SINIRSIZ EĞİTİM VE ARAŞTIRMA DERNEĞİ

Sınırsız Eğitim ve Araştırma Dergisi

Eğitim ve Araştırma Education and Research

The Journal of Limitless Education and Research

Kasım 2024
Cilt 9, Sayı 3

November 2024
Volume 9, Issue 3

The Journal of Limitless Education and Research

November 2024, Volume 9, Issue 3

Sınırsız Eğitim ve Araştırma Dergisi

Kasım 2024, Cilt 9, Sayı 3

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Journal of Limitless Education and Research(J-LERA) is an international refereed journal published three times a year.
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The Journal of Limitless Education and Research, Volume 9, Issue 3

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İNDEKSLER / INDEXED IN

The Journal of Limitless Education and Research, Volume 9, Issue 3

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The Journal of Limitless Education and Research, Volume 9, Issue 3

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Dear Readers,

We are delighted to present you the November 2024 issue of the Journal of Limitless Education and Research.

The aim of our Journal, which has been continually published by the Limitless Education and Research Association (LERA) for 8 years since 2016, is to contribute scientifically to the field of education and research. To this end, theoretical and applied original studies are published for free and shared with readers at nationwide and worldwide.

The Limitless Journal of Education and Research is published in Turkish and English three times a year and indexed in EBSCO, Education Full Text (H. W. Wilson) Database Coverage List, which is accepted as a field index by the Higher Education Council (UAK in Turkish). Additionally, it is indexed in various national and international indexes such as ASOS, DRJI, ESJI, OAJI, ROAD, SIS, SOBİAD, Worldcat, and receives numerous citations. To the SOBİAD impact factor, our journal is in the top 90th among scientific journals in our country. Our initiatives and studies continue so as to let our journal be scanned in national and international indexes.

SEAD Journal, an internationally peer-reviewed journal, is published with scientific contributions of articles, research, and projects by academics, researchers, educators, and teachers from different countries. Our journal has been maintaining its publication for eight years without compromising its academic and scientific quality, delivering current and new studies to readers in the field.

In this issue of our journal, four scientific research and articles related to education are included. We would like to thank all the editors, authors, reviewers, and translators who contributed to the preparation and publication of this issue.

We extend our respect with the hope that our journal will contribute to scientists, researchers, educators, teachers, and students in the field.

LIMITLESS EDUCATION AND RESEARCH ASSOCIATION

The Journal of Limitless Education and Research, Volume 9, Issue 3

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Değerli Okuyucular,

Sizlere Dergimizin Kasım 2024 sayısını sunmaktan büyük mutluluk duyuyoruz.

Sınırsız Eğitim ve Araştırma Derneği (SEAD) tarafından 2016 yılından bu yana 8 yıldır kesintisiz olarak yayınlanan Dergimizin amacı, eğitim ve araştırma alanına bilimsel yönden katkı sağlamaktır. Bu amaçla kuramsal ve uygulamalı özgün çalışmalar ücretsiz yayınlanmakta, ulusal ve uluslararası düzeydeki okuyucularla paylaşılmaktadır.

Sınırsız Eğitim ve Araştırma Dergisi (SEAD), yılda üç sayı olarak Türkçe ve İngilizce yayınlanmakta, ÜAK tarafından alan indeksi olarak kabul edilen EBSCO, Education Full Text (H. W. Wilson) Database Covarage List'te taranmaktadır. Ayrıca ASOS, DRJI, ESJI, OAJI, ROAD, SIS, SOBİAD, Worldcat gibi ulusal ve uluslararası çeşitli indekslerde taranmakta ve çok sayıda atıf almaktadır. SOBİAD etki faktörüne göre Dergimiz, ülkemizdeki bilimsel dergiler içinde ilk 90. sırada bulunmaktadır. Dergimizin ulusal ve uluslararası indekslerde taranabilmesi için girişimlerimiz ve çalışmalarımız devam etmektedir.

Sınırsız Eğitim ve Araştırma Dergisi (SEAD), uluslararası hakemli bir dergi olmakta, farklı ülkelerdeki akademisyen, bilim insanı, araştırmacı, eğitimci ve öğretmen yazarların makale, araştırma, proje gibi bilimsel katkı ve destekleriyle yayınlanmaktadır. Akademik ve bilimsel kalitesinden ödün vermeden sekiz yıldır yayın hayatını sürdürmekte, güncel ve yeni çalışmaları alandaki okuyuculara ulaştırmaktadır.

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Dergimizin alandaki bilim insanı, araştırmacı, eğitimci, öğretmen ve öğrencilere katkılar getirmesi dileğiyle saygılar sunuyoruz.

