

BEHAVIORISM AND LEARNING: HOW IS EDUCATION INFLUENCED BY THORNDIKE'S THINKING?

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ABSTRACT

Thorndike did pioneering work not only in learning theory but also in educational practices, verbal behaviour, comparative psychology, intelligence testing, the nature-nurture problems, transfer of training, and the application of quantitative measures to socio-psychological problems. Thorndike's years of animal research was summarized in his doctoral dissertation, entitled "Animal Intelligence: An Experimental Study of the Associative Process in Animals", which was published in 1898 and expanded upon and republished as Animal Intelligence in 1911. The issue of transfer training as purported by Thorndike includes drill, or practice, of desired responses and environment in which the teacher forms and models appropriate habits. It is therefore not surprising what Polytechnic Colleges and Universities as well as Technical Secondary Schools utilize work experience, practice of task in the curriculum. Pupils must then perform task to the point of high competence. This is captured in the 'Law of Exercise, which states that as long as a response is made to a particular stimulus, each recurrence of that stimulus tends to recall that response as an S-R bond is being strengthened. Thorndike established the 'Law of Effect' under controlled conditions. He observed that particular consequences had a direct effect on behavior and made a backward-acting effect on the strength of a behavior. Thorndike noted that reinforcement (positive or negative) had strong effect on behavior. This is a critical rationale for the employment of different reinforcement by teachers in the learning process because of its effect on behavior modifications. Currently, Thorndike's 'Law of Effect' has continued to contribute to the teaching-learning environment as educators employ different reinforcement in an effort to directly affect the learning process.

KEYWORDS: Behaviorism, Education, Edward Thorndike, Learning, Puzzle-Box.

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INTRODUCTION

Edward Lee Thorndike was born in Williamsburg, Massachusetts, United States on August 31, 1874. In 1889, he received a doctorate from the University of Columbia in Psychology. Dr. Thorndike used his basement to observe the behavior of cats from which evolved 'Animal Intelligence', the first study on the psychology of learning (Thorndike, 1898).

He introduced to academic scholarship the theory of connectionism, which deals with the role of experience in strengthening and weakening of stimulus-response connections. When Thorndike forwarded the theory of connection, he was only 26 years old and was already the holder of a Doctor of Philosophy degree in Psychology.



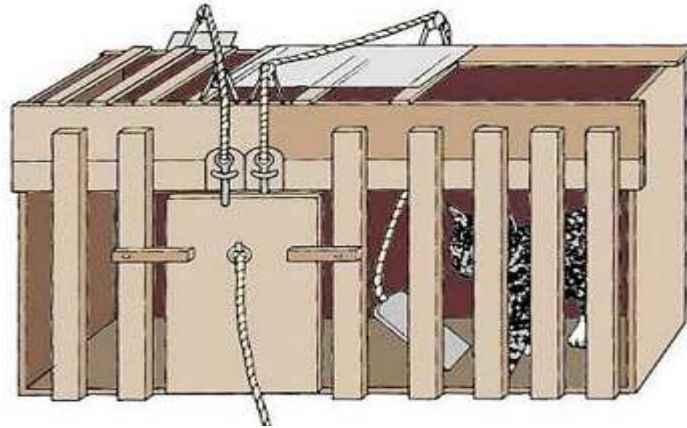
Source: <https://sites.google.com/a/nau.edu/learning-theories-etc547-spring-2011/theorist/edward-thorndike>
Edward Lee Thorndike (August 31, 1874 – August 9, 1949)

Thorndike did pioneering work not only in learning theory but also in educational practices, verbal behaviour, comparative psychology, intelligence testing, the nature-nurture problems, transfer of training, and the application of quantitative measures to socio-psychological problems.

Thorndike's years of animal research was summarized in his doctoral dissertation, entitled "Animal Intelligence: An Experimental Study of the Associative Process in Animals", which was published in 1898 and expanded upon and republished as *Animal Intelligence* in 1911 (Thorndike, 1898). The fundamental ideas put forth in these documents permeated all of Thorndike's writings and, in fact, most of learning theory.

Thorndike's pioneer investigations in the field of human and animal learning are among the most influential in the history of psychology. In 1912, he was recognized for his accomplishments and elected president of the American Psychological Association (APA). In 1934, the American Association for the Advancement of Science elected him as the only social scientist to head this professional organization. Thorndike retired in 1939, but worked actively until his death in 1949.

