Principles of skill learning

Unit 5.3	Principles of Skill Learning
Key learning intention (KLI)	To demonstrate an understanding of how to maximise the learning of a skill through instruction and practice.
Success criteria	I can design a lesson plan for a sport my choice explaining my selection of different types of teaching style and practice.
Resources	P121-137
Key words	Learning, performance, transfer, Cognitive, Associative, autonomous, Learning curve (positive acceleration, negative acceleration, liner, plateau), skill transfer (bilateral, abilities-to-skill, skill-to-skill, practice-to-performance, stage-to-stage, principle-to-skill), types of practice (distributed, massed, fixed, variable, mental), types of presentation (whole, whole-part-whole, progressive-part, part)

Principles of skill learning

Want to improve your sports performance? It's just about practice, right?

5.3.1 Distinguish between learning and performance

- Although we measure learning by observing performance it is important that we know the difference between the two.
- Kerr (1982) defined performance as being 'a temporary occurrence fluctuating from time to time: something which is transitory'.

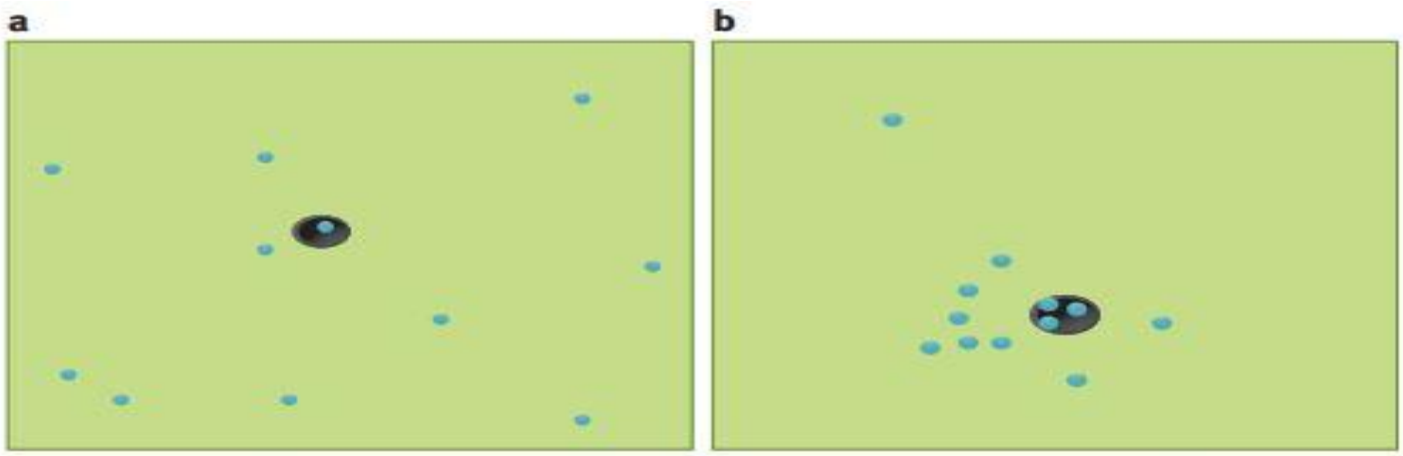
5.3.1 Distinguish between learning and performance

Learning is a relatively permanent change in performance brought about by experience, excluding changes due to maturation and degeneration.

Performance is a temporary occurrence, fluctuating over time.

A change in performance over time is often used to infer learning.

5.3.1 Distinguish between learning and performance



↑ Figure 5.10: **a** shows a learner's attempts to sink a putt in golf while **b** shows the attempts by an experienced golfer.

- Figure 5.10a shows a learner's attempts to sink a putt in golf. Notice that one shot actually went in.
- Figure 5.10b shows the attempts by an experienced golfer. Notice the way the shots are clustered around one point.

Skill in sport

5.3.1 Distinguish between learning and performance

- Even the beginner can produce one good shot but we are not thought to have fully learned a skill until we can perform it with some consistency.
- The process of acquiring this consistency is what we mean by learning.
- Kerr described learning as "a relatively permanent change in performance resulting from practice or past experience."

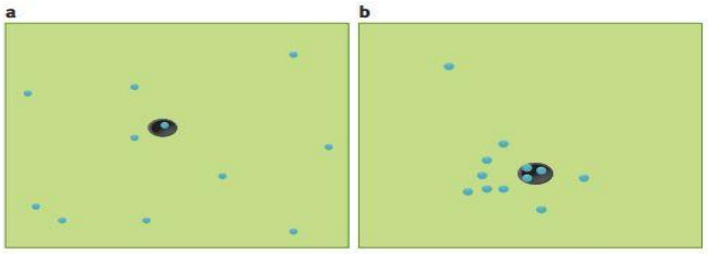


Figure 5.10: **a** shows a learner's attempts to sink a putt in golf while **b** shows the attempts by an experienced golfer.

Principles of skill learning

What is the connection between learning and performance?

5.3.2 Describe the phases (stages) of learning

- One of the most widely held theories of learning is that of Fitts and Posner (1967).
- They claimed that learning takes place in three stages, the **cognitive, associative and autonomous stages**.

