Medical Accounting

- **Fee for Service vs Value Based Care Payment Models**
  Fee for Service vs Value Based Care Payment Models How HCC Coding Affects Risk Adjustment Scores DRGs and Their Role in Hospital Reimbursement Medicare Advantage and Risk Adjustment Strategies Addressing Disparities in Reimbursement Rates Understanding ESRD Risk Adjustment Models The Impact of Chronic Conditions on Reimbursement Optimizing Documentation for Risk Adjustment Challenges in Bundled Payment Models Auditing Risk Adjustment Coding Accuracy State Variations in Medicaid Reimbursement Future of Reimbursement in Telehealth Services
- **Improving Charge Capture Processes in Healthcare**
  Improving Charge Capture Processes in Healthcare Reducing Denial Rates Through Better Documentation Automating Claim Submission for Faster Payments Strategies for Efficient Payment Posting Managing Denials Due to Prior Authorization Using Analytics to Track Revenue Cycle Performance Training Teams for Revenue Cycle Efficiency Addressing Coding Errors in Claim Denials Streamlining Patient Registration Workflows The Role of Clearinghouses in Revenue Cycle Balancing Cost Control and Revenue Growth Case Studies in Revenue Cycle Turnaround
- **About Us**

In the intricate world of healthcare administration, managing denials due to prior authorization remains a challenging yet essential task. Prior authorization is a cost-control process requiring providers to obtain approval from a health plan before delivering specific services to ensure that they are medically necessary. However, despite its intended purpose, this process often leads to claim denials, which can be frustrating for both patients and providers alike.

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One common reason for denial is the lack of timely submission. Healthcare providers may overlook or delay the submission of prior authorization requests due to high patient volumes or administrative bottlenecks. This delay can result in denials simply because the request was not received within the required timeframe set by insurers. Therefore, it is crucial for healthcare facilities to establish efficient workflow processes that prioritize timely submissions.

Another prevalent cause of denials is incomplete documentation. Insurers require comprehensive information to assess medical necessity accurately; thus, any missing or inadequate details can lead to rejection. Providers must ensure that all necessary documentation accompanies the prior authorization request. This includes detailed patient records, past treatment attempts, and physician notes explaining why the proposed service is essential.

Miscommunication between healthcare providers and insurance companies also contributes significantly to denial rates. Often, there may be discrepancies in understanding coverage policies or specific requirements needed for approval. These miscommunications can stem from unclear insurer guidelines or evolving policy changes that are not effectively communicated to medical staff.

Moreover, errors in coding and billing information frequently result in denials related to prior authorizations. The use of incorrect procedure codes or mismatched patient data can trigger automatic rejections by insurers' systems designed to detect inconsistencies swiftly. To minimize such errors, it is vital for healthcare organizations to invest in regular training sessions focused on accurate coding practices and thorough verification of patient information.

Additionally, some services inherently face higher scrutiny under prior authorization protocols due to their cost implications or potential overuse concerns-procedures like imaging tests or elective surgeries often undergo more rigorous evaluation processes before receiving approval.

To manage these challenges effectively requires a multifaceted approach involving improved communication channels with insurers alongside robust internal systems aimed at tracking deadlines meticulously while ensuring completeness in all submitted documents meticulously checked against insurer criteria consistently updated based on current regulations governing medical claims processing procedures today's fast-paced environment demands agility adaptability success this complex endeavor hinges upon strategic planning execution collaborative effort among stakeholders involved ultimately striving enhance quality care provided patients reducing administrative burdens associated securing necessary approvals seamlessly thereby fostering positive experiences outcomes all parties concerned within broader context ever-evolving landscape modern healthcare delivery models call dynamic solutions meet diverse needs populations served globally now future generations come prepared navigate intricacies inherent therein confidently competently always mindful mission core values underpinning noble profession medicine healing arts humanity itself end day paramount importance lies heart matter safeguarding well-being those entrusted care compassion commitment excellence unwavering dedication pursuit better healthier tomorrow everyone matters lives touch meaningful ways make difference world around us together united common purpose shared vision brighter horizons ahead await embrace possibilities infinite unlimited potential unlocking doors opportunities transform dreams reality one step time journey worth taking inspiration hope courage action transcending boundaries limitations boundless spirit resilience perseverance triumph adversity triumphantly emerge victorious stronger wiser ready face whatever lies ahead boldly fearlessly proudly knowing done best ability given circumstances faced each moment cherished gift life lived fullest extent possible grateful abundance blessings bestowed upon conscious aware mindful presence present moment appreciating beauty wonder awe surrounding embracing diversity celebrating uniqueness individuals collective whole tapestry woven threads connect interconnectivity universe ever-expanding continuum existence harmonious balance equilibrium guiding principles universal love truth justice peace harmony guide footsteps path chosen walk hand hand toward destiny awaits discovery exploration adventure awaits beckons calls answer

Key Differences Between Fee for Service and Value Based

Care Payment Models —

The landscape of healthcare is a complex web of interactions between providers, patients, and insurance entities. Within this intricate system, the issue of claim denials is a significant concern that impacts both healthcare providers and patients. Among the various reasons for these denials, prior authorization requirements stand out as a particularly challenging hurdle. Understanding how managing denials due to prior authorization can affect both parties involved provides insight into the broader implications on the healthcare system.

For healthcare providers, dealing with denials related to prior authorization is often a cumbersome process that places additional strain on their already demanding workload. The administrative burden associated with ensuring that all necessary authorizations are obtained before rendering services can be overwhelming. Providers must navigate through numerous forms, guidelines, and sometimes ambiguous criteria set by insurance companies. This not only requires time but also financial resources to employ staff dedicated to managing these processes.

When claims are denied due to lack of proper prior authorization, it leads to delayed reimbursements or outright loss of revenue for healthcare facilities. Such financial constraints can hinder their ability to invest in essential resources like medical equipment or staff training, ultimately affecting the quality of care they can provide. Moreover, constant engagement with insurers over denied claims diverts attention away from patient care-an unfortunate reality that underscores how administrative tasks can detract from clinical priorities.

Patients, on the other hand, encounter their own set of challenges when faced with denials for services deemed necessary by their physicians but not pre-authorized by their insurance plans. These patients may experience anxiety and frustration as they find themselves caught between following medical advice and navigating bureaucratic hurdles imposed by insurers. In some cases, delays in treatment caused by denial issues could lead to deteriorating health conditions or increased stress levels for individuals who are already vulnerable due to illness.

Moreover, if a service is ultimately denied coverage because prior authorization was not secured properly or timely enough, patients might bear the financial burden themselves. This unexpected expense can be daunting and may deter individuals from seeking further necessary medical attention for fear of incurring additional costs.

To mitigate these adverse impacts on both providers and patients alike, there needs to be an emphasis on improving communication channels between all stakeholders involved in the prior authorization process. Streamlining procedures through technology solutions such as electronic health records integration could reduce errors and expedite approvals. Additionally, advocacy for clearer guidelines from insurance companies would help ensure consistency in decision-making regarding what necessitates prior approval.

In conclusion, while managing denials due to prior authorization remains an ongoing challenge within healthcare systems worldwide; addressing this issue effectively holds great potential for improving outcomes across various facets-from enhancing provider efficiency and financial stability-to safeguarding patient well-being by reducing barriers encountered when accessing medically necessary treatments promptly without undue hindrance caused by bureaucratic red tape surrounding authorizations beforehand..

Impact of Fee for Service on Medical Coding Practices

In the complex world of healthcare, managing prior authorization denials is a significant challenge that healthcare providers face. These denials can disrupt patient care, delay necessary treatments, and add administrative burdens to medical practices. Therefore, developing effective strategies to manage these denials is crucial for both operational efficiency and patient satisfaction.

The first step in managing prior authorization denials is understanding the common reasons behind them. Often, denials occur due to incomplete or incorrect information provided during the authorization process. By ensuring that all required documentation is accurate and comprehensive from the outset, healthcare providers can significantly reduce the likelihood of denials. Implementing standardized protocols for collecting and submitting information can help streamline this process.

Education and training of staff involved in handling prior authorizations play a critical role as well. Regular training sessions should be conducted to keep staff updated on payer-specific guidelines and changes in authorization requirements. This knowledge empowers them to address potential issues proactively before they result in denials.