One of Thorndike's major contributions to the study of psychology was his work with animals. Through long, extensive research with these animals, he constructed devices called 'puzzled boxes'. Samples of these devices are shown in Figures 1-3.



Source: <https://www.google.com.jm/search?q=thorndike%27s+puzzle+box&tbm=isch&tbo=u&source=univ&sa=X&sqi=2&ved=0ahUKEwis-7eWtNHTAhUCTCYKHQEkCUQQsAQIRg&biw=988&bih=622>

Figure 1.Puzzle box

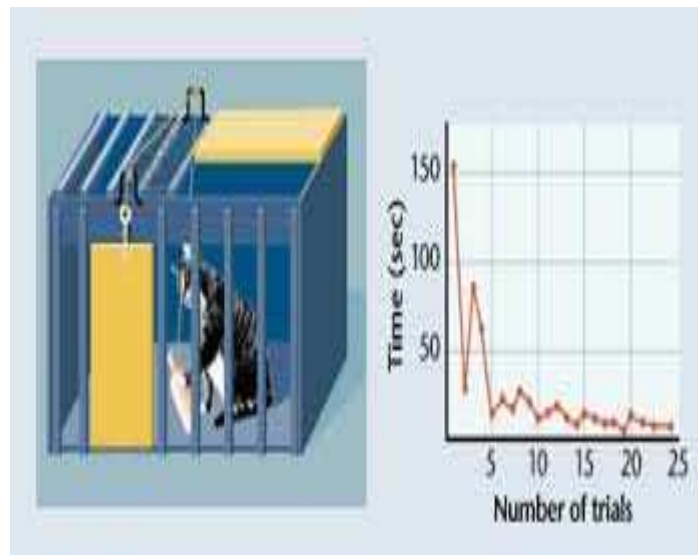
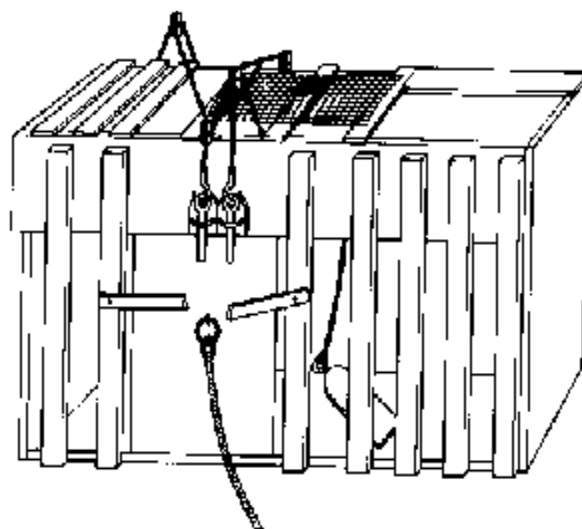