5.3.2 Describe the phases (stages) of learning

- In the **cognitive stage** the individual tries to make sense of instructions. They use **lots of verbal** labels.
- This does not mean that instruction needs to be verbal, but simply that the **individual uses verbalization to aid memory**.
- In skills requiring perception and decision-making, there are often mistakes made and the individual attends to irrelevant as well as relevant stimuli.
- The motor component is characterized by **crude, uncoordinated movement.**

Skill in sport

5.3.2 Describe the phases (stages) of learning

- With practice the individual develops the knowledge of what to do.
- When someone is at this stage they are said to be in the **associative stage** (sometimes called the intermediate stage).
- At this stage, **practice is required to perfect the skill** and develop the consistent, coordinative movement that **demonstrates learning**.

5.3.2 Describe the phases (stages) of learning

When the individual can perform consistently and with little overt cognitive activity, they are said to have reached the **autonomous stage.**

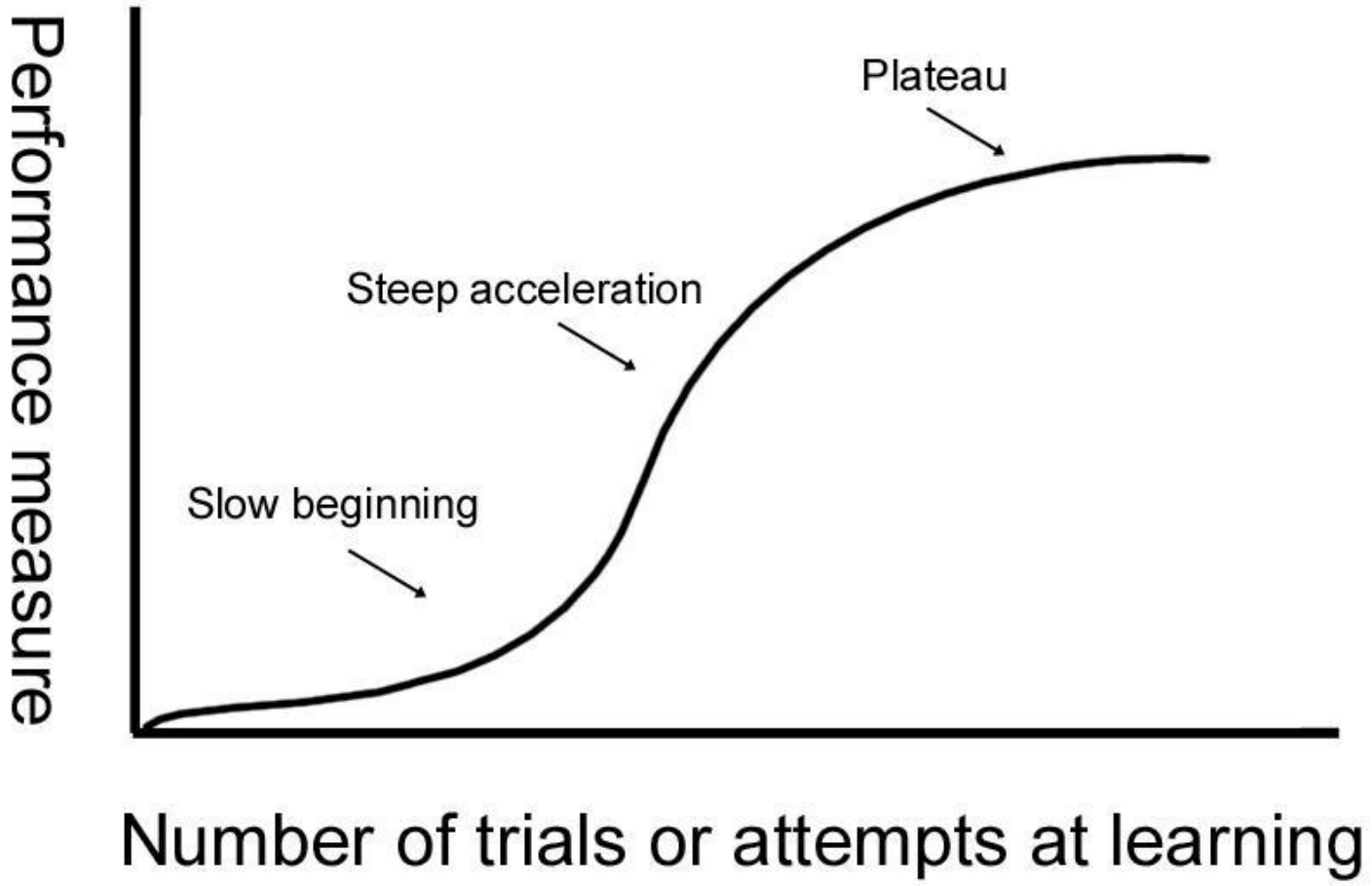
Table 6.2 Summary of Fitts and Posner's (1967) Three Stages of Motor Learning

Stage	Process	Characteristics	Other name
Cognitive	Gathering information	Large gains, inconsistent performance	Verbal-motor stage
Associative	Putting actions together	Small gains, disjointed performance, conscious effort	Motor stage
Autonomous	Much time and practice	Performance seems unconscious, automatic, and smooth	Automatic stage

5.3.2 Describe the phases (stages) of learning

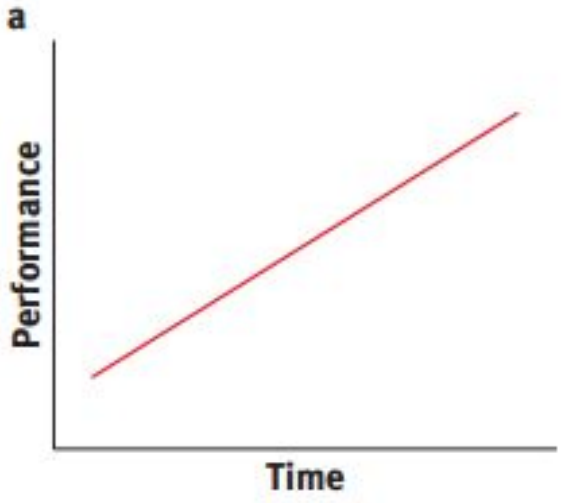
Fitts' three-stage model describes learning as a continuous process with gradual changes in the nature of information processing as learning progresses.

