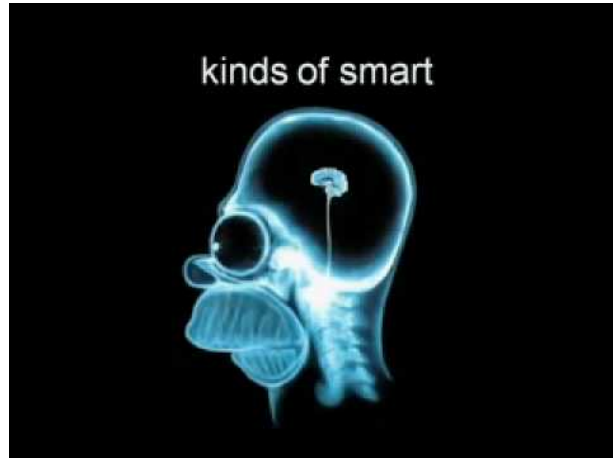


A History of Intelligence and Abilities and Aptitudes in Relation to Learning.

Defining intelligence is a lot more difficult than it initially seems, unlike height or weight, it is difficult to get an exact measurement of an individual's intelligence. Intelligence has different meanings for different cultures and age groups and skill sets.



So what is intelligence?

This is a question that not only do we still not have a universally accepted answer for, but is one that raises even more questions when it's asked. Such as: "What influences intelligence?", "How do we measure it?", "Is it a single general ability or does it cover a range of abilities and aptitudes?" and "Are there different kinds of intelligence, such as emotional intelligence?".

This difficulty in definition and the seemingly endless questions and possible answers is what makes intelligence one of the most hotly discussed topics in psychology. Intelligence is not only an individual difference that is complicated, it's very often controversial.



"Nobody's perfect, but we're working on it."

It was **Francis Galton** who first began discussing intelligence as a way to classify people outside of practical applications. Galton, taking a leaf out of his cousin Charles Darwin's book, theorised that intelligence had **biological**

underpinnings and that selective breeding of intelligent people could produce increasingly intelligent offspring, Galton called this **eugenics**. During this time, in Paris, the French government had recently decided that all children should be sent to school and given an education. Binet and his colleague Simon developed the **Binet-Simon Test** which was used to sort children into groups with similar abilities so that they could be more effectively taught. Unlike Galton, Binet believed that intelligence was not something we are born with but something we can work on and improve on and hoped that his test would identify those children who needed additional attention and help. Unfortunately, his test was used to do the exact opposite and test results were used to label children as underachievers and limit their opportunities.

William Stern took aspects of the Binet-Simon test and used them to create the famous **Intelligence Quotient (IQ) test**.

$$\text{IQ} = \frac{\text{mental age}}{\text{chronological age}} \times 100$$

These tests are useful when used on children who have clear developmental milestones, but there is little difference between ages in adults. For example, there isn't much difference between mental age of 30 and a mental age of 31. However, Lewis Terman who was working from Stanford University at the time encouraged the United States government to begin mass intelligence testing of adult American citizens and immigrants. These test scores were used for practical reasons such as assigning military personnel to suitable jobs during World War I, and less practical reasons such as the mass sterilization of young uneducated women. This total disregard for individual differences in learning and intelligence clearly has catastrophic consequences.

In the early twentieth century it became more accepted that individuals differed with regards to intelligence, aptitudes and abilities. Charles Spearman stated that although we might all have differing individual aptitudes, these aptitudes were all related to his G-Factor of intelligence. Spearman, working with the ideas of Francis Galton developed a statistical procedure known as Factor Analysis to explain how one aptitude or ability could correlate with others to create clusters of abilities which all came together under the umbrella of the G Factor. However, placing a single numeric label on a person's intelligent was then, and still is now very problematic and Spearman's ideas have been challenged extensively. One such challenger is American psychologist Thurstone who administered participants with 56 intelligence tests and ended up with a range of 7 mental abilities and stated that a high score in one did not predict a high score in others, thus disproving Spearman's G Factor theory. However, when Thurstone's studies were replicated, it was found that a high score in one aspect of an intelligence test did tend to predict a similar score on the others. These findings essentially backed up the theory of some kind of G factor.