Moreover, technology can be a powerful ally in managing prior authorization challenges. Utilizing advanced health information systems that integrate with electronic health records (EHR) allows for seamless data exchange between providers and payers. These systems can flag missing or incorrect information promptly, reducing errors that lead to denials.

Another effective strategy is maintaining open lines of communication with payers. Establishing direct contacts within insurance companies enables quick resolution of issues when they arise. Additionally, negotiating contracts with clear terms regarding authorization requirements can prevent misunderstandings that often lead to denials.

Furthermore, adopting a proactive approach by conducting regular audits of denial patterns helps identify trends and underlying causes. Analyzing this data provides valuable insights into areas needing improvement and helps tailor strategies specific to each practice's needs.

Lastly, fostering a collaborative environment among healthcare team members ensures everyone understands their role in preventing and managing denials effectively. When all stakeholders are engaged-from physicians prescribing treatments to administrative staff processing claims-the entire system operates more smoothly.

In conclusion, while prior authorization denials pose significant challenges for healthcare providers, employing strategic management approaches can mitigate their impact effectively. By focusing on accurate documentation, continuous education, technological integration, strong payer relationships, proactive audits, and team collaboration; healthcare organizations can enhance their ability to manage these complexities successfully-ultimately improving patient outcomes and operational efficiency alike.

How Value Based Care Influences Medical Coding and Documentation Requirements

In the intricate world of healthcare management, communication serves as a vital lifeline, threading together patients, providers, and insurance companies. One of the most challenging aspects within this triad is managing denials due to prior authorization. The role of communication in this context cannot be overstated, as it holds the key to unlocking smoother processes and better outcomes for all parties involved.

Denials due to prior authorization often arise from breakdowns in communication between healthcare providers and insurance companies. These breakdowns can lead to delays in patient care, financial strain on healthcare entities, and frustration for patients who find themselves caught in a bureaucratic limbo. To mitigate these issues, effective communication strategies must be employed to ensure that all necessary information is accurately conveyed and understood.

Firstly, clear and timely communication is essential when submitting prior authorization requests. Healthcare providers must ensure that they provide comprehensive documentation that adheres to the specific requirements set forth by insurance companies. This includes detailed patient histories, treatment plans, and any relevant test results or medical evidence that support the necessity of the requested service or procedure. By establishing robust lines of communication with insurers from the outset, providers can preemptively address potential questions or concerns that may lead to denial.

Moreover, fostering a collaborative relationship between healthcare providers and insurance companies can significantly aid in reducing denials. Open channels of dialogue allow both parties to work towards common goals-ensuring that patients receive timely care while also adhering to cost-effective practices. Regular meetings or consultations between provider representatives and insurer liaisons can help clarify guidelines, update each party on policy changes, and resolve ambiguities before they escalate into denials.

Technology also plays a crucial role in enhancing communication efficiency. Electronic health records (EHR) systems integrated with insurers' platforms can streamline the sharing of pertinent information required for authorizations. Automated alerts regarding missing documents or deadlines can prevent errors related to incomplete submissions-a common reason for denial.

Furthermore, training staff on effective communication skills is indispensable. Frontline employees should be equipped with knowledge about insurance protocols and possess strong interpersonal abilities to negotiate successfully with insurers when denials occur. Educating staff members about appealing denied claims through constructive dialogue with payers ensures that they are advocates not just for their organization but also for their patients' best interests.

In conclusion, the role of communication with insurance companies in managing denials due to prior authorization is multifaceted yet unequivocally critical. By prioritizing clear lines of interaction from initial request submission through potential appeals processes-and leveraging technology alongside human expertise-healthcare stakeholders can minimize disruptions caused by denied claims while delivering high-quality patient care efficiently and effectively. As we continue navigating an evolving healthcare landscape marked by complex payer requirements and increasing demand for services; embracing proactive communicative practices will remain paramount in overcoming challenges associated with prior authorizations' denials.

Challenges and Benefits of Transitioning from Fee for Service to Value Based Care in Medical Coding

In the complex landscape of healthcare, managing denials due to prior authorization stands as a significant challenge for providers. Prior authorization is a process used by insurance companies to determine if they will cover a prescribed procedure, service, or medication. When this crucial step is overlooked or mismanaged, it can lead to claim denials that disrupt cash flow and patient care. In this context, the importance of meticulous documentation and strict compliance emerges as a pivotal strategy to mitigate these denials.

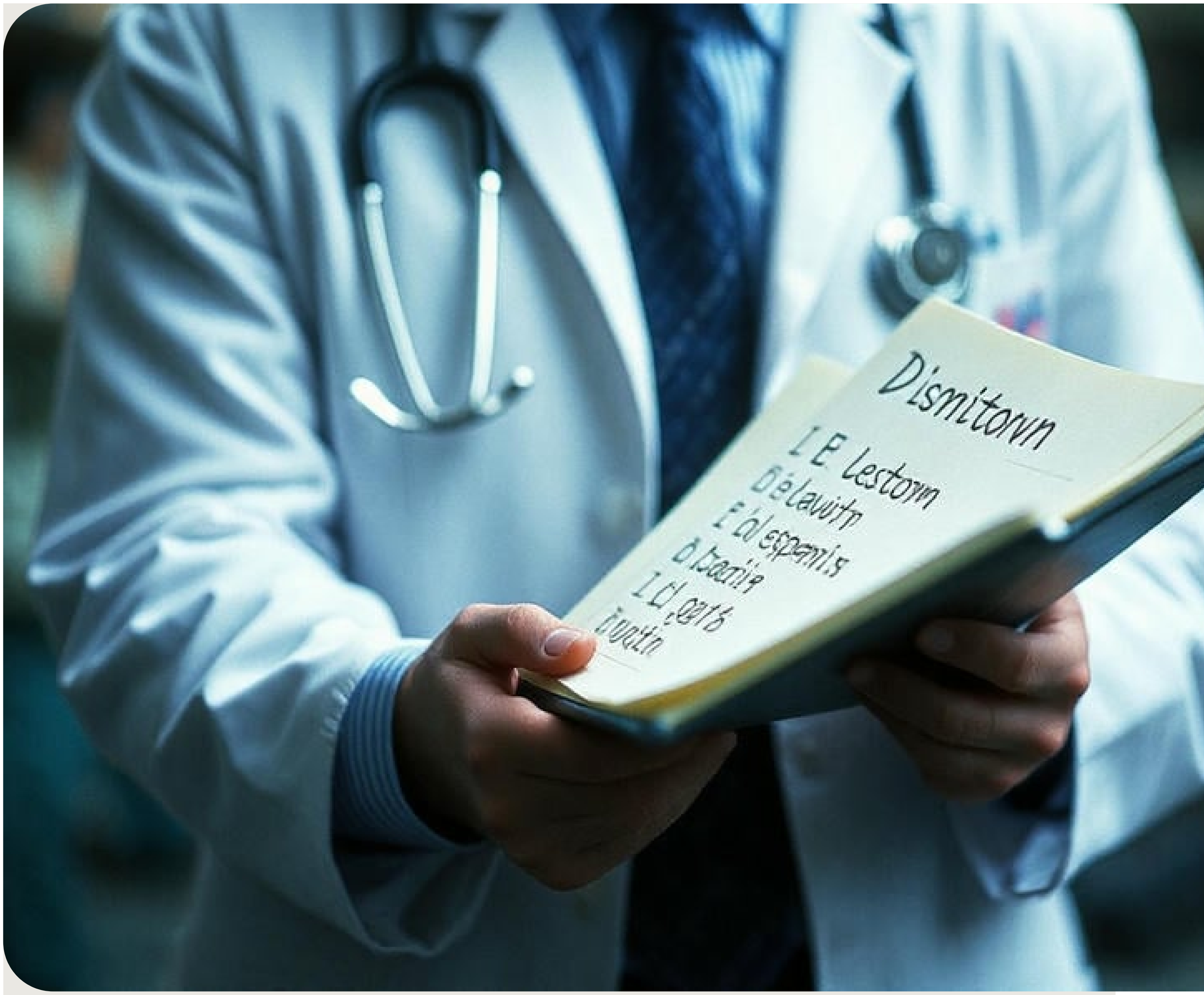
Documentation serves as the backbone of any successful prior authorization process. Comprehensive and accurate documentation ensures that all necessary information is readily available when submitting claims for approval. It involves maintaining detailed records that include patient information, physician notes, diagnosis codes, treatment plans, and any other relevant data that insurers might require. Accurate documentation minimizes errors and discrepancies that could trigger denials. Moreover, it provides a clear narrative that justifies the medical necessity of services rendered, thereby strengthening the case for approval by insurance companies.