Learning curves



5.3.3 Outline the different types of learning curves

- When we learn an easy-to-perform skill we can often demonstrate what we call a linear learning curve (see Figure 5.11a).
- It is **rare** that learning is as easy as this, however.

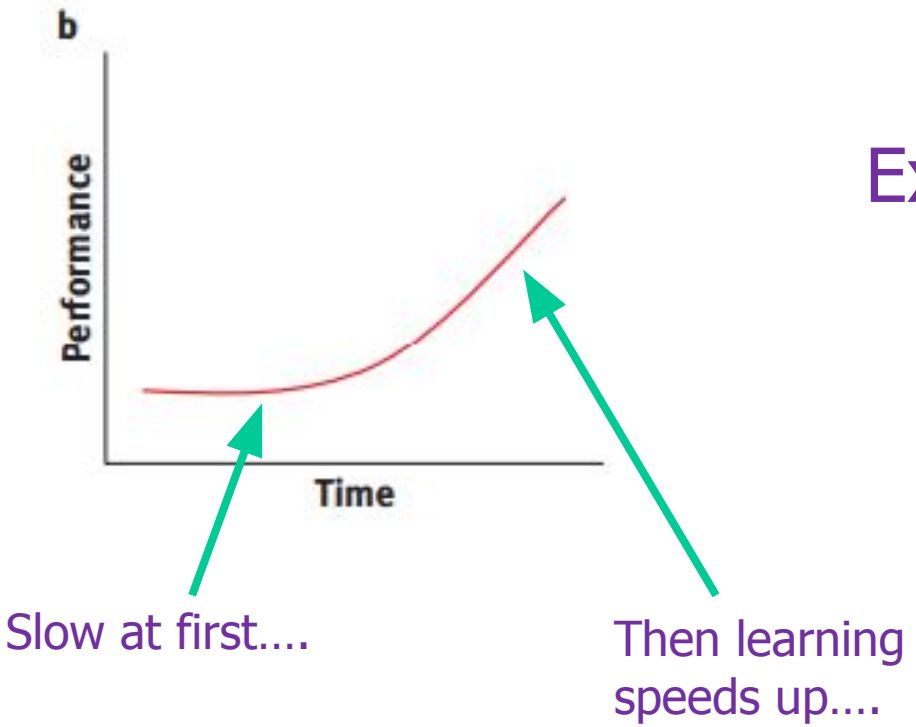


Linear

Examples????

5.3.3 Outline the different types of learning curves

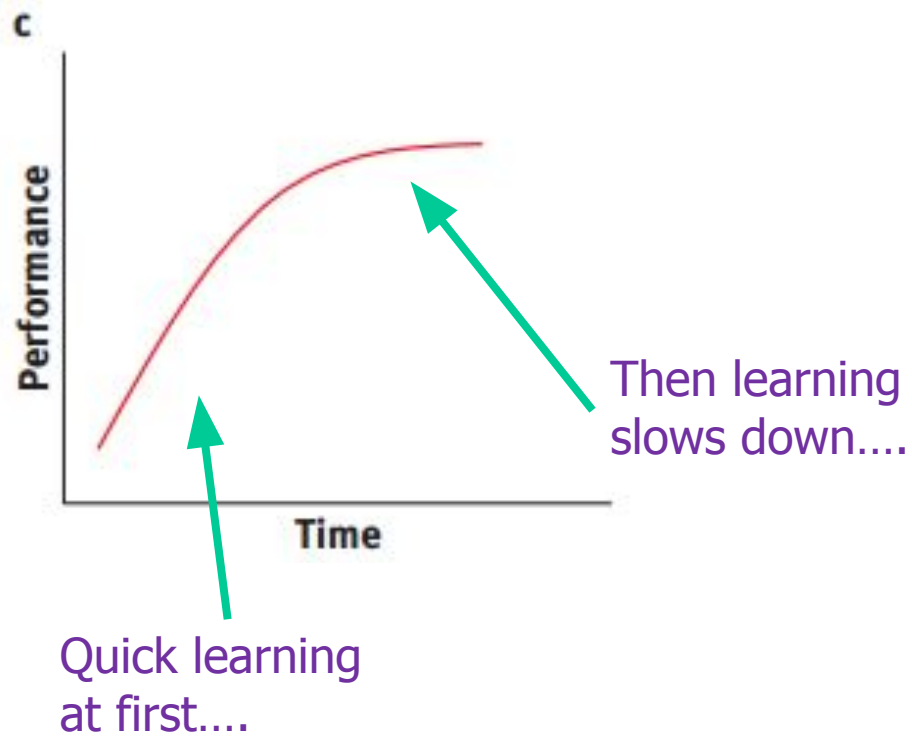
- Many skills are difficult to learn at first.
- Progress is slow but then we reach a point where performance **improves more quickly**.
- This is called a **positively accelerated** curve.



