

# Exploring Coptic Heritage, Religion, Genetics, and the Genetic Influences on Educational Outcomes: A Study of Their Interconnections

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## ABSTRACT

Genetic inheritance significantly influences how offspring interact with educational attainment. This study examines the Coptic population in Egypt and immigrant communities in countries like the USA, aiming to investigate the impact of Coptic-inherited genetic factors on education and daily life. The findings indicate that Coptic-inherited genes play a role in various aspects, including education, socioeconomic status, and cultural values, collectively shaping the connection between genetic predispositions and educational achievement. This research underscores the intricate relationship between genetic and inherited factors, suggesting that improving educational opportunities can enhance the benefits of genetic advantages. Notably, the study reveals that the percentage of young Coptic students enrolling in graduate programs in the USA for healthcare fields such as medicine, pharmacy, and dentistry has surged to an extraordinary 90% of the total Coptic student population. Additionally, engineering, teaching, law, and psychology are other popular fields among these students, accounting for 9% of all young Copts, while the remaining professions make up just 1%.

**Keywords:** Copts; Coptic; Egyptian; Genetics; Education

**Abbreviations:** SES: Socio-Economic Status

## Introduction

Copts (Coptic) are descendants of Egypt's ancient Pharaonic people; they converted to Christianity by St. Mark the Evangelist in 62 CE [1]. Copts means the Egyptians are the original inhabitants of Egypt and are direct descendants of the ancient Egyptians who embraced Christianity in the early centuries [2,3]. After the Arab conquest of Egypt, those who converted to Islam gradually stopped identifying as Coptic, causing the term to become associated primarily with the Christian in Egypt, by the 14th century, Coptic Christians lost their majority status, which aligned with the widespread adoption of Islam across the region, today, Copts constitute a notable ethno-religious group with connections to ancient Egyptians [4]. Research shows that ancient Egyptians had a genetic profile that falls between the populations of Southern Europe and Nubia, which are commonly referenced points [5]. Additionally, a genetic study of Copts has confirmed their status as the most ancient population in Egypt, revealing a shared

ancestry with North African and Middle Eastern groups [6]. Consequently, Copts exhibit a genetic makeup that reflects the ancestral Egyptian population, essentially free from the significant Arab influence present today [6]. The Copts are one of the oldest Christian communities in the Middle East. Although integrated into the more significant Egyptian nation state, the Copts have survived as a distinct religious community, forming 20 percent of Egypt population [7, 8]. Copts take extraordinary pride in their Egyptian heritage. Throughout history, they have consistently resisted and opposed the identities imposed by foreign rulers, emphasizing their own distinct Egyptian identity [9].

While being an essential part of the broader society, Copts have supported their cultural and religious uniqueness. Their liturgical language, Coptic, stands for the final stage in the evolution of the Egyptian language [10]. Coptic music carries on the traditions of ancient Egyptian music, and Coptic culture is viewed as a continuation of

ancient Egyptian civilization [10]. For example, Copts continued using the same calendar and the months their Egyptian ancestors followed for millennia [10]. Consequently, modern Copts are genetically linked to ancient Egyptians and preserve significant aspects of their cultural heritage, including language, music, and more [10]. Copts have made significant contributions, particularly in the arts. Coptic artists are renowned for their decorative works, often featuring intricate designs of interwoven vines and pomegranates and scenes depicting domestic animals like rabbits and birds (Coptic (Egyptian) Genealogy).

In Egypt and various locations with Coptic communities, such as Australia, Sudan, Canada, the United States, Great Britain, and several European countries including Germany and Austria, many Copts who have immigrated to the U.S. and beyond are striving to uphold their culture, language, and religious education for future generations (Education, America and the Copts). Their efforts are inspired by the achievements of larger immigrant communities. In these areas, Coptic churches have initiated preschools, independently or in partnership with outside organizations, to gain experience running educational programs; presently, some churches have established their schools. In contrast, others rent spaces for academic activities (Education, America, and the Copts). Copts tend to have higher educational achievements, a greater wealth index, and more vigorous representation in white-collar professions. However, they firmly reject Arab identity, associating it closely with Islam and Islamism [6].

### Genetic Influences on Educational Outcomes

The genetic architecture of traits affecting educational attainment other than cognitive ability [11]. Genetic research has shown that intelligence significantly contributes to the heritability of academic achievement [12]. Education serves as a crucial predictor of an individual's opportunities in life. The impact of genetic factors on education is well-documented [13]. Nonetheless, the significance of these genetic influences can differ depending on social contexts, as individuals fulfill their genetic potential through ongoing interactions with their environmental circumstances [14]. The findings that DNA differences substantially affect differences in appetites and aptitudes suggest a genetic way of thinking about education in which individuals actively create their own educational experiences in part based on their genetic propensities [15]. It is crucial to consider these factors, as others have similarly proposed that genetic influences should be more significant while shared environmental influences should be minimized in educational systems that foster equal opportunities [16-19].