Compliance with payer-specific guidelines is equally critical in reducing denials related to prior authorizations. Each insurance provider has its own set of rules and requirements which must be strictly adhered to if claims are to be approved without issue. Healthcare organizations must stay abreast of these varying regulations and ensure their administrative staff are well-trained in these protocols. This might involve regular training sessions and updates on policy changes from insurers. By fostering a culture of compliance, organizations not only reduce the risk of denial but also enhance their reputation with payers as reliable partners who follow agreed-upon procedures.

Furthermore, technology plays an invaluable role in enhancing both documentation accuracy and compliance adherence. Electronic health record (EHR) systems can streamline the documentation process by automatically populating fields with patient data and ensuring consistency across records. These systems can also alert staff about missing information or potential discrepancies before submission occurs, thus preempting possible reasons for denial.

Another aspect worth considering is communication among healthcare providers, patients, and insurers during the prior authorization process. Clear communication channels help ensure all parties are informed about any additional requirements or changes in authorization status promptly. This proactive approach helps avert unnecessary delays or miscommunications that may lead to denials.

In conclusion, while managing denials due to prior authorizations presents inherent challenges within healthcare practices, emphasizing thorough documentation coupled with unwavering compliance offers a robust solution towards mitigating these issues effectively. By investing in comprehensive record-keeping systems and ensuring adherence to insurer guidelines through continuous education efforts alongside leveraging technological advancements-healthcare organizations can significantly reduce denial rates leading not only towards better financial outcomes but also improved patient satisfaction through seamless care delivery processes.



Case Studies Highlighting the Effects of Different Payment Models on Medical Coding

Efficiency

In the ever-evolving landscape of healthcare, medical coding professionals play a critical role in ensuring that services provided to patients are accurately documented and appropriately reimbursed. Among their myriad responsibilities, managing denials due to prior authorizations presents a complex challenge that requires both technical expertise and strategic problem-solving skills. The necessity for targeted training and education in this area has never been more pressing.

Prior authorization is a pivotal process in the healthcare reimbursement cycle, serving as a cost-control measure by requiring providers to obtain approval from payers before rendering specific services. While its intent is to ensure medical necessity, it often becomes a labyrinthine hurdle for healthcare providers. Denials due to prior authorization missteps can lead to significant financial losses for providers and delays in patient care. Therefore, equipping medical coding professionals with comprehensive knowledge and skills in managing these denials is essential.

Education programs tailored specifically for handling prior authorization-related denials must focus on several key areas. First and foremost, they should provide an in-depth understanding of the various payer requirements and guidelines. Since these requirements can vary significantly across different insurance companies and plans, coders need the ability to navigate this complexity effectively. This includes familiarizing themselves with common codes associated with prior authorization and understanding how changes in coding practices or payer policies can impact authorization processes.

Furthermore, training should emphasize the development of strong communication skills. Coders often act as intermediaries between healthcare providers, insurance companies, and patients. As such, they must be adept at conveying information clearly and advocating effectively on behalf of all parties involved. This skill is particularly vital when appealing denied claims or negotiating expedited authorizations.

In addition to technical knowledge and communication prowess, problem-solving aptitude is crucial for managing denials successfully. Training programs should incorporate real-world scenarios that encourage coders to think critically about potential solutions to common issues encountered during the prior authorization process. By analyzing case studies or engaging in role-playing exercises, coders can hone their ability to address denials proactively rather than reactively.

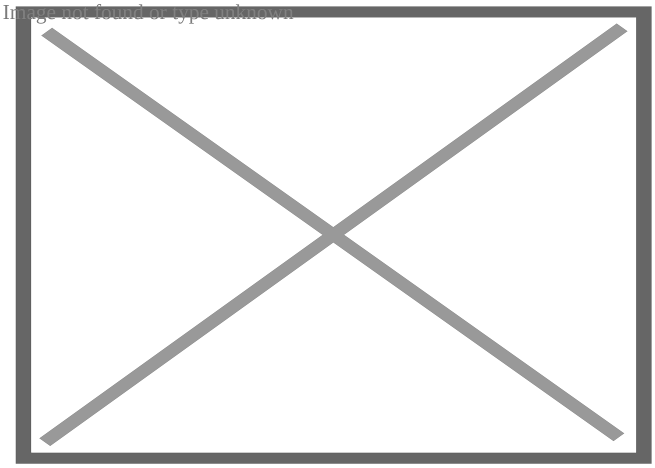
Another essential component of effective training is staying abreast of technological advancements that support the prior authorization process. With many payers adopting electronic systems for submission and tracking authorizations, familiarity with these platforms can streamline workflows significantly. Coding professionals need ongoing education on utilizing such technology efficiently while remaining compliant with regulatory standards like HIPAA.

Lastly, fostering a culture of continuous learning within organizations can greatly enhance efforts in managing denial due to prior authorizations effectively over time. Encouraging participation in workshops or seminars focused on updates within the industry ensures that coding professionals remain knowledgeable about emerging trends impacting their roles directly.

In conclusion, successful management of denials stemming from prior authorizations demands robust educational frameworks designed specifically for medical coding professionals tasked with navigating this intricate domain daily basis . By investing time into developing specialized skill sets through targeted training initiatives , organizations stand poised not only reduce financial risks associated overlooked details but also improve patient satisfaction levels through timely service delivery . Ultimately , empowering personnel manage complex challenges inherent modern-day healthcare environments underscores commitment quality care sustained success long-term operational viability .

About learning

For the album by Perfume Genius, see *Learning* (album).
Several terms redirect here. For other uses, see Learn (disambiguation), Learned (disambiguation), and Learners (film).



American students learning how to make and roll sushi

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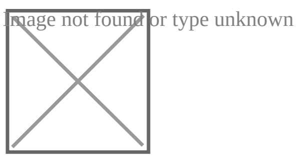
Cognitive psychology



Perception

- Visual
- Object recognition
- Face recognition
- Pattern recognition

Attention

Memory

- Aging
- Emotional
- Learning
- Long-term

Metacognition

Language

Metalanguage

Thinking

- Cognition
- Concept
- Reasoning
- Decision making
- Problem solving

Numerical cognition

- Numerosity adaptation effect
- Approximate number system
- Parallel individuation system

Learning is the process of acquiring new understanding, knowledge, behaviors, skills, values, attitudes, and preferences.[1] The ability to learn is possessed by humans, non-human animals, and some machines; there is also evidence for some kind of learning in certain plants.[2] Some learning is immediate, induced by a single event (e.g. being burned by a hot stove), but much skill and knowledge accumulate from repeated experiences.[3] The changes induced by learning often last a lifetime, and it is hard to distinguish learned material that seems to be "lost" from that which cannot be retrieved.[4]

Human learning starts at birth (it might even start before[5]) and continues until death as a consequence of ongoing interactions between people and their environment. The nature and processes involved in learning are studied in many established fields (including educational psychology, neuropsychology, experimental psychology, cognitive sciences, and pedagogy), as well as emerging fields of knowledge (e.g. with a shared interest in the topic of learning from safety events such as incidents/accidents,[6] or in collaborative learning health systems[7]). Research in such fields has led to the identification of various sorts of learning. For example, learning may occur as a result of habituation, or classical conditioning, operant conditioning or as a result of more complex activities such as play, seen only in relatively intelligent animals.[8][9] Learning may occur consciously or without conscious awareness. Learning that an aversive event cannot be avoided or escaped may result in a condition called learned helplessness.[10] There is evidence for human behavioral learning prenatally, in which habituation has been observed as early as 32 weeks into gestation, indicating that the central nervous system is sufficiently developed and primed for learning and memory to occur very early on in development.[11]

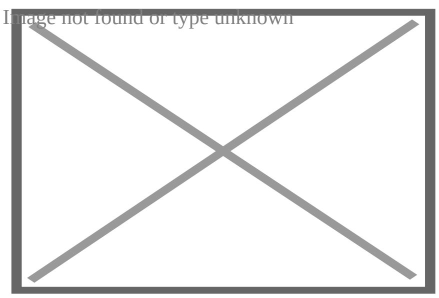
Play has been approached by several theorists as a form of learning. Children experiment with the world, learn the rules, and learn to interact through play. Lev Vygotsky agrees that play is pivotal for children's development, since they make meaning of their environment through playing educational games. For Vygotsky, however, play is the first form of learning language and communication, and the stage where a child begins to understand rules and symbols.[12] This has led to a view that learning in organisms is always related to semiosis,[13] and is often associated with representational systems/activity.[14]

Types

[edit]

See also: Learning styles and Machine learning § Types of problems and tasks

There are various functional categorizations of memory which have developed. Some memory researchers distinguish memory based on the relationship between the stimuli involved (associative vs non-associative) or based to whether the content can be communicated through language (declarative/explicit vs procedural/implicit). Some of these categories can, in turn, be parsed into sub-types. For instance, declarative memory comprises both episodic and semantic memory.