Despite this, Spearman's theory does not take into consideration individual differences in learners and their intelligence. For example gifted artists with little aptitude for mathematics, or musicians with mediocre language skills. This brings forth further questions such as: Can we conclude that a person



is intelligent or not based on some aptitudes but not others? Do some aptitudes hold more weights than others? Further, are there individual differences outside of intelligence which will affect the ability to learn? And as such is it problematic to reduce the expression of a person's intelligence to a single test score?

These questions are never more relevant than when dealing with atypical learners such as gifted and talented learners or students who have a learning disability. A highly able student who has exceptional mathematical ability will often be of average ability when it comes to learning other subjects such as languages or art for example. Further to this, some students who are exceptional in one area, could actually be at a deficit in another such as a talented musician who has dyslexia or attention deficit hyperactivity disorder (ADHD). These students are known as twice exceptional and even now are often overlooked because their learning disability prevents an adequate assessment (such as an inability to attend to a test or insufficient language skills required to read or answer test questions) or their learning disability is not sufficiently supported due to a general belief that high ability in one area corresponds with high ability in others.

These kinds of learners are who lead Gardner to theorize that there are multiple



intelligences beyond Spearman's G Factor. These multiple intelligences included not only aspects of "traditional" intelligence but aspects such as interpersonal intelligence such as those required to be a great leader and bodily-kinesthetic intelligence which is required to be a skilled athlete or dancer. Most modern theories of intelligence now agree that there is more than one kind intelligence, and these theories have allowed teachers to

appreciate the variety of talents of the various learners in their classes. Although there does still seem to be an over emphasis in the media and to the man on the street on a

“high IQ score” to be seen as an able and effective learner, theories such as Gardner's (and Sternberg's)

allow students and in particular atypical learners' differences in abilities and aptitudes to be fully appreciated and catered to in the classroom.

If you were only going to read one thing... [read this](#)

This entry in the Encyclopedia of Education give a great run down of the very basics in individual differences in learning. It's not only got a great section on intelligence, but it also discusses Culture and Gender. There are a variety of authors and the references are a great starting point for further research!

Personality - is there an ideal personality for learning?

It comes at no surprise that personality is an individual difference known to affect learning in Higher Education (HE) in various ways but it seems there is hope for most personality types regarding their ability to learn. It is linked to many other factors and the literature exploring this is seemingly endless. Before considering these, however, it is important to understand the potentially direct influence of personality dimensions on learning.

Most commonly in the research area, the Big Five personality traits are those measured



but there are many inconsistencies amongst findings – likely to be a result of other factors being tested simultaneously.

Chamorro-Premuzic & Furnham (2003) carried out two longitudinal studies with University students and tested academic

performance in exams and end-of-year-projects, offering results regarding personality that are basically isolated from other influencers. They found conscientiousness was the most influential factor, largely congruent with much of the literature and attributed here to its reflection of a hard-working, organised and ambitious character required to do well in HE. Neuroticism was the second most influential dimension, again reflective of research patterns. Unexpectedly, it was found to affect both measures of performance even though it was anticipated only to be anxiety-provoking and thus detrimental during exams. It is worth mentioning that a strength of this paper is that it provided clear explanations of how these personality dimensions directly affected aspects of the students' University work in a way not done so well throughout the area in general. Here, extraversion was only influential (positively, that is) on project marks and is potentially the most ambiguous personality factor in terms of its relation with academic performance. Inconsistent with much of the literature, was the finding that openness had an effect on performance but this was attributed, probably accurately, to the homogeneity of the sample, in that they were all psychology students. We all know, of course, that psychology students are exceedingly open individuals and thus looking at students from other degree disciplines to compare is important but is unfortunately not done enough in the research – perhaps also contributing to the inconsistencies.

In this 2003 study, the authors also considered academic behaviour indicators, such as absenteeism and tutor predictions, and how they affected academic performance. It seems that none of these were as close to personality in influential power – an idea which many students are likely to find encouraging. Given that most of the personality dimensions derive or relate complexly to other influencers, however, it is crucial that you consider these carefully before drawing any solid conclusions (assuming there are such things to be drawn here).

Intelligence

Again, it is largely unsurprising that intelligence is linked to learning but, despite this once being considered the most important determinant (Harris, 1940), the research has come far enough to show that we must be careful not to over-estimate its power.