Examples????

5.3.3 Outline the different types of learning curves

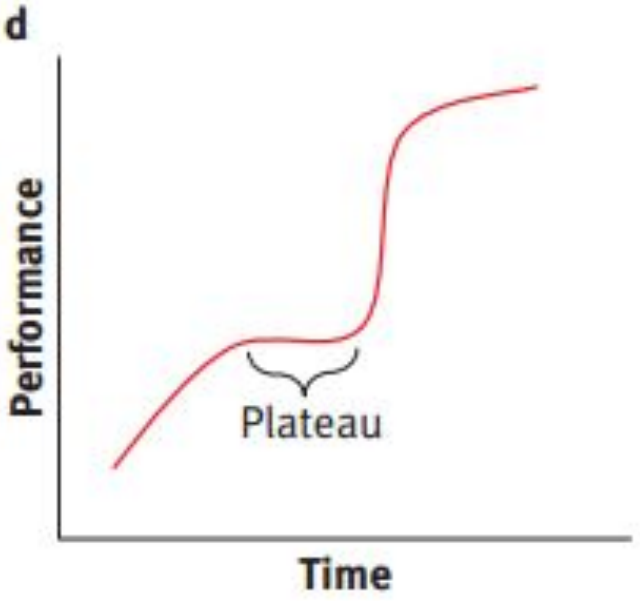
- Sometimes, however, the opposite happens.
- We learn quickly at first but then slow down.
- This is a **negatively accelerated curve**.



Examples????

5.3.3 Outline the different types of learning curves

- A fourth type of curve is demonstrated.
- Learning is positive and probably fairly quick at first but then there is a period when we show no improvement in performance.
- This is called a **plateau effect**.
- However, if we keep on practicing, there is a breakthrough and more learning is demonstrated.
- We are, in fact, probably still learning during the plateau phase but it is not being shown in our performance.
- **Remember performance is not the same as learning**



Examples???

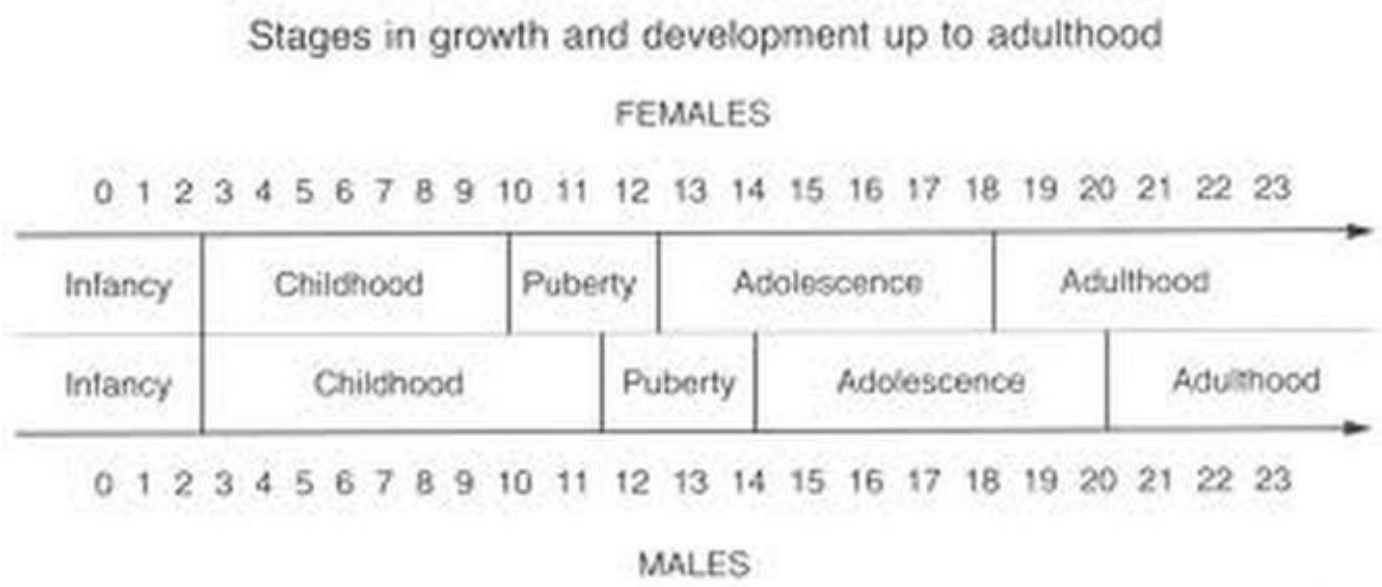
5.3.4 Discuss factors that contribute to the different rates of learning

Factor	How it may affect rate of learning
physical maturation	young learners have difficulty in focusing on important cues, difficulty in processing information. young learners make a large number of errors but as learners mature, more motor plans are generated
Physical fitness	size, shape and level of fitness may assist in learning. one learner may have more flexibility and strength than the other. a learner has an ability to make decisions more effectively if they are not fatigued.
Individual differences of coach	a coach's teaching style ‹command/reciprocal› may appeal to one learner but not the other. the quality and type of feedback received
Age	physical maturation/experience/emotional maturity will affect the progress of a learner
difficulty of task	progress will be slowed if the task is too difficult for the learner, this may have an impact on the motivation of the learner
Teaching environment	a safe teaching environment/limited distractions/small group. learning/ attention/ facilities and space available for learning
motivation	can be related to a person's inner drive ‹intrinsic› or external factors such as trophies ‹extrinsic. the strength of a learner's drive to achieve is ‹very› individual. motivation is also linked to a person's state of arousal

5.3.4 Discuss factors that contribute to the different rates of learning

- We are focusing on **physical maturation, physical fitness and motivation.**

- We cannot expect an individual to learn a skill that has physical demands which they are not yet capable of meeting.
- Sometimes, however, the individual has the physical maturation but is simply not fit enough to do the task.