Children learn to bike in the eighties in Czechoslovakia.

Non-associative learning

[edit]

Non-associative learning refers to "a relatively permanent change in the strength of response to a single stimulus due to repeated exposure to that stimulus."[15] This definition exempts the changes caused by sensory adaptation, fatigue, or injury.[16]

Non-associative learning can be divided into habituation and sensitization.

Habituation

[edit]
Main article: Habituation

Habituation is an example of non-associative learning in which one or more components of an innate response (e.g., response probability, response duration) to a stimulus diminishes when the stimulus is repeated. Thus, habituation must be distinguished from extinction, which is an associative process. In operant extinction, for example, a response declines because it is no longer followed by a reward. An example of habituation can be seen in small song birds—if a stuffed owl (or similar predator) is put into the cage, the birds initially react to it as though it were a real predator. Soon the birds react less, showing habituation. If another stuffed owl is introduced (or the same one removed and re-introduced), the birds react to it again as though it were a predator, demonstrating that it is only a very specific stimulus that is habituated to (namely, one particular unmoving owl in one place). The habituation process is faster for stimuli that occur at a high rather than for stimuli that occur at a low rate as well as for the weak and strong stimuli, respectively.[17] Habituation has been shown in essentially every species of animal, as well as the sensitive plant *Mimosa pudica*[18] and the large protozoan *Stentor coeruleus*.[19] This concept acts in direct opposition to sensitization.[17]

Sensitization

[edit]
Main article: Sensitization

Sensitization is an example of non-associative learning in which the progressive amplification of a response follows repeated administrations of a stimulus.[20] This is based on the notion that a defensive reflex to a stimulus such as withdrawal or escape becomes stronger after the exposure to a different harmful or threatening stimulus.[21] An everyday example of this mechanism is the repeated tonic stimulation of peripheral nerves that occurs if a person rubs their arm continuously. After a while, this stimulation creates a warm sensation that can eventually turn painful. This pain results from a progressively amplified synaptic response of the peripheral nerves. This sends a warning that the stimulation is harmful.[22][*clarification needed*] Sensitization is thought to underlie both adaptive as well as maladaptive learning processes in the organism.[23][*citation ne*

Active learning

[edit]
Main article: Active learning

Active learning occurs when a person takes control of his/her learning experience. Since understanding information is the key aspect of learning, it is important for learners to recognize what they understand and what they do not. By doing so, they can monitor their own mastery of subjects. Active learning encourages learners to have an internal dialogue in which they verbalize understandings. This and other meta-cognitive strategies can be taught to a child over time. Studies within metacognition have proven the value in active learning, claiming that the learning is usually at a stronger level as a result.[24] In addition, learners have more incentive to learn when they have control over not only how they learn but also what they learn.[25] Active learning is a key characteristic of student-centered learning. Conversely, passive learning and direct instruction are characteristics of teacher-centered learning (or traditional education).

Associative learning

[edit]

Associative learning is the process by which a person or animal learns an association between two stimuli or events.[26] In classical conditioning, a previously neutral stimulus is repeatedly paired with a reflex-eliciting stimulus until eventually the neutral stimulus elicits a response on its own. In operant conditioning, a behavior that is reinforced or punished in the presence of a stimulus becomes more or less likely to occur in the presence of that stimulus.

Operant conditioning

[edit]
Main article: Operant conditioning

Operant conditioning is a way in which behavior can be shaped or modified according to the desires of the trainer or head individual. Operant conditioning uses the thought that living things seek pleasure and avoid pain, and that an animal or human can learn through receiving either reward or punishment at a specific time called trace conditioning. Trace conditioning is the small and ideal period of time between the subject performing the desired behavior, and receiving the positive reinforcement as a result of their performance. The reward needs to be given immediately after the completion of the wanted behavior.[27]

Operant conditioning is different from classical conditioning in that it shapes behavior not solely on bodily reflexes that occur naturally to a specific stimulus, but rather focuses on the shaping of wanted behavior that requires conscious thought, and ultimately requires learning.[28]

Punishment and reinforcement are the two principal ways in which operant conditioning occurs. Punishment is used to reduce unwanted behavior, and ultimately (from the learner's perspective) leads to avoidance of the punishment, not necessarily avoidance of the unwanted behavior. Punishment is not an appropriate way to increase wanted behavior for animals or humans. Punishment can be divided into two subcategories, positive punishment and negative punishment. Positive punishment is when an aversive aspect of life or thing is added to the subject, for this reason it is called positive punishment. For example, the parent spanking their child would be considered a positive punishment, because a spanking was added to the child. Negative punishment is considered the removal of something loved or desirable from the subject. For example, when a parent puts his child in time out, in reality, the child is losing the opportunity to be with friends, or to enjoy the freedom to do as he pleases. In this example, negative punishment is the removal of the child's desired rights to play with his friends etc.[29][30]

Reinforcement on the other hand is used to increase a wanted behavior either through negative reinforcement or positive reinforcement. Negative reinforcement is defined by removing an undesirable aspect of life, or thing. For example, a dog might learn to sit as the trainer scratches his ears, which ultimately is removing his itches (undesirable aspect). Positive reinforcement is defined by adding a desirable aspect of life or thing. For example, a dog might learn to sit if he receives a treat. In this example the treat was added to the dog's life.[29][30]

Classical conditioning

[edit]
Main article: Classical conditioning

The typical paradigm for *classical conditioning* involves repeatedly pairing an unconditioned stimulus (which unfailingly evokes a reflexive response) with another previously neutral stimulus (which does not normally evoke the response). Following conditioning, the response occurs both to the unconditioned stimulus and to the other, unrelated stimulus (now referred to as the "conditioned stimulus"). The response to the conditioned stimulus is termed a *conditioned response*. The classic example is Ivan Pavlov and his dogs.[21] Pavlov fed his dogs meat powder, which naturally made the dogs salivate—salivating is a reflexive response to the meat powder. Meat powder is the unconditioned stimulus (US) and the salivation is the unconditioned response (UR). Pavlov rang a bell before presenting the meat powder. The first time Pavlov rang the bell, the neutral stimulus, the dogs did not salivate, but once he put the meat powder in their mouths they began to salivate. After numerous pairings of bell and food, the dogs learned that the bell signaled that food was about to come, and began to salivate when they heard the bell. Once this occurred, the bell became the conditioned stimulus (CS) and the salivation to the bell became the conditioned response (CR). Classical conditioning has been demonstrated in many species. For example, it is seen in honeybees, in the proboscis extension reflex paradigm.[31] It was recently also demonstrated in garden pea plants.[32]

Another influential person in the world of classical conditioning is John B. Watson. Watson's work was very influential and paved the way for B.F. Skinner's radical behaviorism. Watson's behaviorism (and philosophy of science) stood in direct contrast to Freud and other accounts based largely on introspection. Watson's view was that the introspective method was too subjective and that we should limit the study of human development to directly observable behaviors. In 1913, Watson published the article "Psychology as the Behaviorist Views", in which he argued that laboratory studies should serve psychology best as a science. Watson's most famous, and controversial, experiment was "Little Albert", where he demonstrated how psychologists can account for the learning of emotion through classical conditioning principles.

Observational learning

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Main article: Observational learning

Observational learning is learning that occurs through observing the behavior of others. It is a form of social learning which takes various forms, based on various processes. In humans, this form of learning seems to not need reinforcement to occur, but instead, requires a social model such as a parent, sibling, friend, or teacher with surroundings.