Traditionally, it was viewed as being more important than personality and other factors (Elishout & Veenam, 1992) but it is now generally accepted that personality is just as, if not more, influential.

Some research has deduced that intelligence is actually fundamentally linked to personality aspects - most strongly of all being conscientiousness (Busato, et al, 2000) and openness (Blicke, 1996). The link with conscientiousness is fairly self-explanatory and the results obtained regarding openness are explained by lexical intelligence's correlation with the "aesthetic" and "idea" scales within this personality factor. Upon deeper inspection of the literature, however, it becomes clear that perhaps this once assumed inherent link between intelligence and HE learning may be indeed exaggerated. For example, Busato, et al (2000) found only a very small contribution by intelligence which was far outweighed by personality.

It is also important to consider intelligence as a concept before drawing any conclusions about it in this context. Any psychology student who has attended an individual difference lecture will tell you that there are strong arguments to suggest intelligence and how it is tested have issues attached and questions must also be raised as to whether it will vary enough amongst a HE population who will undoubtedly be of similar, relatively high intelligence levels. Therefore, although there is some evidence for its link with personality and ultimately HE learning, caution must be taken when investigating these relationships and making conclusions.

Motivation

A further dimension of the personality and HE learning literature is that of academic motivation. It penetrates most of the research as it is viewed as a key determinant of performance and achievement (Green, et al, 2006). Indeed, there is extensive evidence that it is inherently linked to the personality factors (Clark & Schroth, 2010) in different ways depending on the individual type of motivation students possess. In one of the following sections, motivation and its relation to learning is explored in far more depth but, for now, the results from this 2010 study are worth glancing over and should make more sense in light of the full document:

- Intrinsic motivation related to extraversion, agreeableness, conscientiousness and openness, but relations were dependent on the specifics of the task at hand
- Extrinsic motivation related to extraversion, agreeableness, conscientiousness and neuroticism but was also linked with the specific task
- Amotivation related to disagreeability and carelessness

Style & Approach - is there a perfect way to approach learning?

Style

The concept of learning style opens up a whole new area of the literature that would be impossible to cover fully within this document. There are countless interpretations and representations of learning style but Vermunt's (1998) checklist of what any so-called learning style should consist of are a good starting point:

- Processing strategies such as thinking activities
- Regulatory strategies, e.g. monitoring, planning and control of processing
- Mental models of learning, meaning how they think of learning

- Learning orientations, including personal aims, expectations and doubts

Learning style ties in with individual differences and personality as it is accepted people will lean towards their own style, largely dependent on personality factors - so much so it has been called a subset of personality (Jackson & Lawty-Jones, 1996). However, much of the research shows this may not be the case. For example, in Busato et al (2000) there was no link with their four learning styles (undirected, reproduction directed, application directed and meaning directed) and personality. As mentioned, there is a seemingly endless amount of research on different learning styles meaning it is difficult to fully comprehend how personality and other individual factors come into play.

These difficulties are further enhanced when the construct of *cognitive style* is also taken into consideration, as it presents disputes regarding its nature and link with learning style and approach. Riding & Sadler-Smith (1999) make a convincing argument for cognitive style to be considered as its own stand-alone construct, away from the umbrella of learning style it is often put under. They state that individual cognitive styles tend to be more “pervasive, stable and deep-seated” than learning styles and represent qualitative differences in individual students. In something of a contrast, Kozhevnikov (2007) presents cognitive style as a larger construct, of which learning style is derived. This paper offers a strong illustration of the history of cognitive style (Klein, 1951) and how this developed to form the two original, differing conceptions of learning style (Gregorc, 1984; Kolb, 1974).

The confusion arising about the relationship between learning and cognitive styles is actually somewhat reflective of their general representation throughout the literature. Indeed, many inconsistencies, disputes and critiques still surround these constructs, particularly in terms of their definition, validity and measurement methods. See [Peterson, et al \(2009\)](#) for a coherent summary of the current issues with these

constructs deriving from evidence from researchers in the field. Despite improvements needing to be done, there is no denying that style, in some form or another, is an individual difference that affects learning in HE, more so than cognitive ability/intelligence and situational factors (Riding & Sadler-Smith, 1999) and it indeed has links with personality.

