the new learning explicit, the student may not realise that two problems are connected. Further, the new learning needs to be at around the same level of complexity as that already covered (Reed, Dempster and Ettinger 1985). If teaching has not followed these lines, a student can feel lost and give up. In addition, students might think that the fault lies with their intelligence, rather than in the way the problem was presented. A good teacher will help students to see what they already know, and to use this as the basis for the next step in their learning.

7 Intelligence is a question of how much you know

The popular view of intelligence is that it is an ability to answer the type of closed factual questions set on TV quiz shows. This does not take into consideration aspects of intelligence such as creativity or coping in real-life situations. Another view is that intelligence is a capacity for abstract reasoning such as formulating hypotheses or deriving answers from first principles: you don't need to *know* much at all to reason well. Donaldson (1978) argued that the way we reason depends upon the particular context we are in and on what we already know. She demonstrated that both children and adults interpret what they hear by attending not just to the meaning of words, TV quiz shows. This does not take into consideration aspects of intelligence such as creativity or coping in real-life situations. Another view is that intelligence is a capacity for abstract reasoning such as formulating hypotheses or deriving answers from first principles: you don't need to *know* much at all to reason well.

Donaldson (1978) argued that the way we reason depends upon the particular context we are in and on what we already know. She demonstrated that both children and adults interpret what they hear by attending not just to the meaning of words, but also to their personal understanding of those words based on their own thoughts and previous knowledge. It follows that the amount and kinds of background knowledge you bring to academic study will affect the ease with which you can process new information and reason with it. Our ability to think in abstract ways about something can depend on having already had real-life experience of similar problems. Butterworth (1992) describes how abstract notions such as 'generosity' are actually concrete social realities: real-life experience allows us to develop a mental model, and this model later provides the basis for abstract thinking. If we have gaps in concrete experience – such as with manipulating numbers – we are likely to find it harder to move on to more abstract examples until we have filled the gaps.

Butterworth suggests that when presented with a familiar problem in an unfamiliar context, we may be unable to recognise that the two are similar. This can make us look and feel like complete beginners when it is not the case. It might take somebody else to point out the similarity between what we already know and the new learning. When we see the link, we can do the problem.

'Plastic brains'

The brain has 'plasticity': it is capable of change and development. When a person takes up a new skill, millions of fresh connections are set up between different neurons in the brain to deal with the new information – rather like a set of telephone wires relaying information. The more you develop an ability, the more elaborate the neural networks or wiring system, and the faster your brain can process information related to that skill. When you begin to study a new subject, the speed at which you will be able to take things in and make sense of them will depend on how far your brain can use past learning experiences. If you have studied something very similar in the past, you may experience the new learning as quite easy. If a subject is very new, however, there is little foundation upon which you can build. Your brain has fewer connections it can use to make sense of the new information. If the language used is also unfamiliar to you, the brain will need to build connections for this too. You may *experience* this as finding it harder to listen or harder to read: you may get tired more quickly, or you may feel that your brain is 'dead', or that nothing makes sense. As you go over the same material from different angles, though, the new connections will get stronger and learning will become easier.

8 Intelligence can be measured

IQ tests only measure things that can be measured! Many areas of human excellence, however, cannot be measured easily – such as artistic and musical creativity, emotional maturity, sensitivity to others' needs, managing well in emergencies, being enterprising and inventive. Some people may excel in these areas and yet perform poorly in tests that are language-based. Students who struggled with language- or number-based subjects at school can excel on university courses in the arts. Similarly, people whose spoken communication skills are weak can excel on a range of university courses Einstein's schoolwork was not very good – yet IQ tests are said to correlate well with school performance. Einstein claimed that his initial ideas on the relativity of time and space struck him in a moment of inspiration while he was daydreaming that he was riding on a sunbeam. This kind of imaginative thinking is difficult to measure using IQ tests.

9 Intelligence is about applying effective strategies that can be learnt

This book is based on the premise that what we regard as intelligence is often a question of good study strategies and skills that you can develop. For example, research shows that students who do best at problem-solving spend longer than other students in working out exactly what the problem is before trying to solve it. Other students look at the surface of the problem and do not see the underlying structure which connects it to problems they already know how to solve. Some students fail because they don't spend enough time considering the examples and information they are given; others copy out

examples without reflecting on the underlying purpose of the activity (Keane, Kahney and Brayshaw, 1989). Successful students use strategies that can be learnt. Although the research mentioned above referred to a particular kind of problem-solving, its findings apply to study in general. Some students skim across the surface of their learning, copying a bit from one book and a line from another, without really looking at why the work was set, what the information means, its relevance to them, nor how it might be applied to new contexts. With most university assignments you benefit from taking time to reflect, clarifying what is really being asked, the issues within the title, the reasons it was set, why it is phrased exactly as it is, and the best strategy to use. This way of thinking and working can become a habit.

10 Intelligence is a question of habit and practice

As with any skill, study skills develop through frequent use until your application of them is like a reflex and feels instinctive. Rapid and skilful reading comprehension develops through constant reading, and familiarity with specialist texts typical of your subject. The more you write, the better your writing skills are likely to be. The more you apply your mind to thinking in critical analytical ways, the more fine-tuned your thinking ability. If you want to achieve well, constant practice, coupled with critical reflection on your work, is essential

4- Gardner's Multiple Intelligences:

a) What is MI theory?

In 1983 Harvard psychologist Howard Gardner published his theory of multiple intelligences in his book Frames of Mind. Gardner identified eight separate intelligences. He defines intelligences as independent mental abilities characterized by core operations. For example, musical intelligence focuses on the core operations of recognizing pitch and rhythm. Gardner states that most people have at least seven of these intelligences, but that in some people one intelligence may dominate, and in other people the intelligences blend

b) Gardner's Types of Intelligence:

Below are descriptions of Gardner's eight intelligences.

Linguistic intelligence: the ability to use language to express one's thoughts and to understand other people orally or in writing

Musical intelligence: the ability to hear music in one's head, and to hear tones, rhythms, and larger musical patterns

Logical-mathematical intelligence: the ability to manipulate numbers, quantities, and operations accompanied by a love of dealing with abstraction

Spatial intelligence: the ability to represent the spatial world visually in one's mind

Bodily kinesthetic intelligence: the ability to use the whole body or parts of the body to solve a problem, create a product, or put on some kind of production.

Intrapersonal intelligence: the ability to know and understand one's self, including goals, tendencies, talents, limitations

Interpersonal intelligence: the ability to notice and make distinctions among other individuals; a strong understanding of other people

Naturalist intelligence: the ability to discriminate among living things and to see patterns; also, a sensitivity to features of the natural world

c) Applying multiple intelligences to study contexts

Gardner suggests that different intelligences interact, a view also supported by genetic behaviourists (Kan et al., 2013; Plomin and Deary, 2015). Students who work in a multi-sensory or a multi-disciplinary way often find that learning in one area enhances learning in other areas. If you develop a sense of rhythm, this can improve not only music and dance, but maths and spelling. Similarly, students who are sensitive to shades of colour can use these to structure and organise information might be applied to new contexts.

With most university assignments you benefit from taking time to reflect, clarifying what is really being asked, the issues within the title, the reasons it was set, why it is phrased exactly as it is, and the best strategy to use. This way of thinking and working can become a habit.

interesting.