Imprinting

[edit]
Main article: Imprinting (psychology)

Imprinting is a kind of learning occurring at a particular life stage that is rapid and apparently independent of the consequences of behavior. In filial imprinting, young animals, particularly birds, form an association with another individual or in some cases, an object, that they respond to as they would to a parent. In 1935, the Austrian Zoologist Konrad Lorenz discovered that certain birds follow and form a bond if the object makes sounds.

Play

[edit]
Main article: Play (activity)

Play generally describes behavior with no particular end in itself, but that improves performance in similar future situations. This is seen in a wide variety of vertebrates besides humans, but is mostly limited to mammals and birds. Cats are known to play with a ball of string when young, which gives them experience with catching prey. Besides inanimate objects, animals may play with other members of their own species or other animals, such as orcas playing with seals they have caught. Play involves a significant cost to animals, such as increased vulnerability to predators and the risk of injury and possibly infection. It also consumes energy, so there must be significant benefits associated with play for it to have evolved. Play is generally seen in younger animals, suggesting a link with learning. However, it may also have other benefits not associated directly with learning, for example improving physical fitness.

Play, as it pertains to humans as a form of learning is central to a child's learning and development. Through play, children learn social skills such as sharing and collaboration. Children develop emotional skills such as learning to deal with the emotion of anger, through play activities. As a form of learning, play also facilitates the development of thinking and language skills in children.[33]

There are five types of play:

1. Sensorimotor play aka functional play, characterized by the repetition of an activity
2. Roleplay occurs starting at the age of three
3. Rule-based play where authoritative prescribed codes of conduct are primary
4. Construction play involves experimentation and building
5. Movement play aka physical play[33]

These five types of play are often intersecting. All types of play generate thinking and problem-solving skills in children. Children learn to think creatively when they learn through play.[34] Specific activities involved in each type of play change over time as humans progress through the lifespan. Play as a form of learning, can occur solitarily, or involve interacting with others.

Enculturation

[edit]
Main article: Enculturation

Enculturation is the process by which people learn values and behaviors that are appropriate or necessary in their surrounding culture.[35] Parents, other adults, and peers shape the individual's understanding of these values.[35] If successful, enculturation results in competence in the language, values, and rituals of the culture.[35] This is different from acculturation, where a person adopts the values and societal rules of a culture different from their native one.

Multiple examples of enculturation can be found cross-culturally. Collaborative practices in the Mazahua people have shown that participation in everyday interaction and later learning activities contributed to enculturation rooted in nonverbal social experience.[36] As the children participated in everyday activities, they learned the cultural significance of these interactions. The collaborative and helpful behaviors exhibited by Mexican and Mexican-heritage children is a cultural practice known as being "acomedido".[37] Chillihuani girls in Peru described themselves as weaving constantly, following behavior shown by the other adults.[38]

Episodic learning

[edit]

Episodic learning is a change in behavior that occurs as a result of an event.[39] For example, a fear of dogs that follows being bitten by a dog is episodic learning. Episodic learning is so named because events are recorded into episodic memory, which is one of the three forms of explicit learning and retrieval, along with perceptual memory and semantic memory.[40] Episodic memory remembers events and history that are embedded in experience and this is distinguished from semantic memory, which attempts to extract facts out of their experiential context[41] or – as some describe – a timeless organization of knowledge.[42] For instance, if a person remembers the Grand Canyon from a recent visit, it is an episodic memory. He would use semantic memory to answer someone who would ask him information such as where the Grand Canyon is. A study revealed that humans are very accurate in the recognition of episodic memory even without deliberate intention to memorize it.[43] This is said to indicate a very large storage capacity of the brain for things that people pay attention to.[43]

Multimedia learning

[edit]
Main article: Multimedia learning

Multimedia learning is where a person uses both auditory and visual stimuli to learn information.[44] This type of learning relies on dual-coding theory.[45]

E-learning and augmented learning

[edit]
Main article: Electronic learning

Electronic learning or e-learning is computer-enhanced learning. A specific and always more diffused e-learning is mobile learning (m-learning), which uses different mobile telecommunication equipment, such as cellular phones.

When a learner interacts with the e-learning environment, it is called augmented learning. By adapting to the needs of individuals, the context-driven instruction can be dynamically tailored to the learner's natural environment. Augmented digital content may include text, images, video, audio (music and voice). By personalizing instruction, augmented learning has been shown to improve learning performance for a lifetime.[46] See also minimally invasive education.

Moore (1989)[47] purported that three core types of interaction are necessary for quality, effective online learning:

- Learner–learner (i.e. communication between and among peers with or without the teacher present),
- Learner–instructor (i.e. student-teacher communication), and
- Learner–content (i.e. intellectually interacting with content that results in changes in learners' understanding, perceptions, and cognitive structures).

In his theory of transactional distance, Moore (1993)[48] contented that structure and interaction or dialogue bridge the gap in understanding and communication that is created by geographical distances (known as transactional distance).

Rote learning

[edit]
Main article: Rote learning

Rote learning is memorizing information so that it can be recalled by the learner exactly the way it was read or heard. The major technique used for rote learning is *learning by repetition*, based on the idea that a learner can recall the material exactly (but not its meaning) if the information is repeatedly processed. Rote learning is used in diverse areas, from mathematics to music to religion.

Meaningful learning

[edit]
See also: Deeper learning

Meaningful learning is the concept that learned knowledge (e.g., a fact) is fully understood to the extent that it relates to other knowledge. To this end, meaningful learning contrasts with rote learning in which information is acquired without regard to understanding. Meaningful learning, on the other hand, implies there is a comprehensive knowledge of the context of the facts learned.[49]

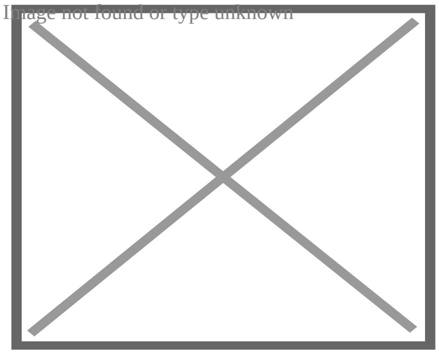
Evidence-based learning

[edit]
Main article: Evidence-based learning

Evidence-based learning is the use of evidence from well designed scientific studies to accelerate learning. Evidence-based learning methods such as spaced repetition can increase the rate at which a student learns.[50]

Formal learning

[edit]
Main article: Education



A depiction of the world's oldest continually operating university, the University of Bologna, Italy

Formal learning is a deliberate way attaining of knowledge, which takes place within a teacher-student environment, such as in a school system or work environment.[51][52] The term formal learning has nothing to do with the formality of the learning, but rather the way it is directed and organized. In formal learning, the learning or training departments set out the goals and objectives of the learning and oftentimes learners will be awarded with a diploma, or a type of formal recognition.[51][53]

Non-formal learning

[edit]
Main article: Nonformal learning

Non-formal learning is organized learning outside the formal learning system. For example, learning by coming together with people with similar interests and exchanging viewpoints, in clubs or in (international) youth organizations, and workshops. From the organizer's point of reference, non-formal learning does not always need a main objective or learning outcome. From the learner's point of view, non-formal learning, although not focused on outcomes, often results in an intentional learning opportunity.[54]

Informal learning

[edit]
Main article: Informal learning

Informal learning is less structured than "non-formal learning". It may occur through the experience of day-to-day situations (for example, one would learn to look ahead while walking because of the possible dangers inherent in not paying attention to where one is going). It is learning from life, during a meal at the table with parents, during play, and while exploring etc.. For the learner, informal learning is most often an experience of happenstance, and not a deliberately planned experience. Thus this does not require enrollment into any class. Unlike formal learning, informal learning typically does not lead to accreditation.[54] Informal learning begins to unfold as the learner ponders his or her situation. This type of learning does not require a professor of any kind, and learning outcomes are unforeseen following the learning experience.[55]

Informal learning is self-directed and because it focuses on day-to-day situations, the value of informal learning can be considered high. As a result, information retrieved from informal learning experiences will likely be applicable to daily life.[56] Children with informal learning can at times yield stronger support than subjects with formal learning in the topic of mathematics.[57] Daily life experiences take place in the workforce, family life, and any other situation that may arise during one's lifetime. Informal learning is voluntary from the learner's viewpoint, and may require making mistakes and learning from them. Informal learning allows the individual to discover coping strategies for difficult emotions that may arise while learning. From the learner's perspective, informal learning can become purposeful, because the learner chooses which rate is appropriate to learn and because this type of learning tends to take place within smaller groups or by oneself.[56]

Nonformal learning and combined approaches

[edit]

The educational system may use a combination of formal, informal, and nonformal learning methods. The UN and EU recognize these different forms of learning (cf. links below). In some schools, students can get points that count in the formal-learning systems if they get work done in informal-learning circuits. They may be given time to assist international youth workshops and training courses, on the condition they prepare, contribute, share, and can prove this offered valuable new insight, helped to acquire new skills, a place to get experience in organizing, teaching, etc.