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https://doi.org/10.29250/sead.1548887

Received: 12.09.2024 **Article Type:** Review **Accepted:** 27.10.2024

Evolutionary Pedagogy: Evolutionary Foundations of Certain Pedagogical Practices and Their Implications in Teaching Processes

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Abstract: Human evolution is the result of highly complex biological, psychological and cultural changes over millions of years. This process can be traced back to the evolution of modern humans, thanks to the ability of human ancestors to adapt to environmental conditions. The evolutionary process involves the development not only of physical characteristics, but also of mental capacities and social structures. It is therefore a natural consequence that evolution has fundamentally influenced human cultural and psychological traits. The main reason for the emergence of fields such as evolutionary psychology and evolutionary psychiatry in the light of recent studies is the search for the contributions of evolutionary processes to such fields. Evolutionary pedagogy is basically the result of such a search. It was shaped as a result of the search for the reflections of psychological and cultural situations affected by evolutionary processes on pedagogy. Therefore, evolutionary pedagogy is a synthesis and it seeks to explain how many pedagogical practices may have been shaped in the evolutionary process. To this end, it draws heavily on evolutionary psychology and directly on human biological evolution. Such a quest for grounding predicts that a more beneficial process can be realized in the teaching-learning process by reproducing evolutionary situations in the classroom environment. In other words, the learning process can become more effective if teachers use the features compatible with evolutionary processes in their teaching techniques, classroom management, and the development of skills for learning to learn, and if they include them in the classroom environment. This is the main starting point of the study. Throughout the study, some examples of the pedagogical practices in which can manifest itself are emphasized. In addition to the explanations and examples given in the study, other researchers may associate different pedagogical practices with evolutionary processes. Therefore, evolutionary pedagogy is not only a new field but also a field that is open to the interest of researchers as a field open to development.

Keywords: Evoluation, Evolutionary pedagogy, Instruction, Evolutionary psychology

Cited in: Vural, L. (2024). Evolutionary pedagogy: Evolutionary foundations of certain pedagogical practices and their implications in teaching processes. *The Journal of Limitless Education and Research, 9*(3), 340 - 361. https://doi.org/10.29250/sead.1548887

1. Introduction

Enhancing the quality of teaching-learning processes has been a major focus for experts in the pedagogy field for many years. A wide range of practices and approaches have been discussed within the framework which include teaching models, strategies, methods and techniques, classroom management, assessment, evaluation approaches and distance education, with some of them being presented as alternatives in the literature to address existing problems. When considering these practices from the perspective of teaching methods and techniques, student-centered education, active learning, STEM, STEM-A applications, and robotics coding activities can be highlighted. In terms of distance education processes, examples include mobile learning, wearable technologies, and generative artificial intelligence (AI) tools. For assessment and evaluation approaches, process-based methods, and the use of AI in assessment activities are key examples. In addition, efforts to reflect individual differences in education, home school practices, and the emergence of approaches such as curriculum-less curriculum can be described as other prominent educational practices within this framework. Different perspectives of all these educational practices might be the result of ongoing search for 'effectiveness in teaching processes,' which lies at the core of educational research. Stating that the learner is at the core of the search for effectiveness is a reasoning that can be easily made and is consistent with the nature of education. This conclusion can be interpreted as the idea that the human being is the subject of the pursuit of quality in teaching.

Education is a social phenomenon that supports the development of human beings not only cognitively but also socially and psychologically and should be a source for diverse thinking and search for meaning. As a biological, psycho-social, and philosophical (Alper, et al., 2001) being, humans have the opportunity to develop and realize themselves through education. The advancement of educational opportunities has shaped modern civilization, and the development of civilization, in turn, created modern human. Though the emergence of modern humanity is the result of a long and challenging process, the essence of this fascinating story lies in the evolution process of humankind, which serves as the script for this captivating narrative written by nature. Demirsoy (2023) emphasizes that understanding how this magnificent story has successfully overcome challenges and barriers of its unique evolutionary process and reached the present day will teach humankind to hold deep respect and love for all living beings. Evolution plays a key role “in fostering an appreciation of even the smallest and most mundane forms of life, in encouraging respect for their life stories”.