Figure 2.Puzzle box

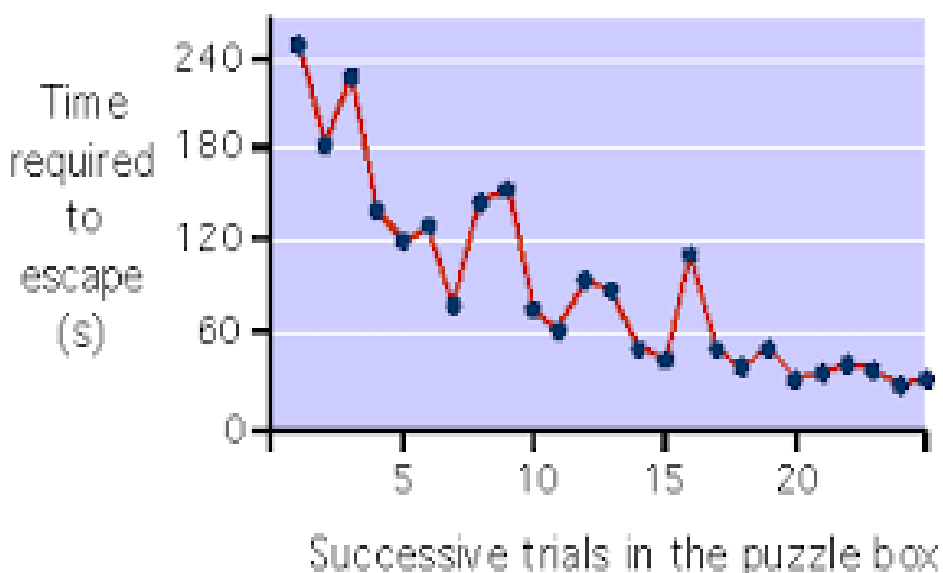


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Figure 3.Puzzle box

This work on animal intelligence used equipment that as at once both famous and controversial. Thorndike's setup of the puzzle boxes is an example of instrumental conditioning: An animal makes some response, and if it is rewarded, the response is learned. If the response is not rewarded, it gradually disappears. The entire experiment was based on animals being placed into these contraptions, and could only escape from it by making some specific response. Such escape procedures would be pulling a string or pushing a button (see Figures 1-3, above).

Thorndike's 'puzzle box' work is referred to as connectionism (Hilgard and Bower, 1966 in Knowles, et al, 2011, pp. 20, 21). The way Thorndike's experiment worked was by placing a hungry cat into the box, then observing its behaviour as it tried to escape to obtain food. For the most part, he noticed that the cat obtained the food through a process of 'trial-and-error'. On successive attempts, the mere trial-and-error behavior decreased and the cat would escape quickly from the entrapment. He studied several cats, and plotted the time it took for them to escape from the puzzle box on successive trials (Figure 4).



Source: <https://www.google.com.jm/search?q=thorndike%27s+puzzle+box&tbm=isch&tbo=u&source=univ&sa=X&sqi=2&ved=0ahUKEwis-7eWtNHTAHUUCTCYKHQEkCUQQsAQIRg&biw=988&bih=622>

Figure 4. Puzzle box successive trial recorded time

The learning curve (Figure 4) did not suddenly improve, but rather the amount of time the animal spent in the box gradually got to be shortened. From this, the animal did not merely realize what it had to do to escape, but the connection between the animal's situation and the response that gradually freed it was stamped in.

With these observations, Thorndike suggested that certain stimuli and responses become connected or dissociated from each other according to his law of effect. He opined, "when

particular stimulus-response sequences are followed by pleasure, those responses tend to be 'stamped in', responses followed by pain tend to be 'stamped out'.

DO YOU AGREE WITH THORNDIKE'S CONTENTION THAT THE SAME LAWS OF LEARNING APPLY TO BOTH HUMAN AND NONHUMAN ANIMALS? EXPLAIN.

Many studies have used animals as subjects of experimentation instead of humans given ethical concerns spanning issues of safety and

security-the harmful effects of certain studies on the subject (Pavlov, 1928; Skinner, 1956, 1987, 1990; Watson, 1968; National Human Genome Research Institute, 2016; New England Anti-Vivisection Society, 2017; Robinson, 2010). It is clear from many scientific enquiries that animals such as chimpanzees, pigeons, apes, and dolphins, are highly intelligent; but this cannot be likened to the intelligence of humans. Pennsi (2007) indicated that chimpanzees are highly intelligent and argued that they are 98% like humans in genetic composition.

Furthermore, Charles Darwin (1963) postulated that humans evolved from apes and this would suggest that there are some similarities between these animals referred to as lower animals and the human family which is classified as upper animals. Psychologists and Biologists have forwarded the perspective that humans are the most intelligent of all animals because of their ability to code, interpret, reason, make decisions, and solve complexed issues (Zimbardo, Johnson, MCawn, 2009), which holds some merit for a refining of Darwin's theory. The fact is, there is a cognitive domain of all animals and learning must be contextualized with this premise.

Behaviorists describe patterns of learning as the cognitive ability of humans. The cognitive processes in human animals are higher than that of nonhuman animals (Pavlov, 1928; Skinner, 1956, 1987, 1990; Watson, 1968). There is ample scientific evidence that many of the theories on behavior, learning and cognition have used lower animals in research because it has less harmful risk factor for humans, and these theories hold true for the upper animals because of the similarities between the two species. The aforementioned perspective gives a clear indication of my partial agreement in support of Thorndike stance that "the same laws of learning apply to both human and nonhuman animals".