To learn a skill, such as solving a Rubik's Cube quickly, several factors come into play at once:

- Reading directions helps a player learn the patterns that solve the Rubik's Cube.
- Practicing the moves repeatedly helps build "muscle memory" and speed.
- Thinking critically about moves helps find shortcuts, which speeds future attempts.
- Observing the Rubik's Cube's six colors help anchor solutions in the mind.
- Revisiting the cube occasionally helps retain the skill.

Tangential learning

[edit]

Tangential learning is the process by which people self-educate if a topic is exposed to them in a context that they already enjoy. For example, after playing a music-based video game, some people may be motivated to learn how to play a real instrument, or after watching a TV show that references Faust and Lovecraft, some people may be inspired to read the original work.[58] Self-education can be improved with systematization. According to experts in natural learning, self-oriented learning training has proven an effective tool for assisting independent learners with the natural phases of learning.[59]

Extra Credits writer and game designer James Portnow was the first to suggest games as a potential venue for "tangential learning".[60] Mozelius *et al.*[61] points out that intrinsic integration of learning content seems to be a crucial design factor, and that games that include modules for further self-studies tend to present good results. The built-in encyclopedias in the *Civilization* games are presented as an example – by using these modules gamers can dig deeper for knowledge about historical events in the gameplay. The importance of rules that regulate learning modules and game experience is discussed by Moreno, C.,[62] in a case study about the mobile game Kiwaka. In this game, developed by Landka in collaboration with ESA and ESO, progress is rewarded with educational content, as opposed to traditional education games where learning activities are rewarded with gameplay.[63][64]

Dialogic learning

[edit]
Main article: Dialogic learning

Dialogic learning is a type of learning based on dialogue.

Incidental learning

[edit]

In *incidental teaching* learning is not planned by the instructor or the student, it occurs as a byproduct of another activity — an experience, observation, self-reflection, interaction, unique event (e.g. in response to incidents/accidents), or common routine task. This learning happens in addition to or apart from the instructor's plans and the student's expectations. An example of incidental teaching is when the instructor places a train set on top of a cabinet. If the child points or walks towards the cabinet, the instructor prompts the student to say "train". Once the student says "train", he gets access to the train set.

Here are some steps most commonly used in incidental teaching:[65]

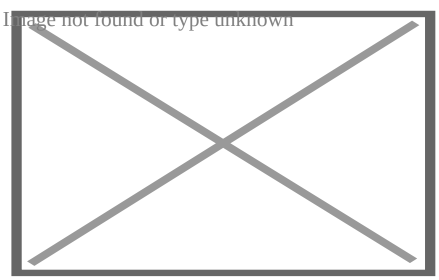
- An instructor will arrange the learning environment so that necessary materials are within the student's sight, but not within his reach, thus impacting his motivation to seek out those materials.
- An instructor waits for the student to initiate engagement.
- An instructor prompts the student to respond if needed.

- An instructor allows access to an item/activity contingent on a correct response from the student.
- The instructor fades out the prompting process over a period of time and subsequent trials.

Incidental learning is an occurrence that is not generally accounted for using the traditional methods of instructional objectives and outcomes assessment. This type of learning occurs in part as a product of social interaction and active involvement in both online and onsite courses. Research implies that some un-assessed aspects of onsite and online learning challenge the equivalency of education between the two modalities. Both onsite and online learning have distinct advantages with traditional on-campus students experiencing higher degrees of incidental learning in three times as many areas as online students. Additional research is called for to investigate the implications of these findings both conceptually and pedagogically.[66]

Domains

[edit]



Future school (1901 or 1910)

Benjamin Bloom has suggested three domains of learning in his taxonomy which are:

- Cognitive: To recall, calculate, discuss, analyze, problem solve, etc.
- Psychomotor: To dance, swim, ski, dive, drive a car, ride a bike, etc.
- Affective: To like something or someone, love, appreciate, fear, hate, worship, etc.

These domains are not mutually exclusive. For example, in learning to play chess, the person must learn the rules (cognitive domain)—but must also learn how to set up the chess pieces and how to properly hold and move a chess piece (psychomotor). Furthermore, later in the game the person may even learn to love the game itself, value its applications in life, and appreciate its history (affective domain).[67]

Transfer

[edit]

Transfer of learning is the application of skill, knowledge or understanding to resolve a novel problem or situation that happens when certain conditions are fulfilled. Research indicates that learning transfer is infrequent; most common when "... cued, primed, and guided..."[68] and has sought to clarify what it is, and how it might be promoted through instruction.

Over the history of its discourse, various hypotheses and definitions have been advanced. First, it is speculated that different types of transfer exist, including: near transfer, the application of skill to solve a novel problem in a similar context; and far transfer, the application of skill to solve a novel problem presented in a different context.[69] Furthermore, Perkins and Salomon (1992) suggest that positive transfer in cases when learning supports novel problem solving, and negative transfer occurs when prior learning inhibits performance on highly correlated tasks, such as second or third-language learning.[70] Concepts of positive and negative transfer have a long history; researchers in the early 20th century described the possibility that "...habits or mental acts developed by a particular kind of training may inhibit rather than facilitate other mental activities".[71] Finally, Schwarz, Bransford and Sears (2005) have proposed that transferring knowledge into a situation may differ from transferring knowledge out to a situation as a means to reconcile findings that transfer may both be frequent and challenging to promote.[72]

A significant and long research history has also attempted to explicate the conditions under which transfer of learning might occur. Early research by Ruger, for example, found that the "level of attention", "attitudes", "method of attack" (or method for tackling a problem), a "search for new points of view", a "careful testing of hypothesis" and "generalization" were all valuable approaches for promoting transfer.[73] To encourage transfer through teaching, Perkins and Salomon recommend aligning ("hugging") instruction with practice and assessment, and "bridging", or encouraging learners to reflect on past experiences or make connections between prior knowledge and current content.[70]

Factors affecting learning

[edit]
Main article: Evidence-based learning

Genetics

[edit]
Main article: Heritability of IQ

Some aspects of intelligence are inherited genetically, so different learners to some degree have different abilities with regard to learning and speed of learning.[*citation needed*]

Socioeconomic and physical conditions

[edit]

Problems like malnutrition, fatigue, and poor physical health can slow learning, as can bad ventilation or poor lighting at home, and unhygienic living conditions.[74][75]

The design, quality, and setting of a learning space, such as a school or classroom, can each be critical to the success of a learning environment. Size, configuration, comfort—fresh air, temperature, light, acoustics, furniture—can all affect a student's learning. The tools used by both instructors and students directly affect how information is conveyed, from the display and writing surfaces (blackboards, markerboards, tack surfaces) to digital technologies. For example, if a room is too crowded, stress levels rise, student attention is reduced, and furniture arrangement is restricted. If furniture is incorrectly arranged, sightlines to the instructor or instructional material are limited and the ability to suit the learning or lesson style is restricted. Aesthetics can also play a role, for if student morale suffers, so does motivation to attend school.[76][77]

Psychological factors and teaching style

[edit]

Intrinsic motivation, such as a student's own intellectual curiosity or desire to experiment or explore, has been found to sustain learning more effectively than extrinsic motivations such as grades or parental requirements. Rote learning involves repetition in order to reinforce facts in memory, but has been criticized as ineffective and "drill and kill" since it kills intrinsic motivation. Alternatives to rote learning include active learning and meaningful learning.