Heritability is the proportion of variability in an observable characteristic linked to genetic variation in a population. It reflects the genetic contribution to traits, such as cognitive functions, but does not show causation or specify the number or nature of genes involved [20]. Research indicates that genetic factors significantly influence individual psychological traits, including cognitive functions essential for learning. The heritability statistics quantify the genetic contribu-

tion to trait variation in populations. However, it is often misinterpreted, leading to misconceptions about education and psychology. Importantly, heritability is a population-level parameter, not applicable to individuals or specific genes, like other population metrics like the arithmetic means. Learning is a multifaceted process involving different cognitive functions [20]. According to [21], behavioral genetics views intelligence and educational achievement as highly heritable traits (influenced by genetics) and polygenic (affected by multiple genes).

Researchers in this discipline have progressed from merely assessing the extent of genetic influence on outcomes to finding specific genetic markers that could predict these traits. Genetics research has offered compelling evidence for the significant impact of the environment on complex traits. It also provides practical methods to identify environmental influences while managing genetic factors [22]. DNA differences substantially affect differences in appetites, as aptitudes suggest a genetic way of thinking about education in which individuals actively create their own educational experiences in part based on their genetic propensities [15]. There are valid concerns that these placements also reflect family backgrounds, mainly since tracking decisions are often made at a youthful age [9,23,24]. Empirical evidence shows that the impact of family background on educational achievement is more pronounced in systems where tracking begins earlier, yet the average performance does not improve [9,23,24]. Genetic influence may not only reflect the realization of "positive" potential but also of "negative" potential that can hamper education [11,12,25] human behavior is shaped by genetic variations. The distinctions among individuals regarding intellectual abilities, personalities, and mental health are primarily determined by their inherited genetic traits. Extensive studies involving twins, adoptees, and families have led to the compelling conclusion that numerous psychological characteristics are influenced by genetics to some degree. Behavioral patterns also show genetic effects; for example, how individuals handle stressful life situations can be partly linked to their genetic makeup. Additionally, personal traits such as spirituality and political views are influenced by genetic factors [26]. Thus, it is not surprising that genetics play a role in family dynamics and interactions among family members [25]. All forms of familial relationships, whether between parents and children, siblings, or spouses, can be partly attributed to genetic influences.

Brain development begins during embryonic stages under genetic guidance but continues throughout life through the formation of new neural connections. This neuronal plasticity is essential for learning, and it requires various cognitive functions, including working memory, attention, and executive functions. These functions develop through brain activity, influenced by neural connectivity and genetics, showing that genes play a role in cognitive processes related to learning [20,27]. We tackle these inquiries by showcasing advancements made in identifying and comprehending two crucial "vectors of influence" that connect genes, the brain, and social behavior:

1. Social information modifies gene expression in the brain, impacting behavior
2. Genetic variation affects brain function and social behavior.

Additionally, we explore how evolutionary changes in genomic elements shape social behavior and present future possibilities for a systems biology approach to understanding social behavior [28].

## Theoretical Framework

According to [29] in the realm of educational research, a theoretical framework emphasizes specific variables and their connections to data collection and analysis conducted by the researcher. The focus of the relevant data is on these variables, guiding the researcher in how to analyze and present the data collected.

Learning and behavioral patterns in humans are shaped by a combination of social, environmental, and genetic factors. Genetic theory explains the role of genes in influencing human behavior. However, the relationship between genetics and behavior is complex, as numerous factors contribute to shaping an individual's actions. While genes alone have little power to dictate human habits or behaviors, the interaction between genetics and the environment is essential in forming a person's behavior [30]. [30] concluded that Vicki's behavior suggests that while social and environmental factors heavily influence her actions, genetics also play a role. Human behavior can be inherited or passed down genetically within families, as members may adopt similar habits or behaviors.

The bio-ecological model posits that human development occurs through stable exchanges with environmental conditions, or 'proximate processes,' across various contextual levels, including family, close networks, and broader institutional arrangements [14]. Thus, even though the genetic endowments we inherit are mostly fixed, whether or to what extent they are realized depends on the social influences we encounter [23]. Enhancement refers to how stable interactions within enriched social environments allow individuals to tap into their genetic potential [14,23]. This mechanism has mainly been studied in family settings. This research supports the Scarr-Rowe hypothesis, which suggests that genetic influences on intelligence are more significant in families with higher socio-economic status (SES) [31,32]. These studies link the enhancement mechanism to social background by indicating that parents with socio-economic advantages foster nurturing environments and provide resources that help unlock genetic potential for cognitive abilities and, more recently, educational achievements [24,33-35].