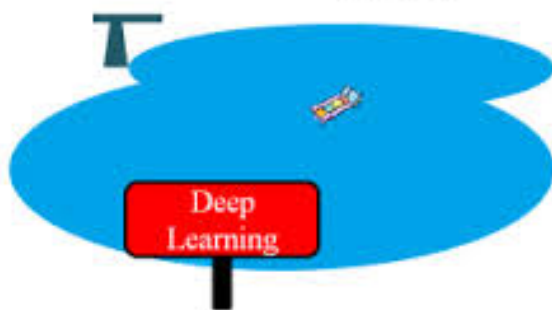
I would recommend for a coherent and relevant technical expansion of these ideas, read [this document](#).

Approach

It is worth considering the overlap between style and learning approach, another aspect tested within this research area. Approach is represented in a more definite model, which involves three different approaches to HE learning (Entwistle & Tait, 1995):

1. **Deep** - done when the learning is apparently related to the students interests, they receive support from instructor and can play a large part in monitoring their own learning (Ramsden & Entwistle, 1981)
2. **Surface** - happens generally when the assessment of learning is based on reproducing information (Dart & Clarke, 1991)
3. **Strategic** - occurs in highly organised cases and when individuals have high motivation to achieve (Watkins, 1982)

"We need to give students snorkels, not water-skis,"
Ben Jonson



There are clear commonalities between approach and style - not least when it is considered that deep and surface learning are some of the recurring styles presented in research (Busato, et al, 2000). Despite

this, the more definite nature of these approaches means it can be tested more reliably and has indeed yielded results showing the direct link with personality. Duff, et al (2004) found a deep approach was most easily achieved with those high in extraversion and openness, surface was associated with neuroticism and agreeableness and the strategic approach was represented mostly by those high in extraversion and conscientiousness and low in neuroticisms. It appears, therefore, that there may not actually be an ideal personality type for increased learning in HE but that different types perform better depending on the nature of the information, the assessment and ultimately which approach must be adopted to achieve. Approach can be dynamic and is very much dependent on what demands the student is facing and indeed their individual personality (Zeegers, 2000).

Another thing to be considered is that Duff et al (2004) tested other factors within their study - those of age and orientation to learning, based on things such as previous academic achievement. Both were found to be related to achievement but not as influential as approach. In the case of orientation, the authors concluded it is a learnt component of personality and presents an interesting argument for whether previous experiences with learning should be tested separately, as part of personality or at all in this context. There is sufficient evidence, however, to believe that it plays some part and comparisons between testing it in isolation and with personality could be important in future.

Are you learning for life or for good grades?

- Intrinsic and Extrinsic motivation and academic performance



Most theories of motivation view motivation as a unitary concept that varies from very little motivation to a great deal of it. However, some theories argue that it is clear that motivation is not a unitary concept, only varying in amount but also, they argue, motivation is a concept varying in orientation or type of motivation. Self-determination theory argues that the orientation of motivation concerns the different goals and reasons that underly an action and answers the question 'why?' an action is performed. For example, a student can be highly motivated to do homework out of personal interest or because he/she wants to get a good grade (Ryan & Deci, 2000). In this example the amount of motivation may not vary but the orientation of motivation does. There are two distinguished types of motivation - intrinsic motivation and extrinsic motivation (Deci & Ryan, 1985).

Intrinsic motivation

Deci and Ryan (1985) argue, according to the self-determination approach to motivation, that intrinsic motivation is to perform an activity simply for the satisfaction and pleasure that comes with it. Fulfilling innate needs for competence and self-determination is what drives intrinsic motivation. A student who is intrinsically motivated to do something also perform the task voluntarily and view new knowledge as a challenge to their existing competencies. An intrinsically motivated student enjoys doing activities that are linked to the individuals positive feeling while performing the activity. Thus, interest in the activity or subject is important and so is a sense of making