The speed, accuracy, and retention, depend upon aptitude, attitude, interest, attention, energy level, and motivation of the students. Students who answer a question properly or give good results should be praised. This encouragement increases their ability and helps them produce better results. Certain attitudes, such as always finding fault in a student's answer or provoking or embarrassing the student in front of a class are counterproductive.[78][79][*need quotation to verify*]

Certain techniques can increase long-term retention:[80]

- The spacing effect means that lessons or studying spaced out over time (spaced repetition) are better than cramming
- Teaching material to other people
- "Self-explaining" (paraphrasing material to oneself) rather than passive reading
- Low-stakes quizzing

Epigenetic factors

[edit]
Further information: Epigenetics in learning and memory

The underlying molecular basis of learning appears to be dynamic changes in gene expression occurring in brain neurons that are introduced by epigenetic mechanisms. Epigenetic regulation of gene expression involves, most notably, chemical modification of DNA or DNA-associated histone proteins. These chemical modifications can cause long-lasting changes in gene expression. Epigenetic mechanisms involved in learning include the methylation and demethylation of neuronal DNA as well as methylation, acetylation and deacetylation of neuronal histone proteins.

During learning, information processing in the brain involves induction of oxidative modification in neuronal DNA followed by the employment of DNA repair processes that introduce epigenetic alterations. In particular, the DNA repair processes of non-homologous end joining and base excision repair are employed in learning and memory formation.[81][82]

General cognition-related factors

[edit]
This section is an excerpt from Development of the nervous system in humans § Adult neural development.[edit]

The nervous system continues to develop during adulthood until brain death. For example:

- physical exercise has neurobiological effects
- the consumption of foods (or nutrients), obesity,[83] alterations of the microbiome, drinks, dietary supplements, recreational drugs and medications[84][85] may possibly also have effects on the development of the nervous system
- various diseases, such as COVID-19, have effects on the development of the nervous system
    - For example, several genes have been identified as being associated with changes in brain structure over lifetime and are potential Alzheimer's disease therapy-targets.[86][87]
- psychological events such as mental trauma and resilience-building
- exposure to environmental pollution and toxins such as air pollution may have effects on the further development of the nervous system
- other activities may also have effects on the development of the nervous system, such as lifelong learning, retraining, and types of media- and economic activities
- broadly, brain aging

Adult learning vs children's learning

[edit]
See also: Aging brain

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Learning is often more efficient in children and takes longer or is more difficult with age. A study using neuroimaging identified rapid neurotransmitter GABA boosting as a major potential explanation-component for why that is.[88][89]

Children's brains contain more "silent synapses" that are inactive until recruited as part of neuroplasticity and flexible learning or memories.[90][91] Neuroplasticity is heightened during critical or sensitive periods of brain development, mainly referring to brain development during child development.[92]

However researchers, after subjecting late middle aged participants to university courses, suggest perceived age differences in learning may be a result of differences in time, support, environment, and attitudes, rather than inherent ability.[93]

What humans learn at the early stages, and what they learn to apply, sets humans on course for life or has a disproportional impact.[94] Adults usually have a higher capacity to select what they learn, to what extent and how. For example, children may learn the given subjects and topics of school curricula via classroom blackboard-transcription handwriting, instead of being able to choose specific topics/skills or jobs to learn and the styles of learning. For instance, children may not have developed consolidated interests, ethics, interest in purpose and meaningful activities, knowledge about real-world requirements and demands, and priorities.

In animal evolution

[edit]

Animals gain knowledge in two ways. First is learning—in which an animal gathers information about its environment and uses this information. For example, if an animal eats something that hurts its stomach, it learns not to eat that again. The second is innate knowledge that is genetically inherited. An example of this is when a horse is born and can immediately walk. The horse has not learned this behavior; it simply knows how to do it.[95] In some scenarios, innate knowledge is more beneficial than learned knowledge. However, in other scenarios the opposite is true—animals must learn certain behaviors when it is disadvantageous to have a specific innate behavior. In these situations, learning evolves in the species.

Costs and benefits of learned and innate knowledge

[edit]

In a changing environment, an animal must constantly gain new information to survive. However, in a stable environment, this same individual needs to gather the information it needs once, and then rely on it for the rest of its life. Therefore, different scenarios better suit either learning or innate knowledge. Essentially, the cost of obtaining certain knowledge versus the benefit of already having it determines whether an animal evolved to learn in a given situation, or whether it innately knew the information. If the cost of gaining the knowledge outweighs the benefit of having it, then the animal does not evolve to learn in this scenario—but instead, non-learning evolves. However, if the benefit of having certain information outweighs the cost of obtaining it, then the animal is far more likely to evolve to have to learn this information.[95]

Non-learning is more likely to evolve in two scenarios. If an environment is static and change does not or rarely occurs, then learning is simply unnecessary. Because there is no need for learning in this scenario—and because learning could prove disadvantageous due to the time it took to learn the information—non-learning evolves. Similarly, if an environment is in a constant state of change, learning is also disadvantageous, as anything learned is immediately irrelevant because of the changing environment.[95] The learned information no longer applies. Essentially, the animal would be just as successful if it took a guess as if it learned. In this situation, non-learning evolves. In fact, a study of *Drosophila melanogaster* showed that learning can actually lead to a decrease in productivity, possibly because egg-laying behaviors and decisions were impaired by interference from the memories gained from the newly learned materials or because of the cost of energy in learning.[96]

However, in environments where change occurs within an animal's lifetime but is not constant, learning is more likely to evolve. Learning is beneficial in these scenarios because an animal can adapt to the new situation, but can still apply the knowledge that it learns for a somewhat extended period of time. Therefore, learning increases the chances of success as opposed to guessing.[95] An example of this is seen in aquatic environments with landscapes subject to change. In these environments, learning is favored because the fish are predisposed to learn the specific spatial cues where they live.[97]

In plants

[edit]

In recent years, plant physiologists have examined the physiology of plant behavior and cognition. The concepts of learning and memory are relevant in identifying how plants respond to external cues, a behavior necessary for survival. Monica Gagliano, an

Australian professor of evolutionary ecology, makes an argument for associative learning in the garden pea, *Pisum sativum*. The garden pea is not specific to a region, but rather grows in cooler, higher altitude climates. Gagliano and colleagues' 2016 paper aims to differentiate between innate phototropism behavior and learned behaviors.[32] Plants use light cues in various ways, such as to sustain their metabolic needs and to maintain their internal circadian rhythms. Circadian rhythms in plants are modulated by endogenous bioactive substances that encourage leaf-opening and leaf-closing and are the basis of nyctinastic behaviors.[98]

Gagliano and colleagues constructed a classical conditioning test in which pea seedlings were divided into two experimental categories and placed in Y-shaped tubes.[32] In a series of training sessions, the plants were exposed to light coming down different arms of the tube. In each case, there was a fan blowing lightly down the tube in either the same or opposite arm as the light. The unconditioned stimulus (US) was the predicted occurrence of light and the conditioned stimulus (CS) was the wind blowing by the fan. Previous experimentation shows that plants respond to light by bending and growing towards it through differential cell growth and division on one side of the plant stem mediated by auxin signaling pathways.[99]

During the testing phase of Gagliano's experiment, the pea seedlings were placed in different Y-pipes and exposed to the fan alone. Their direction of growth was subsequently recorded. The 'correct' response by the seedlings was deemed to be growing into the arm where the light was "predicted" from the previous day. The majority of plants in both experimental conditions grew in a direction consistent with the predicted location of light based on the position of the fan the previous day.[32] For example, if the seedling was trained with the fan and light coming down the same arm of the Y-pipe, the following day the seedling grew towards the fan in the absence of light cues despite the fan being placed in the opposite side of the Y-arm. Plants in the control group showed no preference to a particular arm of the Y-pipe. The percentage difference in population behavior observed between the control and experimental groups is meant to distinguish innate phototropism behavior from active associative learning.[32]

While the physiological mechanism of associative learning in plants is not known, Telewski et al. describes a hypothesis that describes photoreception as the basis of mechano-perception in plants.[100] One mechanism for mechano-perception in plants relies on MS ion channels and calcium channels. Mechanosensory proteins in cell lipid bilayers, known as MS ion channels, are activated once they are physically deformed in response to pressure or tension. Ca2+ permeable ion channels are "stretch-gated" and allow for the influx of osmolytes and calcium, a well-known second messenger, into the cell. This ion influx triggers a passive flow of water into the cell down its osmotic gradient, effectively increasing turgor pressure and causing the cell to depolarize.[100] Gagliano hypothesizes that the basis of associative learning in *Pisum sativum* is the coupling of mechanosensory and photosensory pathways and is mediated by auxin signaling pathways. The result is directional growth to maximize a plant's capture of sunlight.[32]

Gagliano et al. published another paper on habituation behaviors in the *mimosa pudica* plant whereby the innate behavior of the plant was diminished by repeated exposure to a stimulus.[18] There has been controversy around this paper and more generally around the topic of plant cognition. Charles Abrahmson, a psychologist and behavioral biologist, says that part of the issue of why scientists disagree about whether plants have the ability to learn is that researchers do not use a consistent definition of "learning" and "cognition".[101] Similarly, Michael Pollan, an author, and journalist, says in his piece *The Intelligent Plant* that researchers do not doubt Gagliano's data but rather her language, specifically her use of the term "learning" and "cognition" with respect to plants.[102] A direction for future research is testing whether circadian rhythms in plants modulate learning and behavior and surveying researchers' definitions of "cognition" and "learning".