5.3.4 Discuss factors that contribute to the different rates of learning

- In such cases physical training is necessary.
- The most important factor affecting learning, however, is motivation. The learner needs to want to learn.
- This is often closely linked to physical maturation.

The learner is good at knowing when he or she is ready to acquire a skill.

5.3.4 Discuss factors that contribute to the different rates of learning

TO THINK ABOUT

Children provide many examples of the link between physical maturation and motivation in learning. Babies often learn to crawl because they are motivated to get something which is out of their reach. Of course they cannot do this unless they are sufficiently physically developed.

It is not unusual for children to be motivated to copy older siblings in carrying out skills but wanting to do so before they are physically capable. When the physical catches up with the desire they will successfully attempt the skill.

Sometimes the child is physically capable but is not motivated to carry out the skill. So we have to wait until they do become motivated.

When motivation, and physical and indeed mental maturation are coordinated we say that the child has reached the optimal or critical stage of learning. This is surprisingly young for many skills. If we miss the optimal period we can have difficulty in catching up with those who did learn at the usual time. In the animal kingdom failure to learn at the correct time can mean that the skill is never learned. Given that most animal skills are involved in survival this can be fatal.

5.3.5/6 Define / Outline the Concept of Transfer

Transfer of training

- Transfer of training refers to the effect that practice on one task has on the learning or performance of another task.
  - Transfer of training can be **positive, negative or zero (neutral).**

  - Positive transfer is when the practice of one task has a facilitating effect on the learning or performance of another.
  - Negative transfer is when the practice of one task has an inhibiting effect on the learning or performance of another.
  - Zero transfer represents no effect.

5.3.5 Define the Concept of Transfer

TYPE OF TRANSFER	EXAMPLE
Skill to skill	Throwing a ball to throwing a javelin
Practice to performance	Batting in cricket or baseball against a bowling/ pitching machine
Abilities to skills	Improving dynamic strength in order to start races better
Bilateral	A soccer player learning to kick with his or her weaker foot
Stage to stage	From three-on-three basketball to the full game
Principles to skills	From learning that long levers aid throwing to throwing a javelin.

↑ Table 5.3: Types of transfer

5.3.7 Outline the Different Types of Practice

- Practice is essential in acquiring motor skills.
- Practice and learning are said to be **monotonic**, that is, as the amount of practice increases, so does the rate of learning.

- However, the rate of learning is said to level off over time even as practice continues.
- It is important to note that the type of practice an individual engages in also affects learning.

This seems logical when you consider that learning may be **negatively affected by over-practice**, or when an individual practices an incorrect or ineffectual technique.

5.3.7 Outline the Different Types of Practice

- From an information processing perspective, practice provides individuals with opportunities to gather information about the movement.
- This information is used to develop the motor programs for that movement which are stored in the long term memory.
- During practice, the individual gathers key pieces of information (or cues) to develop the motor program and to compare the motor program to the model, usually provided to the learner by the teacher, coach or peer.
- When the motor program does not match the model, corrections are made through further practice until the motor program matches the model.

5.3.7 Outline the different types of practice

- Distributed practice: is seen as practice with relatively long breaks or rest periods between each attempt or block of attempts

- The practice is interspersed with rest or a different activity.
- For example, a shooting practice in basketball that is punctuated at regular points with opportunities for a short scrimmage game.
- Intervals between the trials that are greater than the time it takes to complete one trial.

- Distributed practice can often lead to better performances because it reduces the levels of fatigue and boredom experienced by the performer.

Skill in sport

5.3.7 Outline the different types of practice

- Massed practice: is seen as being almost continuous practice with very little or no rest at all between attempts or blocks of trials.

- For example, a field hockey team practices shooting techniques non-stop for 40 minutes, or a wrestler player practices a particular move for an entire session.
- Massed practice is described as having intervals between the trials of a task that are shorter than the time it takes to perform one compete trial.

5.3.7 Outline the different types of practice

- There is **little evidence** to suggest that there are differences between the two types of practice with regards to how we learn.
- Ultimately, when organizing practice, the coach needs to take into account the **needs of the individual** and the nature of the task being performed.

- For example, if a task is very simple or is very tiring, it may not be fruitful to practice this task for long, uninterrupted periods of time.
- However, if the task is more complex, or if the individual is a novice performer, then it may be of greater benefit for the practice to be prolonged.
- This may not be the case for very young children as their ability to concentrate for long periods of time is limited.

5.3.7 Outline the different types of practice

Order of practice

- Another way to think about the structuring of practice is the order in which the practice of skills takes place.
- Generally, there are three ways practice can be ordered: **blocked, random or serial**.