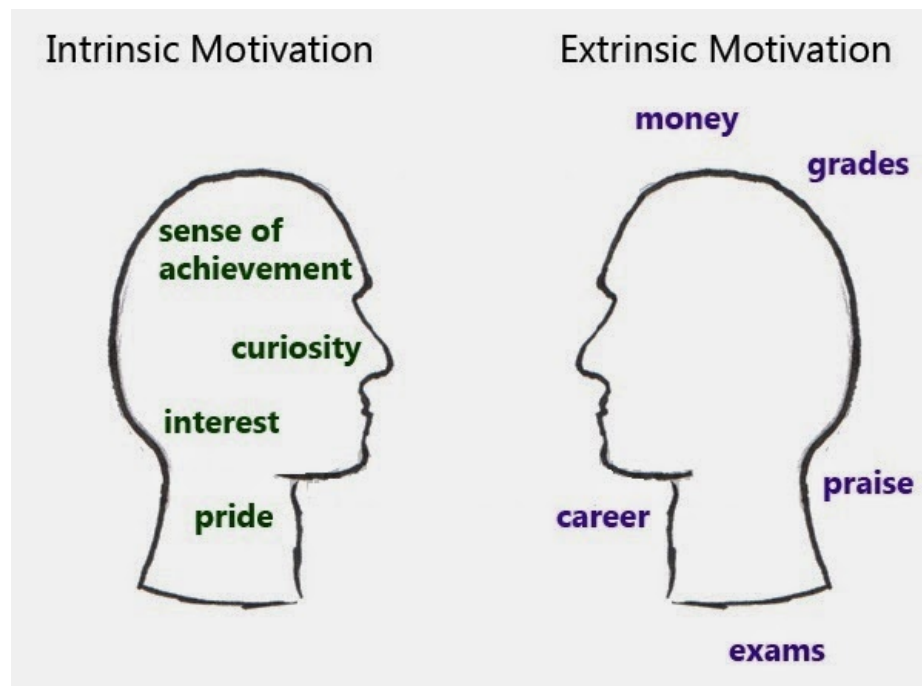
progress (Deci & Ryan, 1985). Studies about motivation in language learning argue that students who intend to continue learning a new language are more intrinsically motivated, thus they learn the language for the language's sake, than students who are extrinsically motivated and who intend to stop learning a new language and who view language learning as a means to other goals, for example acquire course credit (Ramage, 1990).

Extrinsic motivation

A student is motivated by rewards or punishments which depends on the success or failure in a task thus it is not dependent on interest or enjoyment. Grades are a common extrinsic reward for students. It was originally believed that extrinsic motivation lacks self-determination, however, more recently it has been argued that there are three levels of extrinsic motivation in the context of education and self-determination may be more important in some of these than others. The three levels of extrinsic motivation are:

1. External: Motivating behaviour by means external to the individual for example taking a specific course for the sole purpose of acquiring course credit.
2. Introjected regulation: Motivating behaviour by means internal to the individual for example in response to some kind of pressure that the individual has internalised. For example, a student putting a lot of effort into learning something in order to make other people impressed by their proficiency. Thus, learning takes place when the student feels the need to self aggrandize but also when he or she feels the need to reduce guilt by for example do their homework for the sole reason to avoid feeling guilty.
3. Identified regulation: A student performs a behaviour because he or she thinks it is important personally (Deci and Ryan, 1995). For example a student who has

experienced the value of knowing several languages may value language learning very positively. Thus, the student's learning is sustained as long as he or she finds it to be valuable (Deci & Ryan, 1985).

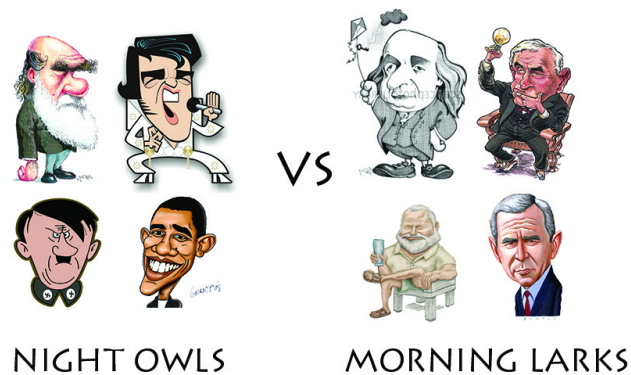


It has been argued that intrinsic- and extrinsic motivation are incompatible. As one of William Perry's students at Harvard University once said: "I can't afford to get interested in this course because I have to get a good grade" (Lin, McKeachie & Kim, 2001). Thus, being interested and assumedly learning for life (intrinsic), which is one of the goals of higher education, may not be what is best in terms of getting good grades. On the other hand increased intrinsic motivation has been linked to higher academic performance (Harter & Connell, 1984). Covington (1999) agrees with Harter and Connell (1984) and argues that working for high grades is not incompatible with valuing learning as long as the student is not failure avoidant and see grades as providing feedback for future improvement. Assumedly, a combination of intrinsic and extrinsic motivation seems to be most effective in terms of acquiring good grades but also to

encourage students to study subjects they find enjoyable and interesting and to learn for life and not only for marks.