Thorndike's statement is considered equipotentiality which is a central process in early S-R or behavioral theories. Equipotential learning suggests that both human and nonhuman animals have been ascribed the same learning processes. Early behaviorists posited that by studying learning in nonhuman animals it was easy to identify the basic processes that were common in human learning. Also, they stated that it was only by observing events or stimuli in an environment and measuring its response that learning could be studied. Based on their statement, it is not conclusive that human animals and nonhuman animals have the same laws of learning, but similar applicable laws.

According to behaviorists, the internal mental states are not engrafted in scientific research as it is not a requirement for the study of learning. A hypothetical illustration is of a football player learning the game by observation and that an indication that learning has taken place is by way of a change in behavior. Their suppositions were derived from responses of the following questions, "what happens to the football player who was taught certain skills in training or by showing him a video on how to play the game however he was not allowed to play but rather demonstrated the behaviors for an extended period of time? Does this mean, he did not learn the skills?"

To further clarify their statement, behaviorists indicate that all beings were born with "a blank mind" or "a tabula rasa (blank slate)" and it is their environment which develops "the history of [their] learning" (Halpern, Donaghey, Lamon, & Brewer, n.d). For the behaviorist, learning is shaped from an organism's experience and environment; so based on this fact, it is evident that there are certain things babies do not require to be taught.

All organism, based on their ability to learn can adapt to any dynamic modifications in the environment. Thus making learning an

unavoidable circumstance in life. As if we were unable to learn, we would be considered dead (Halpern, Donaghey, Lamon, & Brewer, n.d). Although, there are different behaviorists perspective on how learning should be conceptualized, it is clear that the general conception of the learning theory is derived from three major assumptions: (1) behavior is influenced by experience/practice/observation, (2) learning is adaptive for the individual and for the species, and (3) learning is a process governed by natural laws that can be tested and studied (Halpern, et al., n.d). Supporting theories of the learning processes synchronize relationship between stimuli that affects the organism and its response to that stimuli. This view is referred to as S-R theories.

Thorndike's theory about connection is the premise that holds the explanation for employing findings from studies on lower animals to that of upper animals. Hence, this supports a rationale for the usage of lower animals in many psychological, biological and neurological investigations. The reality is, behaviorists like Ivan Pavlov and B.F. Skinner as well as B. Watson have all used lower animals to generate theories of learning that are applicable to humans, and to connectionism as believed by Thorndike. While lower animals have been used in research trials, this only reduces the harmful risk factors for human; but the fact is, human must be brought into the investigation at some point as there are disparities between both species.

Thorndike's work on connectionism had much merit because there are substantial similarities between the lower and the upper animals. As a result, studies have used the lower animals to proxy its influence on the upper animals (humans). Such a reality is captured in a perspective by the New England Anti-Vivisection Society that states that "the basic assumption was that if animals used in laboratories experimentally contracted an

infection and were cured, there was a high probability of stopping the same disease in humans" (New England Anti-Vivisection Society, 2017), indicating a rationale guiding the thinking of behaviorists including Edward Thorndike and their use of the lower animals. Even though lower animals have been used in experiments instead of the upper animals, humans, cautioned must be taken in lower animals studies as is captured in an account made by the New England Anti-Vivisection Society:

There is demonstrated evidence of the failures of the animal model. For example: forcing dogs to inhale cigarette smoke did not show a link to lung cancer; Flosint, an arthritis medication, tested safe in monkeys but caused deaths in humans; and the recalled diet drug fen-phen caused no heart damage in animals, while it did in humans—just a small sampling of volumes of examples. Yet in spite of the fact that species differences between human and nonhuman animals have led to flawed science and incorrect conclusions, the practice of animal experimentation continues (New England Anti-Vivisection Society, 2017)

The above mentioned empirical findings support a dissimilarity between the lower and the upper animals and as such speaks to a cautioned in using the lower to proxy the upper animals in a whole scale manner. Nevertheless, using the lower animals do aid our understanding of the behavior of upper ones, which is a rationale used by Thorndike in applying what is learned in one species to another. Thorndike's perspective is aptly captured in this statement:

But our interest in human genetics does not stop at the boundaries of the species, for what we learn about human genetic variation and its sources and transmission inevitably contributes to our understanding of genetics in general, just as the study of variation in other species

informs our understanding of our own (National Institutes of Health, 2007)

It can be deduced from the expression of the National Institutes of Health that empirical investigations of the lower animals do aid an understanding of the upper animals; but it was also noted that there are substantial variations in both species and that this must should have been taken into account by Thorndike. Hence, the law of lower animals cannot be totally employed to serve to replace humans as their cognitive capabilities are far more superior, and not all lower animals have the same cognitive capacity, as earlier seen from the studies done in chimpanzees.

