

Environmental and Hereditary Effects on Intelligence and Learning Capabilities

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ABSTRACT

A person's intelligence is defined by their different cognitive abilities, such as thinking fast, solving problems, developing questions, understanding, and using critical thinking; these abilities are far more important than general intelligence acquired in a school system. The environment may affect a person, such as having no support from one's parents to study or do well in school and develop cognitive skills. Cognitive skills can be improved, such as attention span, which may improve with consistent practice. Everyone learns differently and requires different modules of learning; people who have high IQs and do well in school tend to be because they fit into the learning module that schools provide. This research will talk about adaptive intelligence and how it is essential to solve problems of the moment because a person with this intelligence has the necessary tools to adapt their skills to any situation. It will also cover the understanding of human abilities, the factors that may affect them, the difference between households, and the effect this can have on a person, such as the amount of support and motivation given to a person to learn and understand. Furthermore, this investigation delineates the importance of education and how it is vital in helping people develop their cognitive skills and improve them over time.

Introduction

Countless investigations have been conducted to pinpoint the source of human intelligence. Many sources converge on the peculiarity that intelligence can be genetic-based and (in most cases) nurtured; this research is about what defines a person's intelligence and how it can be reinforced and achieve a higher level of intelligence. Intelligence is a person's cognitive skills and abilities, which a person is born with and can improve by education. Showcasing the importance of education in children is essential since, with quality education, for example, children can improve their cognitive skills. The problem with education is that schools tend to teach all children the same way, yet as shown in this research, all children are diverse; therefore, they learn differently and must be taught differently. Many environmental factors may influence a child's mental development, starting from the environment in the womb when the child is not even born yet. The purpose of this research is to make aware that just because a child is not as fast as the rest of the kids, it does not mean they are incapable, but rather that their cognitive abilities need to be better developed.

Moreover, this research also highlights that intelligence is genetically based, which does not exclude that the environment can also have an effect. The environment a person is raised in may have a negative or positive effect depending on how that child is treated and supported. Additionally, inquiry aims to make aware that there is more to intelligence than getting good grades or having a high IQ; those who achieve good scores and have a high IQ may be because they fit into the standard learning module provided. Those who do not fit into these modules is because they have a different way of learning and understanding. This research also shows how a person with adaptive intelligence, intelligence that adapts to the needs of the time, and a person who

employs fast critical thinking is more important than general intelligence. This topic is essential to raise awareness that everyone is different, and some may be more intelligent than others, but that does not mean that those who are not as intelligent cannot achieve more intelligence. It just means that they have to work harder for it. It demonstrates how the inequality of resources between people of different social classes may affect a person's intellectual development because those from a lower social class do not have access to or the money to receive a better education or particular class to be able to improve their cognitive skills in comparison to those from a high social class. The benefit that this topic could bring to society is that it will raise awareness that many factors are involved in a person's mental development and cognitive functions. From the environment, a person is exposed to the genetics of a person; this shows how some things are controllable while others are not, but what is essential is to try, be persistent, and never give up because everything is achievable with time and patience. Things that may be harder to change or improve are things one must keep trying and learn to live with and find one's strengths because nobody is perfect. Some will be better at certain things; there is no changing that, but one can always try one's best to improve.

Research Question

What factors affect a person's intelligence and cognitive skills?

Review of Literature

The Effect of Environment and Genetics in Intelligence

Intelligence is a person's cognitive abilities and mental skills; this article shows the effects that both genetics and the environment may have. This study aims to evaluate the impact of an individual's genetic and ethnic background on their intelligence and ability to learn. This article discusses intelligence, genetics, education, and ethnicity, as well as how these factors can be used to justify not educating children. This article discusses opportunity denial, education in developing countries, and strategies for elevating marginalized groups' status and defending their legal rights. It emphasizes that a person's learning ability is not inherited but rather a result of inadequate teaching resources. It also demonstrates how developmental factors, including those influenced by the mother's environment, affect intelligence rather than being inherited. The following source can indicate that:

We believe that a more accurate understanding of the contribution of heredity to intelligence will be possible only when social conditions for all races are equal and when this situation has existed for several generations. We maintain that the racism and discrimination in our country impose an immeasurable burden upon the black person. Social inequalities deprive large number of black people of social, economic, and educational advantages available to a great majority of the white population. The existing social structures prevent black and white people, even of the same social class, from leading comparable lives. In light of these conditions, it is obvious that no scientific discussion of racial differences can exclude an examination of political, historic, economic, and psychological factors which are inextricably related to racial differences. (Gordon, 1969)