Are you a morning lark or a night owl?

- Circadian preferences and academic performance.



Test yourself: <http://www.bbc.co.uk/science/humanbody/sleep/crt/>

Circadian preference is what determines preferred bed-/rise times, midpoint of sleep and preferred time for mental and physical activity (Adan et al., 2012). Individuals who perform best in the mornings are morning types (MT), individuals who feel most alert in the evenings are evening types (ET) and those individuals who do not have a particular circadian preference are neither types (NT) (Natale & Cicogna, 2002). Circadian preference is to a great extent determined by genetics (Adan et al., 2012) but is also affected by other factors such as age, gender and social environment (Önder, Besoluk, Iskender, Masal & Demirhan, 2014).

What happens when individuals have to perform outside their circadian preference? When a night owl has to perform and be alert in the early hours of the day and vice versa, social jetlag occurs. Social jetlag means that an individual has to participate and perform in activities and duties when their chronotype is in asynchrony with their

preferred time of the day (Diaz-Morales & Escribano, 2013). For example, a night owl has to get up early to go to class/work, which might mean that he or she has not slept the hours needed during the night to feel refreshed in the morning (Tzischinsky & Shochat, 2009). It has been reported in several studies that ET have poorer sleep quality than MT and NT whereas morning people report significantly less daytime sleepiness than ET and NT (Lima, Varela, Silveira, Parente & Araujo, 2010). This suggests that both the evening- and the neither types are expected to rise before their circadian optimum and both are therefore affected by social jetlag (Önder, Besoluk, Iskender, Masal & Demirhan, 2014). It has previously been proposed that later school starting times could reduce social jetlag in adolescents (Hansen et al., 2005).



The implication of early school starts includes that one chronotype (MT) is more favored than other types (ET and NT) may for instance be noted in research reporting better academic performance in morning people (Onyper, Thacher, Gilbert & Gradess, 2012). Morning larks who easily wake up in the morning, have less sleep-related problems and are more active and alert at earlier times of the day have been found to perform better in exams, than evening people (Besoluk, 2011). It has also been suggested that they

might have a higher motivation to learn and achieve (Roeser et al., 2013). Night owls, on the other hand, go to a morning class or a morning meeting feeling less motivated to learn and achieve because they do not feel sufficiently rested and are less alert in that time of the day (Roeser, 2013). Poor sleep quality also have a negative effect on physical- and mental health which also may affect their academic performance (Valdez et al., 2008) Thus, early scheduled activities may explain why some studies report evening people performing worse in exams.

However, in a recent study conducted at the university of Madrid in which out of nearly 1000 participants 25% were classed as MT, 32% were classed as ET and the remainder were classed as NT they found that ET students scored higher on inductive reasoning which is a good estimate of general intelligence and one of the best predictors of academic performance

(<http://www.independent.co.uk/life-style/health-and-families/health-news/if-you-want-to-get-ahead-be-a-night-owl-8547115.html>). Similar results were found in another study which was conducted on US Air Force recruits and they found that ET recruits were significantly more intelligent than MT even when they were tested in the morning (Roberts & Kyllonen, 1999). Creative thinking is another domain in which ETs outperform MTs (Giampietro & Cavallera, 2007). Thus, there seems to be an ongoing debate about whether it is best to be a morning lark or a night owl. What is clear, however, is that in the context of higher education universities should really try to schedule lectures, tutorials and exams so that all chronotypes are given the best conditions to learn and perform.

Summary Advice

Personality - It is important to account for all of the influencing factors and reading [Busato et al \(2000\)](#) is an excellent place to start, or at least provides a coherent summary if you have no further interest, as it covers the main influencers of intelligence and motivation.