Skill in sport

5.3.7 Outline the different types of practice

- **Blocked practice** is when one movement is repeated over and over again in a drill-like fashion.
- For example, a tennis player practices forehand ground strokes in 5 sets of 10 strokes with a few minutes rest in-between each set.
- Like massed practice, this can lead to **quick improvements in performance.**
- Sometimes immediate improvements can lead the individual to believe that they have learned the skill when really they have not.

5.3.7 Outline the different types of practice

- **Random practice** is when the practice of one movement is randomly interspersed with the practice of other movements.
- For example, a learner golfer may randomly vary the club and the type of shot they play during practice. They may begin with a small chip shot, followed by a full swing with a six-iron, followed by a half-swing with an eight-iron and so on.

- **Serial practice** is when different movements are practiced, but in a structured and consistent order.
- For example, a volleyball player may practice the dig, the overhead pass and the spike in the same order each time.

The diagram below can help you to picture these three scenarios.

BLOCKED	aaa	bbb	ccc
RANDOM	cab	bca	acb
SERIAL	abc	abc	abc

5.3.7 Outline the different types of practice

- Research shows that random practice is more effective than blocked practice for learning.

- Presenting the learner with different types of information in this way, encourages them to apply more cognitive effort to learning the tasks.
- This in turn, strengthens the motor program for these tasks.

5.3.7 Outline the different types of practice

- **The action plan hypothesis** suggests that in order to move on to a different task the individual must forget the previous task so that they have enough space in the working memory to engage in the new task.

- Each time they are faced with a new task they have to re-develop an action plan for learning the task.
- This requires more cognitive effort and they become more competent at creating action plans for learning.
- They should become more efficient at problem-solving when they are faced with a new situation or task.

- This goes some way to explain why research shows that retention and transfer are enhanced when practice is ordered in a random fashion.

5.3.8 Explain the different types of presentation

- It is very important that teachers, coaches and performers understand how different forms of practice can impact on performance.
- However, it is also important that they understand the different ways in which practice tasks can be presented.
- Teachers and coaches have to decide whether to present the whole task or skill, part of the task or skill or a combination of the two.

Skill in sport

5.3.8 Explain the different types of presentation

- The key factor in deciding how the task should be presented is the nature of the task itself.

The whole task should be presented when its component parts are performed simultaneously, for example, the serve in tennis or volleyball. (whole practice)

However, when the component parts of the skill are performed consecutively, then this skill can be broken down into those parts, for example, a lay-up in basketball. (part practice)

5.3.8 Explain the different types of presentation

- **Variable practice and schema theory**

- According to schema theory, we store information about the specific invariant features of a movement (for example, relative timing and organization of limb parts in coordination).
- These are known as generalized movement programs (GMPs).Variability of practice develops the learner's ability to control the GMP in a number of different ways.

- This is because when we perform we gather information about:

  - the initial conditions
  - the response specifications
  - the sensory consequences
  - the outcome.

5.3.8 Explain the different types of presentation

- This information creates and strengthens schema that are applied to our GMPs and enables us to control or apply the skill in different situations (transfer).
- Some level of variability in practice is necessary for all skills, however, it is particularly important for skills that are performed in more open environments.

Skill in sport

5.3.8 Explain the different types of presentation

- Whole:
  - when the activity or skill is presented in total and practised as full/entire skilled movement or activity.
  - learner is able to develop their kinaesthetic awareness or total feel for the activity.
  - more effective use of time and should be used whenever possible particularly when skills have low levels of complexity and high levels of organization, e.g. bench press in weight training.
  - In some activities the components of the skill are unable to be broken down.

Wesson et.al 2004

5.3.8 Explain the different types of presentation

- Part:
  - Skills which are very complex but low in organization lend themselves to being practiced and learned more effectively by the parts method.
  - An additional consideration is again how interrelated or independent the sub-routines are.
  - Activities such as freestyle are not too complex but low in organisation lend themselves to being taught by the part method.
  - The arms action, breathing pattern and leg action can be analysed and taught individually.
  - However, if the beginner does not experience the whole stroke there is possibility that the kinaesthetic feel for the whole action could be lost.

Skill in sport

5.3.8 Explain the different types of presentation

- Whole-part-whole:
  - often used with performers in the Cognitive/Associative stages is whole-part-whole practice.
  - The teacher/coach introduces the complete skill, highlighting the important elements. The performer then attempts to carry out the skill.
  - As a result of any problems or faults observed the teacher then breaks the whole skill down into sub-routines in order to allow the learner to practice appropriate areas of difficulty.
  - Once the teacher is satisfied that the problem areas have been mastered the parts are integrated back into the whole skill.

Wesson et.al 2004

Skill in sport

5.3.8 Explain the different types of presentation

- Progressive part:
  - The progressive part method is where earlier independent actions change their form to become something totally different.
  - A learner taught complex skills by the progressive part method benefits from the positive aspects of both part and whole methods.

Wesson et.al 2004

Skill in sport

5.3.8 Explain the different types of presentation

- Progressive part:
  - A gymnast coach trying to develop a gymnast's routine would often follow the progressive part method.
  - All the relatively complex but independent parts of the routine e.g. handstand, cartwheel, hand spring, somersault e.t.c. are learned in and practiced in isolation, but then linked together in small units in order that the gymnast can experience and learnt how to fluently sequence individual skills together.