The importance of this source concerning this investigation is that it talks about how intelligence and the ability to learn are not hereditary but depend on the environment that a person grew up in and how they were raised. This source also talked about how individuals can develop intelligence from the people around them, such as a person's parents, and even when a child is in their mother's belly, it can affect their development. This article also talks about how intelligence does not account for a person's race or ethnicity but the environment. Also, this source shows that kids can be affected by how learning is portrayed to them and how this can affect their ability to learn or be intelligent psychologically. This article also mentions how there is only one

learning ability and how this might be a mistake. Exploring different types of skills and learning modes might show more of a change than only having one pattern of abilities and trying to teach all children this one ability pattern. It is thought that those who have higher mental capacities are those who fit into this ability pattern. The people whom society calls stupid are stupid because they do not fit into the abilities and modes that they are taught.

The Hereditary Effect on Short Term Memory and Verbal Divergent Thinking

Short-term memory and verbal divergent thinking are examples of cognitive skills, and this article explains how some are genetic-based while others are developed. This article examines the heritability of verbal divergent thinking and short-term memory. It explains how verbal divergent thinking is not inherited, but short and long-term memory is. This article illustrates the impact of an individual's living environment on them. It also shows how, because verbally divergent students are different from most children, teachers must develop innovative ways to help them understand. Since they need more time than the other children, these children need more support and care from educators and parents. The following article elucidates this argument by indicating that:

This research has demonstrated that first, short term memory has a moderate heritability index, .54, as compared to Jensen's .80 for the general intelligence factor 'g,' and the three divergent thinking factors, verbal fluency, verbal flexibility, and verbal originality have no statistically significant genetic components. Second, and consequentially, these mental capacities are identified as candidates for facilitation efforts. If it is a fact that short term memory, Jensen's Level I, does have 54% concomitant variation with genetic makeup, then Level I is a more likely candidate for facilitation than the conventional IQ. Furthermore, if verbal divergent thinking has no significant genetic component, it is a most likely candidate for facilitation.

[...]

If teachers are made aware of the narrowness of the range through which learning is conducted, and that other learning capacities not only exist but are much less "fixed" than the conventional 'g,' they may be more open to alternative ways of teaching. In this way the schools may learn, to utilize the relatively unused strengths of children whose major strength is not of the verbal-cognitive-abstract type. Jensen also points out (1969, p. 117) that Level I may be the basic avenue to learning among the disadvantaged. If this is the case, then it seems mandatory that teachers be made aware of a diversity of approaches to make learning rewarding to children of diverse ability patterns. (Pezzullo & Madaus, 1971)

The information presented in this source validates that some things are hereditary while others are not. Things that are not hereditary, such as verbal divergent thinking, are something that teachers and parents have to deal with. People with such things may need more help than other children; they might even need a different type of teaching system to understand. Not just in school but in their houses, parents must provide a healthy environment where children, in general, can develop happiness and the ability to think and want to do work and help. Other things, such as long-term and short-term memory, have been proven to have a percent of heritability but still can be reinforced by teachers and parents with memory games and simple day-by-day tasks. It shows that just because some may be born with gifts, it does not mean that others who were not can not achieve being smart or have long-term memory because, with good education and willingness, children can learn so much. It is not the child who is smart or dumb but how people help that child develop that desire and curiosity that makes someone truly succeed.

The Difference Between Race in People's Intelligence Capacity

The difference between Black and white people's intelligence capacity is the environment surrounding them and the support given to them. This article studies the differences between black and white people's intelligence capacity and what factors are involved. This study compares African Americans' and White Americans' cognitive capacities. This paper examines the difference in cognitive abilities of White and Black individuals. The interiors of white and black homes are also different. The theory put forth in the article holds that the distinctions between whites and blacks can be traced to how each group adapted to the unique cognitive demands of their various roles within the American caste system. Hence, compared to people of color, white people have benefited from and had more opportunities. The following study was able to state that:

Genetic factors which cause individual differences in cognitive skills or IQ within the Black population are probably the same as those which cause individual differences within the White population. But the same factors do not necessarily cause Black-White differences in cognitive skills or behavior. I do not mean by this that Blacks and Whites may not differ in their genetic equipment for cognitive development. Vandenberg (1971:203-204), reports, for instance, that one gene which causes mental deficiency, Phenylketonuria (PKU), is known to occur more frequently in the White than in the Black population. I only wish to point out that I have found no research which shows that specific genes linked to lower IQ are found in higher proportion among Blacks than among Whites. Nor have studies shown that specific genes which control conceptual and abstract thinking are found in higher proportion among Whites than among Blacks. There are, in short, no studies which have empirically demonstrated that gene-controlled deficiencies in mental abilities, such as inbreeding, mutant genes, and chromosomal abnormalities, are found in higher proportion among Blacks than among Whites. (Ogbu, 1974)