Machine learning

[edit]

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Robots can learn to cooperate.

Main article: Machine learning

Machine learning, a branch of artificial intelligence, concerns the construction and study of systems that can learn from data. For example, a machine learning system could be trained on email messages to learn to distinguish between spam and non-spam messages. Most of the Machine Learning models are based on probabilistic theories where each input (e.g. an image) is associated with a probability to become the desired output.

Types

[edit]

Phases

[edit]

See also

[edit]

- 21st century skills – Skills identified as being required for success in the 21st century
- Anticipatory socialization – Process in which people take on the values of groups that they aspire to join
- Epistemology – Philosophical study of knowledge
- Implicit learning – in learning psychology

- Instructional theory – Theory that offers explicit guidance on how to better help people learn and develop
- Learning sciences – Critical theory of learning
- Lifelong learning – Ongoing, voluntary, and self-motivated pursuit of knowledge
- Living educational theory
- Media psychology – Area of psychology
- Subgoal labeling – Cognitive process

Information theory

[edit]
- Algorithmic information theory – Subfield of information theory and computer science
- Algorithmic probability – mathematical method of assigning a prior probability to a given observation
- Bayesian inference – Method of statistical inference
- Inductive logic programming – learning logic programs from data
- Inductive probability – Determining the probability of future events based on past events
- Information theory – Scientific study of digital information
- Minimum description length – Model selection principle
- Minimum message length – Formal information theory restatement of Occam's Razor
- Occam's razor – Philosophical problem-solving principle
- Solomonoff's theory of inductive inference – A mathematical theory
- AIXI – Mathematical formalism for artificial general intelligence

Types of education

[edit]
- Autodidacticism – Independent education without the guidance of teachers
- Andragogy – Methods and principles in adult education
- Pedagogy – Theory and practice of education

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Further reading

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Library resources about
Learning

- Resources in your library

- *Ulrich Boser (2019). Learn Better: Mastering the Skills for Success in Life, Business, and School, or How to Become an Expert in Just About Anything. Rodale Books. ISBN 978-0593135310.*

External links

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Wikimedia Commons has media related to ***Learning***.

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Wikiquote has quotations related to ***Learning***.

- *How People Learn: Brain, Mind, Experience, and School* (expanded edition) published by the National Academies Press
- *Applying Science of Learning in Education: Infusing Psychological Science into the Curriculum* published by the American Psychological Association

Links to related articles

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Ethology

Branches

- Animal cognition
- Animal communication
- Animal consciousness
- Animal culture
- Animal sexual behaviour
- Animal welfare science
- Anthrozoology
- Bee learning and communication
- Behavioural ecology
- Behavioral endocrinology
- Behavioural genetics
- Breed
- Cognitive ethology
- Comfort behaviour
    - Grooming
- Comparative psychology
- Emotion in animals
- Ethogram
- Evolutionary neuroscience
- Feeding
- Hover
- Human ethology
- Instinct
- Learning
- Neuroethology
- Pain in animals
- Philosophical ethology
- Sociobiology
- Stereotypy
- Structures
    - Hive
    - Honeycomb
    - Nest
    - Instinct
- Swarm
- Tool use by non-humans
- Zoosemiotics
- Zoomusicology

Ethologists

- Patrick Bateson
- Marc Bekoff
- Donald Broom
- John B. Calhoun
- Charles Darwin
- Marian Dawkins
- Richard Dawkins
- Irenäus Eibl-Eibesfeldt
- Dian Fossey
- Karl von Frisch
- Jane Goodall
- Heini Hediger
- Julian Huxley
- Konrad Lorenz
- Desmond Morris
- Thomas Sebeok
- William Homan Thorpe
- Nikolaas Tinbergen
- Jakob von Uexküll
- Wolfgang Wickler
- E. O. Wilson
- Solly Zuckerman

Societies

- Association for the Study of Animal Behaviour
- International Society for Applied Ethology

Journals

- *Animal Behaviour*
- *Animal Cognition*
- *Animal Welfare*
- *Behavioral Ecology*
- *Behaviour*

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Human intelligence topics

Types

- Collective
- Emotional
- Intellectual
- Linguistic
- Multiple
- Social
- Spatial (visuospatial)

Abilities, traits, and constructs	○ Cognition ○ Cognitive liberty ○ Communication ○ Creativity ○ Fluid and crystallized intelligence ○ *g* factor ○ Intellect ○ Intelligence quotient ○ Knowledge ○ Learning ○ Memory ○ Problem solving ○ Reasoning ○ Skill ○ Thought (abstraction) ○ Understanding ○ Visual processing
Models and theories	○ Cattell–Horn–Carroll theory ○ Fluid and crystallized intelligence ○ Multiple-intelligences theory ○ PASS theory ○ Three-stratum theory ○ Triarchic theory
Areas of research	○ Evolution of human intelligence ○ Heritability of IQ ○ Psychometrics ○ Intelligence and environment / fertility / height / health / longevity / neuroscience / personality / race / sex

- Image not found or type unknown Outline of human intelligence / thought

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Learning

Non-associative learning	○ Habituation ○ Sensitization
Associative learning	○ Classical conditioning ○ Imprinting ○ Observational learning ○ Operant conditioning
Insight learning	○ Abductive reasoning ○ Deductive reasoning ○ Inductive reasoning

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Mental processes

Cognition	Association Awareness Cognitive flexibility Cognitive liberty Forecasting - affective Foresight Comprehension Consciousness Critical thinking Decision-making Imagination Intuition Problem solving - methods - strategies Prospection
Perception	Amodal Color - RGB model Depth Form Haptic (Touch) Perception as interpretation Peripheral Social Sound - Harmonics - Pitch - Speech Visual
Memory	Consolidation Encoding Storage Recall

Other	◦ Attention ◦ Experiential avoidance ◦ Higher nervous activity ◦ Intention ◦ Ironic process theory ◦ Learning ◦ Mental fatigue ◦ Relational frame theory ◦ Mental set ◦ Thinking ◦ Thought suppression ◦ Volition

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- **Challenges in Bundled Payment Models**
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Frequently Asked Questions

What is prior authorization, and why is it important in medical coding?

Prior authorization is a requirement from insurance companies for healthcare providers to obtain approval before performing specific services or procedures. Its crucial in medical coding as it ensures coverage and payment for services, preventing claim denials due to lack of pre-approval.

How can inadequate documentation lead to denials related to prior authorization?

Inadequate documentation can result in denials because insurance companies require detailed clinical information to justify the necessity of the requested service. Without comprehensive documentation, the insurer may refuse authorization or payment.

What steps can be taken to prevent prior authorization-related denials?

To prevent denials, ensure thorough understanding of each insurers policies, maintain accurate and complete patient records, submit timely requests with all necessary details, and verify that authorizations are obtained before providing services.

How does effective communication play a role in managing prior authorization issues?

Effective communication between healthcare providers, patients, and insurers helps clarify requirements and resolve misunderstandings promptly. This minimizes delays in obtaining authorizations and reduces the risk of claim denials.

What are some strategies for appealing denied claims due to lack of prior authorization?

For appealing denied claims, review denial reasons thoroughly, gather additional supporting documentation if needed, adhere strictly to appeal deadlines set by insurers, and clearly articulate medical necessity based on clinical guidelines during appeals.

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