Wesson et.al 2004

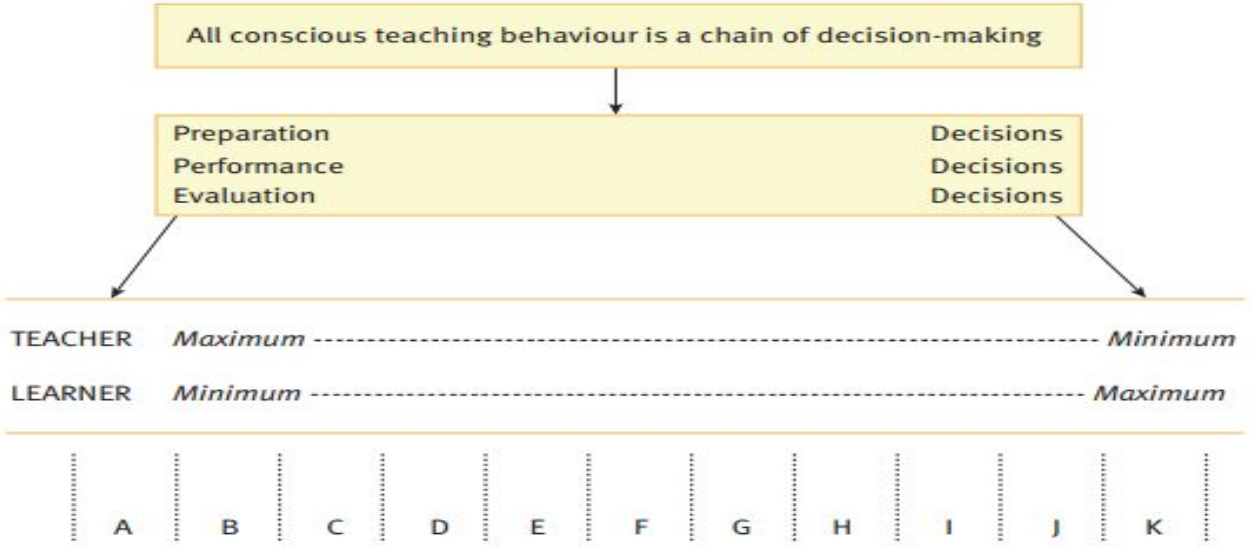
5.3.9 Outline the spectrum of teaching styles

- **Mental practice**, sometimes known as **mental rehearsal**, is when a performer thinks about specific components of the movement without actually performing the movement.
- **Mental practice aids performance** because it helps the performer to understand and practice the cognitive components of the movement, where sequence, timing or strategy might be critical to successful performance. However, most researchers believe that, as a learning tool, mental rehearsal **only works in conjunction with physical rehearsal.**
- One theory put forward to explain the advantages of mental rehearsal is that, by thinking about the skill, we build up a picture or model in our Central Nervous System (CNS) of how the skill should be performed.

Skill in sport

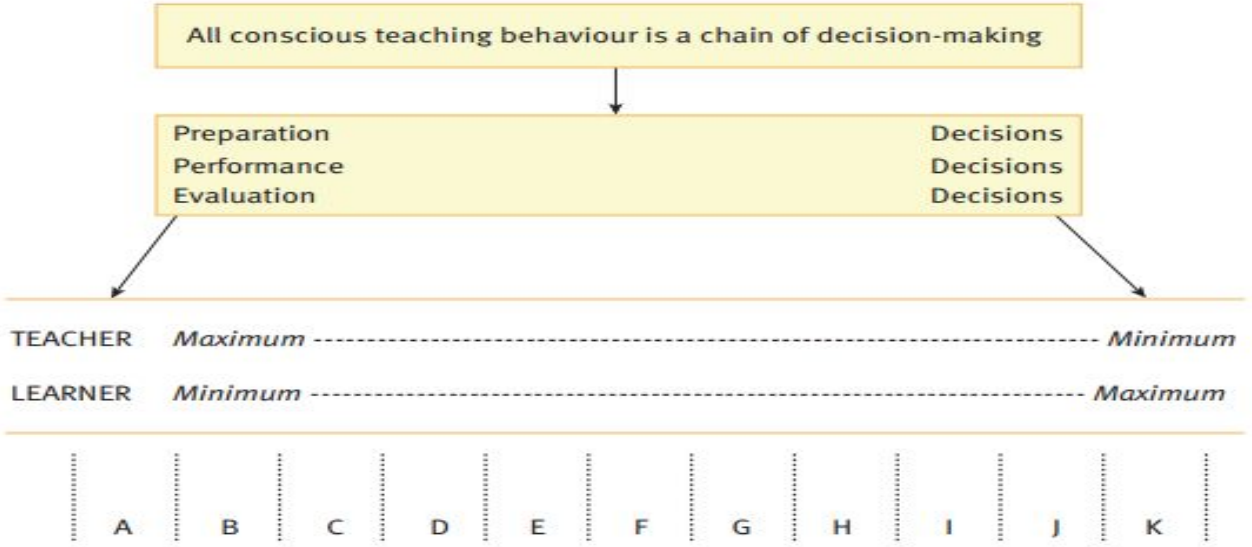
5.3.9 Outline the spectrum of teaching styles

- 11 teaching styles, A to K, used in physical education.
- However, these styles are also used in coaching and, when used appropriately, can facilitate the development of cognitive, affective and motor skills.
- The governing principle that underpins the teaching styles is that decision-making is the unifying element that connects the teaching and learning experience.