ASSUMING THORNDIKE'S REVISED LAW OF EFFECTS TO BE VALID, DO YOU FEEL CLASSROOM PRACTICE IN THIS COUNTRY IS IN ACCORDANCE WITH IT? CHILD-REARING PRACTICES? EXPLAIN

According to Thorndike (1898), the law of effect purports that responses that produce a positive stimulus (pleasant or satisfying) in a particular situation is more likely to be reoccurring. Contrary to that, responses that produce a negative stimulus (discomforting, annoying, or unpleasant) is less likely to occur again in the situation. Based on this revised law of effect, reinforcement intensifies the strength of a connection, while punishment reduces its strength (Halpern, Donaghey, Lamon, & Brewer, n.d).

Though, punishment was found to repress inappropriate behavior in most school population, the flip side is also true. In a research done in an Australian school, it was revealed that students were more prone to get involved in criminal activities as that style of punishment fosters resentment and increases aggression and truancy (Australian Law Reform Commission, 20 May 2010). Hence, it can be stated categorically that punishment can bein

effective in modifying behaviors and provides enough evidence to support the authorities' decisions to take corporal punishment out of the education system in Jamaica and have now incorporated legislation on child abuse and child protection.

Classroom and child-rearing practices in Jamaica are in keeping with Thorndike's revised law of effect. A behavioristic teacher, for example, who teaches nonreaders to read, first should develop a list of words and then incorporate those words into the student's working vocabularies. This should be done prior to the introduction of specific letter-sound relationships, after which(s)he should teach students to read whole words and then express their meanings. Thorndike's S-R learning process further reinforces this approach as it suggests that students be taught in one of the following ways or a combination of the two:

1. Classical conditioning (stimulus substitution): This procedure is when the teacher would get his students to say a specific words; then he would give them the appropriate stimulus, in the form of the written word, just prior to their saying that word. The repeated practice would stimulate students to repeat the action (Bigge & Shermis, 1999).
2. Operant/ Instrumental conditioning (response modification): This procedure is when the teachers would give students a "reward" for their behaviors to reinforce the positive stimuli that is when a word is completed properly or filled in properly in a blank space. There is "feedback" from the reinforcing "reward," which will increase the probability that, on future occasions, students would accurately read or write the completed or filled-in words (Bigge & Shermis, 1999).

For decades, both teachers and parents have been using classical or instrumental

conditioning to apply Thorndike's law of effect to encourage desirable behaviors and discourage undesirable behaviors but this law requires active recognition by the subject. Some mechanism is needed for the subject to identify if the reinforcement was satisfying or not; hence the effects to loop feedback into the mechanism to strengthen an associative bond between a response and a stimulus (Halpern, Donaghey, Lamon, & Brewer, n.d).

The problem however, that still plagues reinforcement theory revolves around the need for the mediation of response-produced effects. An important issue that is still outstanding is the fact that some consciousness is needed to adequately address the judgmental realization in the act of reinforcement effect. Thorndike opined that at the core of physiological level are satisfiers and annoyers (Halpern, Donaghey, Lamon, & Brewer, n.d). In Jamaica, classrooms do not reflect wholly Thorndike's revised law of effects.

ACCORDING TO THORNDIKE, WHAT DETERMINES WHAT WILL TRANSFER FROM ONE LEARNING SITUATION TO ANOTHER?

The notion, "transfer of learning" as construed by Thorndike and Woodworth is referred to learning or performance on prior experience. Similarly, Gagne (1965) posits that learning is a change in human disposition which can be retained and which is not simply ascribable to the process of growth. Thorndike's principle explored mental functioning and how this influences another functioning. The theory depends upon how similar the learning task is from the transfer task.