Style & approach - There are seemingly endless theories and ideas about different learning styles and approaches but reading [Duff, et al \(2004\)](#) would give you a clear understanding of a, for want of a better phrase, straightforward approach to approach. Further, this paper is ideal for looking at the crucial overlap between style/approach and personality, boosting its usefulness when researching this area.

Intrinsic and extrinsic motivation - This is a relatively recent paper which provides a comprehensive overview of the differences between intrinsic- and extrinsic motivation. It also describes some of the past and current debates regarding motivation, for example whether intrinsic- and extrinsic motivation are incompatible.

Ryan, R. M., & Deci, E. L. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary educational psychology*, 25(1), 54-67.

Circadian preferences and academic performance - A very good and recent paper looking at several aspects of academic performance, and especially relating to circadian preferences and sleep quality.

Önder, İ., Beşoluk, Ş., İskender, M., Masal, E., & Demirhan, E. (2014). Circadian Preferences, Sleep Quality and Sleep Patterns, Personality, Academic Motivation and Academic Achievement of university students. *Learning and Individual Differences*, 32, 184-192.

References - Personality

Blickle, G. (1996). Personality traits, learning strategies, and performance. *European Journal of Personality*, 10, 337-352.

Busato, V. V., Prins, F. J., Elshout, J. J., & Hamaker, C. (2000). Intellectual ability, learning style, personality, achievement motivation and academic success of psychology students in higher education. *Personality and Individual Differences*, 29(6), 1057-1068.

Chamorro-Premuzic, T., & Furnham, A. (2003). Personality predicts academic performance: Evidence from two longitudinal university samples. *Journal of Research in Personality*, 37(4), 319-338.

Clark, M. H., & Schroth, C. A. (2010). Examining relationships between academic motivation and personality among college students. *Learning and individual differences*, 20(1), 19-24.

Elshout, J., & Veenman, M. (1992). Relation between intellectual ability and working method as predictors of learning. *Journal of Educational Research*, 85, 134–143.

Green, J., Nelson, G., Martin, A. J., & Marsh, H. (2006). The causal ordering of self-concept and academic motivation and its effect on academic achievement. *International Education Journal*, 7, 534–546.

Harris, D. (1940). Factors affecting college grades: a review of the literature, 1930-1937. *Psychological Bulletin*, 37, 125-166.

Jackson, C. J., & Lawty-Jones, M. (1996). Explaining the overlap between personality and learning styles. *Personality and Individual Differences*, 20, 293–300.

Kolb, D. A. (1984). *Experiential learning*. Englewood Cliffs, NJ: Prentice-Hall.

Vermunt, J. D. (1998). The regulation of constructive learning processes. *British Journal of Educational Psychology*, 68, 149-171.

References - Style & Approach

Dart, B. C., & Clarke, J. A. (1991). Helping students become better learners: a case study in teacher education. *Higher Education*, 22, 317–335.

Duff, A., Boyle, E., Dunleavy, K., & Ferguson, J. (2004). The relationship between personality, approach to learning and academic performance. *Personality and individual differences*, 36(8), 1907-1920.

Entwistle, N. J., & Tait, H. (1995). The revised approaches to studying inventory. Edinburgh: Centre for Research on Learning and Instruction, University of Edinburgh.

Gregorc, A. F. (1984). Style as symptom: Phenomenological perspective. *Theory into practice: Ohio State University, College of Education*, 23, 51–55.

Klein, G. S. (1951). A personal world through perception. In R. R. Blake & G. V. Ramsey (Eds.), *Perception: An approach to personality* (pp. 328–355). New York: The Ronald Press Company.

Kozhevnikov, M. (2007). Cognitive styles in the context of modern psychology: toward an integrated framework of cognitive style. *Psychological bulletin*, 133(3), 464.

Peterson, E. R., Rayner, S. G., & Armstrong, S. J. (2009). Researching the psychology of cognitive style and learning style: Is there really a future? *Learning and Individual Differences*, 19(4), 518-523.

Ramsden, P., & Entwistle, N. J. (1981). Effects of academic departments on students approaches to studying. *British Journal of Educational Psychology*, 51, 368–383.