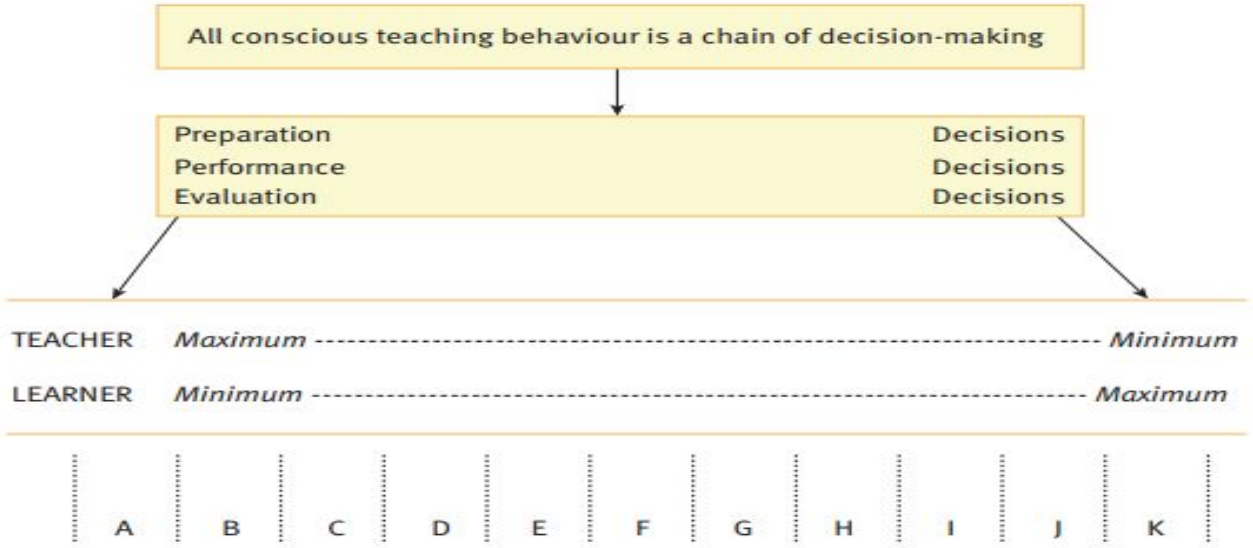
5.3.9 Outline the spectrum of teaching styles

- The **reproductive cluster** (A to E) would choose to use these styles when the objective is to replicate specific known skills and knowledge.
- The teacher specifies the subject matter, the learning conditions (style) and defines the criteria for correct task completion.



5.3.9 Outline the spectrum of teaching styles

- The **productive cluster** (F to K) involves the discovery of new information by the learner.
- The learner is engaged in cognitive operations such as problem-solving, inventing, comparing, contrasting and synthesizing; the climate favors patience and tolerance, and individual, cognitive and emotional differences.
- **Feedback refers to the production of new ideas**.



5.3.9 Outline the spectrum of teaching styles

- **Command (Style A):**
  - When adopting the command style, the coach or teacher is very much in charge. They select the content for the session as well as the methods of practice and training. There is no ambiguity in the role of the coach/teacher or the learners. This style can be particularly useful when working with a large group or when the activity involves an element of danger
  - For teachers or coaches to use this style successfully they need to be particularly well respected for their knowledge of the activity, of the teaching style and the learners.
  - However, this style has major limits if the learners are at different levels of ability and development
  - This can result in the learner becoming a clone of the teacher.
  - It has limitations for developing open skills as these require the performer to adapt and make their own decisions.

5.3.9 Outline the spectrum of teaching styles

- **Reciprocal (Style C):**
  - The reciprocal style is sometimes called peer teaching or coaching.
  - As with the command style, the teacher or coach sets the agenda, i.e. chooses the topic or topics to be learned.
  - They then encourage the learners to work in pairs so that they can provide each other with feedback about their performance in the task.
  - The teacher or the coach may have to spend some time with the learners to develop their ability to observe and provide feedback, however, this style is useful when the learners know the tasks well and are willing and able to help one another.
  - They can progress at their own rate and can work on the specific aspects of their own performance.
  - Some care may have to be taken when pairing learners, as not everyone is able to work cooperatively

5.3.9 Outline the spectrum of teaching styles

- **Problem-solving approach (Style H):**
  - The problem solving approach (aka divergent style) encourages students to be creative and develop their individual cognitive and performance processes.
  - According to their different sizes, shapes, abilities and capabilities learners can approach problems set by their teacher individually.
  - This style can lead to some great moments of innovation by the learners.
  - It also allows for an increase in independence and self-esteem in the individual.
  - Additionally, when games players have developed a solution of their own, they are more likely to want to implement it during the game than one which has been forced upon them.

5.3.9 Outline the spectrum of teaching styles

- Problem-solving approach **(Style H):**
  - For example:
    - Find a way to dribble past your opponent in a 1 on 1 situation.
    - How could you gain the attack from this situation?

- Wesson et.al 2004

5.3.9 Outline the spectrum of teaching styles

- **Problem-solving approach**
  - This "cognitive perspective" approach is believed to have long term benefits as learners are encouraged to think about, understand and adapt performance according to a variety of situations.
  - Variety of practice is important for positive transfer and the development of schemas. It also allows learners to deal with new or novel situations.
  - The main issue for the teacher or coach is to set realistic problems and to explain the scenario succinctly to the learner. Learners do need a lot of experience to use this method successfully.