This suggests that transfer is always specific, never general as the number of common elements increase, the number of transfers between the two situations also increase. Thus, the elements in common that make up the transferring from one situation to the next may

actually be stimulus situations or they may be procedures (Hergenhahn & Holson, 2005). In essence, your past experience impacts the modality of learning in a new situation.

Thorndike's perspective underlying 'what determines what will transfer from one learning situation to another' is widely supported in the literature on animals' behavior. In other words, animals form a cognitive map of things, which they used to solve other situations and this was empirically established by Edward Tolman using the mental map of rats in the maze (Tolman and Honzik, 1930).

Nevertheless a study by Kohler (1925) of a chimpanzee called Sultan discredits the widely held assumption of behaviorists that animals form a cognitive map of things that they use in similar situation. Kohler's work highlighted that chimps showed *insight learning* to solve unfamiliar situations, meaning prior knowledge is not needed for solutions.

Such a finding does add another perspective to the interpretation of learning and this means that people are able to solve unfamiliar situations without prior knowledge too because of insight learning. Simply put, animals including humans are able to solve issues without using conditioned responses; but they will do so by way of insight learning, which is found in Gestalt psychology.

Gestalt psychology posits that problem-solving of situations can be framed around reorganization of perceptions, which is a trait found in both the lower and upper animals. So, Thorndike's perspective is not refuted by cognitive learning as it only adds depth to the complex nature of animals. Hence, Thorndike's work is aptly relevant and true; but, we should be mindful of cognitive learning as people may solve issues without prior knowledge, which is by way of cognitive reorganization.

SUMMARIZE THORNDIKE'S CRITICISMS OF THE FORMAL DISCIPLINE APPROACH TO EDUCATION. HOW WOULD YOU ARRANGE SCHOOLROOM PRACTICES SO THAT THEY TAKE INTO CONSIDERATION THORNDIKE'S THEORY CONCERNING THE TRANSFER OF TRAINING?

Thorndike was the first to rigorously question common assumptions in educational practices, that is, formal discipline. What evolves from his questioning was the theory of transfer?

Prior to Thorndike's work, the popular theory was associationism. This theory links learning to the principles of the organism's history. Thorndike disagreed with the widely held view at the time by scholars in psychology that was taken from the premise that the human mind was made up of several faculties such as reasoning, attention, judgment, and memory, which could be strengthened by practice. He contended that education resulted in highly specific skills learned more so than on general skills (Halpern, Donaghey, Lamon, & Brewer, n.d). Dr. Thorndike gave an example of how practice can enhance skills. He indicated that a person can be an expert musician but is lower skilled in other areas as poetry and vice versa. The same perspective holds true for Usain Bolt being the fastest man in the 100m and 200m since 2010; but he is unrecognized in other sporting events such as basketball, volleyball, soccer, or in other areas like poetry, academics and the list is an unending one. It can be deduced from Thorndike's work that education is a deepening of specialized knowledge than a general one. Such a perspective holds true as the more one pursues education, the less general one becomes. According to White "It means more than a preparation for the life that now is. It has to do with the whole being, and with the whole period of existence possible to man. It is the harmonious development of the physical, the mental, and the spiritual powers"

(p. 13). Based on Ellen G. White's perspective, many decades after Thorndike's theory, she seemed to share his perspective (White, 1952).

The reality is, contemporary secular education omits spirituality, and the need for God. The secular scholarship omits God and this uni-dimensionality is passed on as intellect multi-dimensionality. Because humankind is a living multi-dimensional soul, education must cater to his/her inner being, that is spiritual being, and not only the physical or intellectual as it is only then that education will be judged to be 'true education' (See Ellen White's work on Education). White opines that while men/women have expanded on their understanding of the world, social systems and functioning of many issues, there is still a supreme source of knowledge, the Infinite One – God. Hence, White postulates that true higher education come from the Infinite One and she uses scriptures from Moses (Job 12:13) and Solomon (Proverbs 2:6), which clearly indicate that all wisdom and knowledge is enveloped in God. As such, she forwards "In a knowledge of God all true knowledge and real development have their source" (p. 14), suggesting that we should begin our quest for knowledge by subscribing to the knowing God and it is He who will provide wisdom beyond our soul's comprehension. She aptly puts it this way, "The mind of man is brought into communion with the mind of God, the finite with the Infinite. The effect of such communion on body and mind and soul is beyond estimate" (White, 1952, p. 14). An example was made with the first human, Adam, who was made in the likeness of God with vast wisdom, and the fact is he was not educated in the formal system. So if man is to be realigned with His maker, man's knowledge will far exceed what is present. man's depth of knowledge may be impressive in one area yet in other aspects he is an imbecile; he may be a gifted poet; but an ignoramus in music; he may have a wonderful