Sadler-Smith, E., & Riding, R. (1999). Cognitive style and instructional preferences. *Instructional science*, 27(5), 355-371.

Watkins, D. (1982). Identifying the study process dimensions of Australian university students. *Australian Journal of Education*, 26, 76–85.

Zeegers, P. (2000). Approaches to learning in science: a longitudinal study. *British Journal of Educational Psychology*, 71, 115–132.

References - Are you learning for life or for good grades? - Intrinsic and extrinsic motivation and academic performance

Covington, M. V. (1999). Caring about learning: The nature and nurturing of subject-matter appreciation. *Educational Psychologist, 34*(2), 127-136.

Deci, E. L., & Ryan, R. M. (1985). The general causality orientations scale: Self-determination in personality. *Journal of research in personality, 19*(2), 109-134.

Harter, S., & Connell, J. P. (1984). A model of children's achievement and related self-perceptions of competence, control, and motivational orientation. *Advances in motivation and achievement, 3*, 219-250.

Lin, Y. G., McKeachie, W. J., & Kim, Y. C. (2001). College student intrinsic and/or extrinsic motivation and learning. *Learning and Individual Differences, 13*(3), 251-258.

Noels, K. A., Clément, R., & Pelletier, L. G. (1999). Perceptions of teachers' communicative style and students' intrinsic and extrinsic motivation. *The Modern Language Journal, 83*(1), 23-34.

Ramage, K. (1990). Motivational Factors and Persistence in Foreign Language Study*. *Language Learning, 40*(2), 189-219.

Ryan, R. M., & Deci, E. L. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary educational psychology, 25*(1), 54-67.

References - Are you a morning lark or a night owl? - Circadian preferences and academic performance

Adan, A., Archer, S. N., Hidalgo, M. P., Di Milia, L., Natale, V., & Randler, C. (2012). Circadian typology: A comprehensive review. *Chronobiology international*, 29(9), 1153-1175.

Díaz-Morales, J. F., & Escribano, C. (2013). Predicting school achievement: The role of inductive reasoning, sleep length and morningness–eveningness. *Personality and Individual Differences*, 55(2), 106-111.

Giampietro, M., & Cavallera, G. M. (2007). Morning and evening types and creative thinking. *Personality and Individual Differences*, 42(3), 453-463.

Hansen, K. H., Vang-Lauridsen, J., & Asheim, B. (2005). The Creative Class and Regional Growth-Towards a knowledge based Approach. *CIRCLE Working Paper WP 2005/15*.

Lima, A. M. A., Varela, G. C. G., Silveira, H. A. C. S., Parente, R. D. G., & Araujo, J. F. (2010). Evening chronotypes experience poor sleep quality when taking classes with early starting times. *Sleep Sci*, 3(1), 45-8.

Natale, V., & Cicogna, P. (2002). Morningness-eveningness dimension: is it really a continuum?. *Personality and Individual Differences*, 32(5), 809-816.

Onyper, S. V., Thacher, P. V., Gilbert, J. W., & Gradess, S. G. (2012). Class start times, sleep, and academic performance in college: A path analysis. *Chronobiology International*, 29(3), 318-335.

Roberts, R. D., & Kyllonen, P. C. (1999). Morningness–eveningness and intelligence: early to bed, early to rise will likely make you anything but wise!. *Personality and Individual Differences*, 27(6), 1123-1133.

Roeser, K., Schlarb, A. A., & Kübler, A. (2013). The Chronotype-Academic Performance Model (CAM): Daytime sleepiness and learning motivation link chronotype and school performance in adolescents. *Personality and Individual Differences*, 54(7), 836-840.

Tzischinsky, O., & Shochat, T. (2009). Eveningness, sleep patterns, daytime functioning, and quality of life in Israeli adolescents. *Chronobiology international*, 28(4), 338-343.

Valdez, P., Reilly, T., & Waterhouse, J. (2008). Rhythms of mental performance. *Mind, Brain, and Education*, 2(1), 7-16.

Önder, İ., Beşoluk, Ş., İskender, M., Masal, E., & Demirhan, E. (2014). Circadian Preferences, Sleep Quality and Sleep Patterns, Personality, Academic Motivation and Academic Achievement of university students. *Learning and Individual Differences*, 32, 184-192.