The usefulness of this source within this investigation delineates that white people are not more intelligent than black people and never are more brilliant, just that white people tended to have more resources. It is shown in this article that white people in the past would usually have a higher IQ score than black people. However, this is due to the lack of push by their parents and lack of good education. It also says how black people in the past were taught not to compete with white people for a better position in society because they were always thought of as inferior to them. It shows that it was not because they were black but what being black represented to society, and they ended up believing it themselves. Psychologically, this made them think they were not good enough constantly, but it was the contrary. They just lacked a good education and people to push them to keep trying. This research also found that black children tended to fail in their schoolwork often from lack of serious effort rather than because they could not perform a given task.

Can Education Improve Cognitive Functions?

Cognitive functions depend on one's genetics, but this does not mean they can be improved with education and practice. This paper investigates the effects of education and genetics on cognitive functions. It highlights how, although cognitive functions are inherited, they can also develop via experience and training. While each person has a distinct set of these abilities from birth, these can be enhanced through practice and patience. The human genome contains about 20,300 genes, some related to cognitive functions. Particular cognitive skills can only be learned through experience, while others develop naturally. The goal is to identify the traits that are most easily enhanced and those that are more difficult to alter. Genetic traits can be affected by various factors, including genetic variations and environmental factors like education and life experiences. The investigation aims to determine the more accessible and harder-to-change traits through educational intervention. The following source goes into detail by stating:

This review focuses on the heritability of cognitive functions that are relevant for learning. Children are not a simple tabula rasa, as once thought since they are conditioned by their genome to an extent. The environment, including the educational one, is also a significant factor which can allow them to make the most

of their capabilities, including intellectual and emotional aspects. In other words, although the brain is malleable and can be changed through education and daily experiences, and thus so can cognitive functions, its formation and functioning are based on a genetic substrate that influences it to a moderate or high degree. Therefore, knowledge of the existence of genetic and epigenetic influences on the development of cognitive functions and the extent of their influence, may empower education professionals to work toward more respectful and flexible practices. (Bueno, 2019)

The data extrapolated from this source shows how cognitive skills are based on their genetic makeup since birth. However, this article shows that one can still develop those skills and traits with the help of an educator or specialist. One's brain is designed to learn and process information. It consists of neural connections that generate and support mental functions formed throughout life, enabling lifelong learning of new concepts and skills. The article points out how, despite the high genetic heritability in most brain processes associated with learning, educational practices are still vital contributors to student development, allowing skills to be enhanced or diminished. Education and consistency in practice are crucial to developing cognitive skills since one may not be born with as many cognitive skills or not have them as designed. However, with practice and help from educators, one can improve specific skills over time. Everyone is different and has different genes. Therefore, some people may have to work harder and need more help than others, and some may be better at some things than others due to everyone having a different genetic basis. This source will help advance the investigation because it shows that just because one is not born with as many cognitive skills as others, it does not mean one cannot achieve them with time. The human brain is malleable and is affected by education and daily experiences; therefore, so are cognitive functions; this shows that most things can be achieved through practice and consistency. Even high heritability traits may be significantly altered by the environment acting directly on brain malleability or epigenetic modifications.

Understanding Human Mental Abilities

This investigation aims to understand human mental abilities mechanistically and how variations in intelligence and brain structure are heritable but are also influenced by environmental factors. It covers environmental factors that may affect a child's mental development, such as drinking, drug use, and smoking while pregnant, and describes the various brain regions that support intelligent behavior. Breastfeeding helps improve a child's cognitive functioning. The study shows that the integrity, structure, and function of the lateral prefrontal cortex and other regions are related to intelligence, precise reasoning, and problem-solving skills. Intelligence is influenced by both nature and nurture, according to a study involving identical twins; the correlation for intelligence was 0.72. The evidence points to a significant hereditary component of intelligence, but monozygotic twins are more alike due to several non-genetic factors. An investigation conducted by Gray & Thompson showcases the following:

Genetic and environmental effects on intelligence are not always independent of each other, understanding the specific causal pathways of gene action is vital when evaluating any genetic account of mental ability. Gene effects might be direct; they might depend on the environment (gene-environment (GE) interaction); and they might act in directly through correlated environments (GE correlation). About half of the population variance in intelligence is attributed to genetic differences, yet the environment also influences intelligence. Dutch 18-year-old men tested in 1982 scored 20 IQ points ($SD=15$) higher than 18-year-old men tested in 1952 (REF. 145), a widely replicated population-level increase in intelligence known as the 'Flynn effect'. Large environmental influences on IQ can be reconciled with high heritability estimates if individuals' environments become increasingly matched to their genotypic preferences 95(GE correlation). Gifted individuals might create or evoke situations that further enhance their intellectual ability (active and reactive GE correlation, respectively 146). (Gray & Thompson, 2004)

The significance of this source regarding this research is that it shows that genetics and environment may influence intelligence. However, it emphasizes intelligence being mostly hereditary and depending on genetics. There are still many environmental factors that may have some impact on a person's intelligence and mental development. This article talks about the different components of the human brain that affect a person's intelligence, such as the lateral prefrontal cortex, which has been shown to support intelligent behavior. The information from this source will help advance the investigation because it talks about facts and not theories. It shows factors that affect intelligence and the percentile of effect that it may have. This article shows many graphic pictures of the percent of genetics in the intelligence of a person; for example, with identical twins, the article shows how both their brains are almost a copy of one another where they share all the same genes, while fraternal twins share about half of the same genetics. The investigation also discusses how genes and environment have crucial roles in the transmission and expression of disorders; the fact that intelligence depends substantially on genetics does not necessarily have implications for population-group differences. Also, the environment a child grows up in affects their intellectual function. The source showed that children who grew up in the same family increased IQ, and the strength of the correlations decreased if individuals were raised separately for these relatives, which states that differences between family environments affect mental development.

Ability to Pay Attention and How to Boost It

People's ability to pay attention varies; some may be better than others, but it can also be improved with practice and consistency. This study intends to determine what influences attention and how to enhance it. It talks about how some kids are genetically predisposed to being better attention seekers, but that ability can also be improved with targeted attention training. According to a study on children between the ages of 4 and 6, children's attention spans naturally grow. On the other hand, children who receive special attention training may even become more adept at paying attention than those who do not. The study emphasizes how crucial customized attention training is to kids' attentional growth. The cited source can state the following:

Strong improvement in executive attention and intelligence was found from ages 4 to 6 years. Both 4- and 6-year-olds showed more mature performance after the training than did the control groups. This finding applies to behavioral scores of the executive attention network as measured by the attention network test, event-related potentials recorded from the scalp during attention network test performance, and intelligence test scores. We also documented the role of the temperamental factor of effortful control and the DAT1 gene in individual differences in attention. Overall, our data suggest that the executive attention network appears to develop under strong genetic control, but that it is subject to educational interventions during development. (Rueda et al., 2005)

The significance of this source regarding this research is that it provides a specific ability that is affected by genetics, which is the ability to pay attention. The article shows how a child's ability to pay attention is genetically based, but that could be improved by getting special attention training. This source provides information on how genetics may influence a person's ability to learn, but certain things may be reinforced with different resources and support. The information provided will help advance the investigation because it shows evidence that the ability to pay attention can be improved. It also provides data on a few different age groups, which is helpful because it is specific and not general. This research compares the differences between kids who get special attention training and those who do not, and it shows that those who do receive training reach a higher level of attention span. By providing information on a child's ability to pay attention from a young age, it is shown that just because a person is genetically disadvantaged, it does not mean that there is no hope for that child, but rather that it will take more effort and more training to reach a higher attention span.

Ways to Improve Intelligence: Benefits and Factors Involved

This article examines the different elements that affect intelligence and academic performance—finding the best ways to increase IQs and the possible benefits to humanity if people could increase their intelligence. The aim is to prove that various controllable and uncontrollable factors influence a child's ability to raise their IQ and succeed academically. Some factors could be prenatal and early childhood experiences, socioeconomic background, or even the child's genetics. The article also describes how improving education for students with learning challenges requires diversity rather than consistency in approaches and goals. It also discusses how different patterns of abilities rather than cultural deprivation, low socioeconomic status, or cultural bias account for differences in IQ. IQ tests and contemporary teaching methods fail to take advantage of some learning capacities. In this regard, the following investigation can state the following:

If diversity of mental abilities, as of most other human characteristics, is a basic fact of nature, as the evidence indicates, and if the ideal of universal education is to be successfully pursued, it seems a reasonable conclusion that schools and society must provide a range and diversity of educational methods, programs, and goals, and of occupational opportunities, just as wide as the range of human abilities. Accordingly, the ideal of equality of educational opportunity should not be interpreted as uniformity of facilities, instructional techniques, and educational aims for all children. Diversity rather than uniformity of approaches and aims would seem to be the key to making education rewarding for children of different patterns of ability. The reality of individual differences thus need not mean educational rewards for some children and frustration and defeat for others. (Jensen, 1967)

The significance of this source regarding this research is that it talks of ways to improve a person's intelligence and fix the problem instead of just pointing out the problem. It provides knowledge on not the culture or socioeconomic status that influences a person's intelligence and development but rather the fact that everyone is different; therefore, everyone learns differently. It also talks about how IQ tests are uniform, where every person receives the same test, but the problem with this is that everyone has a different approach to learning and a different way of understanding; therefore, IQ tests are not entirely accurate. The information provided by this article will help advance the investigation because it also shows how there are genetic and biological factors involved in a person's intelligence, but that does not mean that those who are genetically disadvantaged do not have hope, rather that they rely on the environment and teachers to take more time teaching them to be able to work for a higher intelligence level. In addition to measuring children's IQs and school achievements, this article measured children's ability to learn. It also shows how kids who grew up in a middle-class family tended to have more family influence, which manifests in the child's behavior and motivation; since they had money, they also were able to provide individual tutoring for their children, which provided one-on-one with a teacher. On the other hand, children who grew up in a lower-class family tended not to have much family support or help due to the lack of education of the parents limiting the ways they can help their child, or the lack of influence and motivation of their parents wanting them to get a higher education.

What Defines a Person's Intelligence?

Intelligence is not defined by having good grades or high IQ but by being good at several cognitive skills. This article examines the various facets of human intelligence, including individual differences in intelligence, reasoning, planning, problem-solving, abstract thought, understanding complex ideas, and learning from experience. Intelligence encompasses more than academic aptitude or test-taking skills; it illustrates how intelligence can be economically and reliably utilized to forecast job performance. The article also discusses brain imaging studies demonstrating genome-wide associations with intelligence and correlations between intelligence levels and cortical volumes, thicker cortex, and white matter microstructure. The Parieto-Frontal Integration Theory postulates that white matter pathways and regions in the frontal, parietal, and temporal lobes may affect individual differences in intelligence. The following excerpt will further discuss this by indicating:

Intelligence (or the other terms listed in the previous sentence), as a human phenotype, is measured using cognitive tests, of which there are thousands. This hands the cynic a weapon that, to the ignorant, can glibly dismiss the field of research because, as Boring [1] famously wrote in 1923, "...intelligence as a measurable capacity must at the start be defined as the capacity to do well in an intelligence test. Intelligence is what the tests test." That much-quoted last short sentence was not Boring's opinion; rather, it was his saying that that is what one would think if one did not know the research findings. His next sentence starts, "This is a narrow definition, but it is the only point of departure for a rigorous discussion of the tests". We shall have that rigorous discussion here. Before that, we offer another, much-cited definition: "Intelligence is a very general mental capability that, among other things, involves the ability to reason, plan, solve problems, think abstractly, comprehend complex ideas, learn quickly, and learn from experience. It is not merely book learning, a narrow academic skill, or test-taking smarts. Rather, it reflects a broader and deeper capability for comprehending our surroundings— 'catching on', 'making sense' of things, or 'figuring out' what to do' [2]. More succinctly, intelligence has been described as, "rapid and accurate problem solving" [3]. (Deary et al., 2022)

The significance of this source regarding this research is that it defines intelligence and shows that the way that intelligence is measured needs to be more accurate since intelligence is not defined by whether a person does well in school or is a good test taker. It describes intelligence as a person's ability to comprehend their surroundings, make sense of things, and figure out what to do in a situation. That is one of the reasons this source is significant because it makes a person rethink what supposedly makes a person intelligent. It also gives information on how intelligence is one of the best and cheapest ways to predict performance on a job, which does not necessarily mean it is the right way. This information will help advance the investigation because it provides further intel on the specific areas of the brain that may affect a person's intelligence level. Also, it demonstrates that a person with a high IQ and good grades does not mean that they are intelligent, but rather that they are good test takers or fit into that type of teaching module. Those with low IQs who do not get good grades are not dumb; instead, they are intelligent in other aspects, such as problem solvers, faster thinkers, and planners, or they learn differently.