memory for figures and only a mediocre memory for localities, poetry or human faces; school children may reason admirably in science and be below the average in grammar; those very good in drawing may be very poor in dancing. Thorndike expanded on the knowledge of the day and questioned many of the established foundations of philosophical viewpoints. He articulated, therefore, that a "Law of Exercise" is in essence the psychology of learning and progressivist thinking before 1929, which emphasized spontaneity and favored student selection of activities and freedom from a planned curriculum sequence and from drill. As a result, he concurred with educational thinkers such as John Dewey, Marietta Johnson, and William James. In keeping with his perspective and those whom he supported as previously mentioned, he opined:

Intellect and character are strengthened not by any subtle and easy metamorphosis, but by the establishment of particular ideas and acts under the law of habit The price of a disciplined intellect and will is eternal vigilance in the formation of habits Habit rules us but it also never fails us. The mind does not give us something for nothing, but it never cheats (1906, pp. 247-248)

Thorndike's perspective sounded like an educational philosopher instead of a psychologist or an educational psychology as he was philosophizing based on the issue of habits, its role in behavior and its value to learning as was never before conceptualized and promulgated by any scholar. Thorndike was radicalizing the established philosophies of learning and offering new insights into educational theorizing to the discourse. He believed in freedom, spontaneity, inner direction, and 'unfolding' that did not stand in the way of nature's reality. He could be likened to Albert Einstein in the radical approach he took to his discipline and the subsequent

impact on generations thereafter. Thorndike's perspective on psychology and psychology of learning was totally different from his predecessors' practice or exercise (or drill) with reward; and measurement of progress through frequent testing, preferably by standardized tests so that more reliable estimates of learning could be had.

HOW WOULD YOU ARRANGE SCHOOLROOM PRACTICES SO THAT THEY TAKE INTO CONSIDERATION THORNDIKE'S THEORY CONCERNING THE TRANSFER OF TRAINING?

The teaching-learning process has been significantly influenced by the work of Dr. Edward Lee Thorndike and other behaviorists such as B.F. Skinner, Ivan Pavlov, B.J. Watson and Albert Bandura. This influence is only limited to conceptual theorizing as it extends to teaching strategies, learning approaches, and classroom dynamics which include arrangement. One of the foundations of learning is physical environment, which can be guided by Thorndike's perspective on the transfer of training. The arrangement of classroom in keeping with transfer of training is by way of positive control in that physical space. This approach is encapsulated in what is referred to as modeling in the teaching-learning process. In a transfer of training classroom, the teacher will structure it in such a way that the satisfiers strengthen connections but annoyers do not weaken them. As such, the lecturing methodology could not be applied as the classroom much is specially designed to ensure that annoyance is lower and strengths are encouraged therein. Hence, a transfer training classroom would make in keeping with teaching students one-on-one.

Interestingly, Thorndike educators should arrange the classroom in such a way that they emphasize the direct training of those skills

they believe to be important beyond school (Hergenhahn & Holson, 2005). It can be deduced that the apprenticeship programme established and widely used in the practical areas would have evolved from Thorndike's transfer of training perspective. This means that the schools' curriculum should be such that it influences the students long after graduation: the school's curriculum should be designed to include tasks similar to those students will perform when they leave school or in the workplace.

The issue of transfer training as purported by Thorndike includes drill, or practice, of desired responses and environment in which the teacher forms and models appropriate habits. It is therefore not surprising what Polytechnic Colleges and Universities as well as Technical Secondary Schools utilize work experience, practice of task in the curriculum. Pupils must then perform task to the point of high competence. This is captured in the 'Law of Exercise, which states that as long as a response is made to a particular stimulus, each recurrence of that stimulus tends to recall that response as an S-R bond is being strengthened. It, therefore, should not be surprising that pupils who attend and graduate from Polytechnic Colleges or Universities and Technical Secondary High Schools are able to function at a high level on entry into the workplace.