Uncertainties pose a challenge, requiring individuals to depend more heavily on their genetic potential to navigate such situations successfully [35,36]. This concept underpins the Saunders hypothesis, which asserts an inverse trend compared to the Scarr-Rowe hypothesis; it suggests that genetic influences are amplified in less favorable conditions, such as low-SES families (ibid.). On a macro

scale, welfare-state structures play a crucial role in moderating the effects of social background on status-related outcomes, particularly in education [37-39]. Regarding macro scale moderation about genetic influences on education, it's crucial to recognize the significant impact of social ascription. Unlike inherent traits such as cognitive and non-cognitive skills [40], education is shaped by social ascription. These social influences affect educational choices beyond an individual's inherent abilities [41,42]. Such choices lead to varied educational settings and play a key role in how well individuals can achieve their genetic potential. Therefore, to understand the disparities in genetic influences on education, it's essential to examine the social selectivity within the educational system.

## Finding

The percentage of young Coptic students enrolling in graduate programs in the USA for healthcare professions, including medicine, pharmacy, and dentistry, has soared to an unprecedented 90% of the total Coptic student population. Other popular fields among these students are engineering, teaching, law, and psychology, which account for 9% of all young Copts. The remaining professions comprise just 1% (Medical School Mania Grips Coptic Church Community, Investigative Journalist Special). In Egypt, Copts generally achieve higher levels of education, possess a greater wealth index, and are more represented in white-collar professions than their Muslim peers. Historically, Copts worked as accountants, and in 1961, Copts controlled 51% of the banks in Egypt [43]. Copts have relatively higher educational attainment and wealth index due to Coptic Christianity's emphasis on literacy and the fact that Coptic Christianity encouraged the accumulation of human capital [43]. According to a 2016 Pew Center study on religion and education worldwide, approximately 26% of Copts earn a university degree from higher education institutions [44]. According to [45], Copts belong to the educated middle and upper-middle class. The Copts still played a significant role in managing Egypt's state finances. They held 20% of total state capital, 45% of government employment, and 45% of government salaries" [46], 45% of the medical doctors and 60% of the pharmacists of Egypt were Christians [47]. Coptic intellectuals hold to Pharaonism, which states that Coptic culture primarily derives from pre-Christian, Pharaonic Egyptian culture. It gives the Copts a claim to a deep heritage in Egyptian history and culture [48-62].

## Discussion

There exists a notable connection between Coptic inheritance genes and the educational and professional backgrounds of individuals. This relationship often reveals itself through a deep commitment to education and knowledge, which has been a fundamental aspect of Coptic culture for centuries. This tradition is evident in their impressive educational achievements, with many Copts pursuing advanced degrees and thriving in various professions, including medicine, engineering, and academia. The community's focus on education not only promotes individual success but also cultivates a sense of collec-

tive accomplishment and resilience. Additionally, the strong familial and community bonds within the Coptic community frequently offer young members mentorship and support, motivating them to reach their educational and professional aspirations. This nurturing atmosphere, paired with a cultural heritage of perseverance and adaptability, continues to inspire new generations to excel and innovate in their respective fields. Coptic Christianity has played a crucial role in shaping the religious landscape of Egypt with its rich history of monasticism and theological scholarship. Despite facing various challenges throughout history, including periods of persecution and political upheaval, the Copts have preserved their heritage and continue to contribute to the social and cultural fabric of the nation. In addition to its religious aspects, Coptic culture is expressed through its vibrant festivals, traditional music, and distinctive cuisine, reflecting a blend of ancient Egyptian and Christian influences.

These elements continue to be celebrated and cherished by Copts worldwide, fostering a sense of identity and continuity within the community. The remarkable trend highlights the growing interest and commitment of the Coptic community toward pursuing advanced education and careers in healthcare. Numerous factors could contribute to this surge, including the community's emphasis on education, strong cultural values prioritizing service and care for others, and the perceived stability and opportunities within the healthcare sector. Additionally, many Coptic students are likely motivated by the potential to make a meaningful impact on society through their work in medicine, pharmacy, and dentistry. The supportive networks within the Coptic community, including mentorship programs and scholarships, may also play a crucial role in encouraging students to follow this path. As these students advance in their studies and enter the workforce, they bring diverse perspectives and a deep commitment to patient care, enriching the healthcare landscape in the USA. This trend reflects the aspirations of the Coptic community and contributes positively to the broader goal of diversity and inclusion in healthcare professions.

## Conclusion

As the Coptic community continues to make strides in various fields, its contributions serve as a testament to resilience and adaptability. This dynamic interplay between tradition and progress offers valuable lessons on the importance of inclusivity and the strength found in diversity. By embracing their rich cultural legacy while looking toward the future, the Copts are paving a path of growth and opportunity for themselves and society. Their journey underscores the power of community and the enduring impact of cultural identity in shaping a better, more inclusive world.

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