Factors Influencing Intelligence

Many factors have been found to influence a person's intelligence and abilities. This study looks at the genetic influence on intelligence, its variable heritability, genetic effects, and correlations with education and social class. It highlights the importance of intelligence in psychology and genetics and highlights five notable discoveries. From childhood to adulthood, environmental factors affect an individual's intelligence heritability; however, as an individual ages, genetic influence increases. The study also examines the significant effects of genetic influences on cognitive abilities and assortative mating on intelligence. There is also a discussion of the connection between intelligence and social class, highlighting the differences in the resources that those from higher social classes and those with greater education have access to. The following source showcases the following:

It would be reasonable to assume that as we go through life, experiences—Shakespeare's 'whips and scorns of time'—have a cumulative effect on intelligence, perhaps overwhelming early genetic predispositions. However, for intelligence, heritability increases linearly, from (approximately) 20% in infancy to 40% in adolescence, and to 60% in adulthood. Some evidence suggests that heritability might increase to as much as 80% in later adulthood⁴⁷ but then decline to about 60% after age 80. (Plomin & Deary, 2015)

The significance of this source regarding this research is that it shows how intelligence evolves. It shows that when a person is an infant, their intelligence mostly depends on their environment, but as that person grows, genetics start having more of an influence on that person's intelligence and cognitive development; the source also provides intel on how intelligence increases from about 20% in infancy to perhaps 80% in later adulthood. The source is also essential because it provides some background story on how intelligence was the

first behavioral trait studied using newly emerging quantitative genetic designs such as twin and adoption studies and how intelligence is one of the most heritable behavioral traits. It also emphasizes how intelligence is one of the best predictors of important life outcomes such as education, occupation, mental and physical health and illness, and mortality. The information provided in this source will help advance the investigation because it also talks about differences in social classes and how children from a high social class have more opportunities, such as better education and tutoring. This source also shows that even though intelligence depends mostly on genetics, no genetic trait is 100% heritable. All traits show substantial environmental influence; the source also shows the importance of genetic and environmental influences, leading to interest in the interplay between genes and the environment.

Adaptive vs. General Intelligence

This study examines the connection between general and adaptive intelligence, emphasizing that intelligence is best understood as the capacity to use learning and reasoning to adapt to one's surroundings. American psychologist Richard Haier suggests that intelligence must be biological because cultural factors influence its biological substrate. Therefore, researchers should concentrate on understanding intelligence biologically and its evolutionary function. While general intelligence is insufficient to prevent the extinction of the human species, adaptive intelligence is essential to preserving a hospitable planet for future generations. Because different situations require different cognitive capacities, intelligence must adapt to them; this is why adaptive intelligence is essential for finding solutions in various contexts. To exemplify this further, the following source stated the following:

Our research has shown, for example, that practical and general (academic) intelligence are only very weakly correlated [30,31], even in the United States. If we extend this argument outward, to people of very different cultures, these people use these processes very differently from the way you or I do [32], and some of the high-IQ people of our society would and do look pretty stupid in the context of other cultures, such as ones placing a premium on hunting, gathering, ice-fishing, spatial-navigation, or other skills [33]. From this point of view, it is cultural hubris to suggest that the IQ-based skills as we measure and value them are somehow the fundamental ones. Place many of us even in an inner-city ghetto (or in an active war zone) overnight and we might not survive until the next morning to tell about our experiences, whereas ghetto children or children growing up in war zones, much younger than we are, likely would be there the next morning to tell the tale. Or as an example from our research among Yup'ik Eskimos, we found that even children in middle childhood could be placed in the winter in the frozen tundra and navigate a dog sled through scores of miles, without any obvious landmarks, from one Alaskan fishing village to another. Most of their teachers—and most of us—would die in the attempt [34]. (Sternberg, 2019)

The significance of this source regarding this research is that it will help advance the investigation because it shows a different point of view on how intelligence should be conceptualized. The article shows how schools and IQ tests test a person's general intelligence, but the intelligence needed to solve problems depending on generation is adaptive. Intelligence depends on the situation happening around a person and how they can adapt and help resolve the problem. The article also shows how intelligence is tested and taught the same everywhere, but this is a mistake because everyone has different needs and situations; therefore, intelligence needs to be adaptive to the problems around that cultural setting. This information will help advance this investigation because there is a generalized term and way of defining intelligence and a generalized way for intelligence to be implied, but this does not mean that the same cognitive abilities are needed everywhere. The information in this source also suggests how schools should be responsible for teaching skills that are not only general but also adaptive, the kind of intelligence that the world needs for the world to preserve as a place in which humans can live and thrive. The article also talks about how schools that teach liberal arts help develop a broad knowledge of things; whether a person thinks creatively, analytically, practically, and wisely depends mostly on how it is

taught rather than what is taught; this shows that teaching children to think liberally and outside the box is an improvement and helps that person develop more knowledge and creativity, skills needed to solve all types of problems and attend to all sorts of needs.