Outside of the aforementioned issues, Thorndike significantly contributed to learning by way of providing rules for teaching. He developed seven rules for teaching: 1) the teacher must evaluate the situation by the learners' face; 2) the response and the desired connect with it; 3) the connection or bond psychology, do not expect a miracle; but institute the desired outcome in the teaching process; 4) the teacher should establish no bond or connection that will have to be broken; 5) bonds or connections should be instituted in

such a manner as required and not multiple bonds of no importance; 6) bonds or connections should be instituted in class as they are expected for later life, and 7) the circumstances which life itself will offer, and the responses which life itself will demand.

DISCUSS FIVE CONTRIBUTIONS OF THORNDIKE'S THEORY ON EDUCATION

Thorndike's work has made significant contribution to education, particularly adult education and these will be discussed below:

1. In 1914, Thorndike began his research through approaches of methodology, operationalization and conceptualization on clerical aptitudes and interest. This research led to further studies into vocational guidance for schools. Based on his empirical findings, Thorndike advocated that special efforts and new departures in vocational education for school children – around a third of the total – “may learn only discouragement and failure” from their existing curriculum (Joncich, p. 473).
2. Hergenhahn and Holson (2005) provided information that shows how Thorndike's theory has been interwoven in education. They indicated that he has contributed to conceptualizing learning and behavior. The earlier theorizing lacked systematic, experimental treatment of learning, and Thorndike was the first to do this as well as blend psychology with learning. Following the platform set by Thorndike, studies began collecting data to systematically evaluate the learning process. Hergenhahn and Holson (2005) postulated that Thorndike established and revealed the phenomena of trial and error learning and transfer of training, which set the stage for the development of the domain of learning theory (Hergenhahn & Holson, 2005).
3. The 'Law of Effect' developed by Edward Thorndike is among his most significant

contributions to the space of learning theory (Hergenhahn & Holson, 2005; Ormrod, 2008). Observing cats in his basement, Thorndike established the 'Law of Effect' under controlled conditions. He observed that particular consequences had a direct effect on behavior and made a backward-acting effect on the strength of a behavior. Thorndike noted that reinforcement (positive or negative) had strong effect on behavior Hergenhahn & Holson (2005). This is a critical rationale for the employment of different reinforcement by teachers in the learning process because of its effect on behavior modifications. Currently, Thorndike's 'Law of Effect' has continued to contribution to the teaching-learning environment as educators employ different reinforcement in an effort to directly affect the learning process(Hergenhahn & Holson, 2005).

4. Thorndike is considered to be the father of psychology of education and among his discoveries is the 'Law of Exercise'. He noted that animals follow a 'Law of Exercise' and suppression of behavior whenever they are punished (Hergenhahn & Holson, 2005). This suppression of behavior is because of the negative reinforcement employed, and this is widely used by parents and teaching as well as prison-rulers to lower an undesirable behavior. The 'Law of Exercise' had two components: 1) Law of Use and 2) Law of Disuse. The 'Law of Use' holds that whenever connection is strengthened by way of positive reinforcement, the behavior will be increased. The 'Law of Disuse' dealt with a connection that reduces a behavior. Educators have continued to employ the 'Law of Exercise' in the teaching-learning process as they seek to increase learning in the classroom. They thereby will resort to measures that increase behavior by positive

reinforcement or reduce it by way of negative reinforcement.

5. Having developed some critical issues to the discourse of education, Thorndike later questioned the transfer of training—formal discipline, which was used in educational practices. Although Thorndike did not study cognitive behavior and linked this to learning, he is still considered as the forerunner for contemporary cognitive learning theories (Hergenhahn & Holson, 2005). Clearly, Dr. Thorndike's work has influenced Social Cognitive Theory that was developed by another behaviorist, Albert Bandura.

CONCLUSION

Behaviorism, particularly the works of Edward Thorndike, continues to significantly influence our social system, today. The reality is, Thorndike's theories have left an undeniable legacy for contemporary paradigm, especially in education and more so educational psychology. Despite the limitations of behaviorism, it is highly intertwined in many educational practices, theories, principles and structure of our social system.

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