Methods

This investigation utilized a computer with an internet connection and an internet browser (Google Chrome). In order to find the sources required for this investigation, the Google Scholar and EBSCO Host search engines were paramount for pinpointing the necessary sources to elucidate the research question. Although the internet connection was unstable at times, it proved sufficient to conduct all the required constituents of this investigation. All of the sources were peer-reviewed or approved by the investigation mentor. All these components working in tandem created the optimal conditions for the consummation of this project.

This investigation was completed utilizing a documentary analysis design. To populate this research, it was necessary to specify the purpose of each of the ten sources used. Furthermore, it was essential to recognize the source's design and approach, indicate the target audience, highlight their limitations, and determine the recommendations and findings in each. An analytical component outlining the significance of the data presented in the inquiry was generated, so a descriptive content analysis methodology had to be utilized for this investigation.

Results

The utilized search engine (Ebsco Host) proved most beneficial for the selected sources of this investigation. The first source within the Literature Review was not recent, as it was published in 1969 and dealt with information regarding the effect of environment and genetics on intelligence. The second source was not recent (1971). It discussed information regarding the heritability of short-term memory and verbal divergent thinking. The third source was not recent (1974), and it indicated that ethnic differences between blacks and whites are due to adaptation to different cognitive requirements of their respective positions in the American caste system. The fourth source was recent (2019), and it described how everyone is born with different types of cognitive skills, but over time and with practice, a person can develop and improve those skills. The fifth source was not recent (2004), and it delved into the fact that different brain areas affect and support intelligent behavior and the different environmental factors that may affect a child's mental development. The sixth source was not recent (2005), and it demonstrated that some kids are naturally better at paying attention because of their genes. However, kids also can improve their ability to pay attention by getting special attention training. The seventh source was not recent (1967), and it validated that diversity rather than the uniformity of approaches and aims is needed to improve education for the disadvantaged. The eighth source was very recent (2022), and it elucidated the fact that intelligence is a person's ability to reason, plan, solve problems, think abstractly, comprehend complex ideas, and learn from experience, and not narrow academic skills or test-taking smart. The ninth source was not recent (2015), and it illustrated the different factors that have been found to influence a person's intelligence and abilities. Finally, the tenth source was recent (2019), and it clarified the fact that adaptive intelligence is essential to preserving a hospitable planet for future generations because different situations call for different cognitive capacities, and intelligence must adapt to them.

Discussion & Conclusion

The presented sources were able to elucidate the different effects on learning capabilities and intelligence, such as ethnicity, genetics, and environment, and how some things may be partly hereditary, such as short-term memory, and other things, such as verbal divergent thinking, are acquired depending on how that person was taught and the environment around that person that impacts their way of learning and motivation to learn. Therefore, educators should be aware of those with specific learning difficulties so they may teach them differently. Moreover, this investigation delineated whether race or ethnicity affected intelligence and learning capacity. Still, it was found that it depended on the environment in which a person grew up, such as their economic status and access to education and learning. Additionally, evidence shows that everyone is born with different cognitive skills, but over time and with practice, a person can develop and improve those skills. Therefore, education is essential because it helps people develop their cognitive abilities to achieve their total mental capacity. Notwithstanding this, further data also supported the investigation by stating that different areas in the brain affect and support intelligent behavior and the different environmental factors that may affect a child's mental development. Factors such as drinking, drug use, and smoking while pregnant and an example of something that can improve a child's cognitive functioning is breastfeeding.

Furthermore, this research demonstrated that some kids are naturally better at paying attention because of their genes. However, kids also can improve their ability to pay attention by getting special attention training. Specialized training may help children boost their ability to pay attention, which will help them understand what they are doing and not get distracted as easily. In addition, this investigation also presented the fact that diversity rather than the uniformity of approaches and aims is what is needed to improve education for the disadvantaged. Only some people tend to learn and capture information the same way, and everyone has different needs and doubts.

Moreover, this research elucidated that intelligence is a person's ability to reason, plan, solve problems, think abstractly, comprehend complex ideas, and learn from experience, not narrow academic or test-taking skills. A person's cognitive abilities make a person wise and able to deal with situations and resolve problems using critical thinking. These abilities can be taught and improved with consistent practice and practical education. Following this, the following source was able to delineate the different factors that have been found to have an influence on a person's intelligence and abilities. Factors such as genetic influence on intelligence, its variable heritability, a range of genetic effects, and correlations with education and social class can all influence a person's intelligence. However, people can still improve their skills with education.

Finally, some data elucidated the topic of adaptive intelligence and how it is essential to preserving a hospitable planet for future generations. Different situations require different cognitive capacities, and intelligence must adapt to them. General intelligence may be suitable for IQ tests and getting jobs. However, adaptive intelligence is needed to push society forward, achieve significant breakthroughs, and solve society's big problems. The process revealed some limitations, which might be resolved by more investigation. Generally, it would have been beneficial if the sources outlined more information on specific techniques to improve a person's cognitive abilities. Generally, the sources presented a vignette on the factors influencing intelligence and cognitive skills. The source that had the most significant impact on this investigation was, *Can Education Improve Cognitive Functions?* because it elucidates cognitive functions and how they are genetically based but can be improved with specialized training and good education. The second most important source within the Literature Review was labeled *Adaptive vs. General Intelligence* since it portrayed the benefits and the necessity of having an adaptive intelligence to be able to come up with ideas to fix problems affecting society and the world in general and coming up with solutions to fix future problems that society may face. Lastly, the source about *Ability to Pay Attention and how to Boost It* was another critical investigation since it provides an example of a cognitive skill that some people are better at than others, and it portrays ways for it to be improved.

For upcoming continuing research and data analysis, recommendations include securing more years of data and requesting more study resources, as well as including field analysis to see and analyze the factors

limiting a person and what tools may be used to help a person fully develop their cognitive skills. Ultimately, this investigation aimed to answer the factors influencing intelligence and learning capabilities. Sources converged to provide an answer, which is that there are several factors involved in influencing a person's intelligence and learning capabilities, factors such as a person's genetics, which is the basis of a person's intelligence, which later can be improved and fully developed with good education and practice. These sources showed how no trait is 100% hereditary, which means that the environment around a person will always have an influence. Therefore, people should ensure that the environment in which a child grows is healthy and supportive to help that child improve developmentally.

Limitations

For the investigation to come to fruition, the scope of the research question had to be more encompassing to find more information on the subject, which permitted the optimal conditions to answer the research question. If the original research question had not been changed, the essay would not have been written as well, given that the research question would have been challenging to complete. Additional internal threats had to be mitigated to preserve the investigation's internal validity, such as changing various sources that did not meet the quality threshold to elucidate the problem surrounding the conducted research correctly. Moreover, multiple external threats had to be addressed to preserve the inquiry's external validity, such as the institution's Internet connection instability, a limited database, slow computers on occasion, and lost methodological resources.

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References

- Bueno, D. (2019). Genetics and learning: How the genes influence educational attainment. *Frontiers in psychology*, 10, 1622.
- Deary, I. J., Cox, S. R., & Hill, W. D. (2022). Genetic variation, brain, and intelligence differences. *Molecular psychiatry*, 27(1), 335-353.
- Gordon, E. W. (1969). Education, Ethnicity, Genetics and Intelligence. *Jensenism: Another Excuse for Failure to Educate*. *IRCD Bulletin*, 5(4).
- Gray, J. R., & Thompson, P. M. (2004). Neurobiology of intelligence: science and ethics. *Nature Reviews Neuroscience*, 5(6), 471-482.
- Jensen, A. R. (1967). How much can we boost IQ and scholastic achievement?
- Ogbu, J. U. (1974). *Social Structure and Cognitive Behavior: A Critique of the Heredity-Environment Hypothesis and an Alternative Interpretation of Black-White Differences in IQ*.
- Pezzullo, T. R., & Madaus, G. F. (1971). The Genetic Components of Verbal Divergent Thinking and Short-Term Memory.

Plomin, R., & Deary, I. J. (2015). Genetics and intelligence differences: five special findings. *Molecular psychiatry*, 20(1), 98-108.

Rueda, M. R., Rothbart, M. K., McCandliss, B. D., Saccomanno, L., & Posner, M. I. (2005). Training, maturation, and genetic influences on the development of executive attention. *Proceedings of the National Academy of Sciences*, 102(41), 14931-14936.

Sternberg, R. J. (2019). A theory of adaptive intelligence and its relation to general intelligence. *Journal of Intelligence*, 7(4), 23.