Human evolution is a long-lasting process with different stages and aspects and is too comprehensive to be reduced to mere biological development. It is also essential for understanding a wide range of social and psychological phenomena. This process, demonstrated by the findings of the theory of evolution, has been gaining momentum for more than 150 years. Except in certain conservative and political circles worldwide, debates over the validity of evolutionary theory have nearly come to the end. With the theory of evolution, profound shifts have been experienced in the explanation of biological diversity as well as in our overall perspective on life. In this regard, the theory of evolution has both significantly contributed to and been influenced by humanity's search for meaning. Initially considered to be a field of study only for biology and anthropology, the theory of evolution has expanded beyond this framework and has become the subject of many fields such as philosophy, theology, psychology, social psychology, economics, reproduction and selection, population dynamics. Başıbüyük (2023) highlights that evolutionary theory has a unique aspect compared to other scientific theories. He notes that although evolution represents continuous change, it encompasses a timespan far beyond a human lifetime and can only be observed through careful examination of nature. He emphasizes that evolution has a multifaceted impact on life. The theory of evolution through natural selection provides revolutionary insights into understanding the design of the human mind and brain (Tooby & Cosmides, 2005). All living species today have emerged through the transformation of other species. The theory of evolution is a biological framework that explains this phenomenon, taking into account many factors such as natural and sexual selection, genetic drift, mutation, migration and epigenetic factors (Karaca, 2023).

One of the ways evolution impacts life is through its role in explaining human behavior by referencing evolutionary processes. The field of “evolutionary psychology”, which draws attention to evolutionary processes in the shaping of human behavior and deals with the psychological aspects of human beings, has become a significant area of study since its emergence. Solak and Bakırcı (2017) suggests that the early seeds of evolutionary psychology were sown by Darwin, citing his statement that "psychology, mental powers and abilities should be acquired slowly and gradually”. According to evolutionary psychologists, since the human mind and behavior have developed with a specific purpose and internal consistency, it is essential to study human evolutionary history and analyze human behavior within this context (Solak & Bakırcı, 2017). Kurzban (2012) also notes that evolutionary psychology is based on the premise that the information-processing structures of the human mind were acquired through natural selection and that this field is grounded in the principles of evolutionary biology and

cognitive science. Also Tooby and Cosmides (2005) argue that evolutionary psychology can be seen narrowly as a scientific project mapping our evolved psychological mechanisms and broadly as a project to reformulate and extend the social sciences and medicine in light of the progressive mapping the evolved architecture of human species. In this context, the number of publications on "evolutionary psychology" has noticeably increased in recent years, as the field has been interpreted more broadly and has interacted with various other disciplines. For example, as of October 2024, a search on Science Direct's open access platform reveals 2,937 publications on "evolutionary psychology" dating back to 2000, underscoring significant growth and widespread interest in this field (https://www.sciencedirect.com, October 24, 2024). It is a natural consequence that evolutionary psychology, which emphasizes the role of evolutionary processes in shaping human behavior, would also influence educational sciences, which can be interpreted as a technology for behavior acquisition.

Educational sciences have benefited from fields such as developmental and learning psychology in designing instructional processes that cater to group dynamics and individual development. Findings from psychology serve as fundamental insights for educational sciences. Many pedagogical practices within educational sciences are shaped by the findings of psychology. From the development of teaching principles and methods to the establishment of classroom management processes, as well as learning strategies, memory aids, and techniques for enhancing learning motivation, many pedagogical practices are based on psychological findings (behaviorist theory, cognative theory, memory and perception, information processing theory, multiple intelligence etc.) related to learning theories, cognitive and physiological development, and social-emotional growth. These scientific findings have been the source of providing teachers with educational content that has diverse practical applications. In this context, numerous teaching methods, techniques, and principles have been developed to facilitate the achievement of learning outcomes at various levels, resulting in a rich educational content in the field. Within this enriched educational content, teachers may choose certain educational practices over others by considering various factors to ensure an effective teaching process. For example, choices regarding teaching methods and techniques can be influenced by factors such as the level of learning outcomes, the learning environment, class size, and other variables. This suggests that some teaching methods and techniques may be more advantageous than others, depending on the specific variables at play.

Among these variables, there is one that has not been widely discussed but could be considered a significant factor in educational choices as research in evolutionary psychology

continues to grow. This suggests that another variable, informed by evolutionary psychology, might soon be brought to teachers' attention as a factor in shaping their educational preferences. This variable could be "evolution" and the "psychological processes" it reveals. If certain pedagogical practices within different areas of educational sciences prove to be more advantageous for learners, supporting these practices with findings from evolutionary psychology could help create a more effective and theoretically grounded educational process. This approach would contribute to the theoretical grounding of a more advantageous educational process in favor of students. This may enable teachers to choose some pedagogical practices (teaching methods-techniques, classroom management, assessment and evaluation, etc.) that are in line with the findings of evolutionary processes to achieve a good learning outcome in the teaching-learning process. Additionally, educational practices that incorporate variables advantageous in evolutionary processes—such as competition, cooperation, and altruistic behavior— could be influential in shaping teachers' instructional decisions. In conclusion, the basis of teachers' choices regarding educational practices can be considered a variable influenced by "evolution" and the "social and psychological processes" shaped by evolutionary processes. Additionally, understanding the evolutionary foundations of certain educational practices may provide teachers with valuable insights for interpreting teaching processes and student behaviors.

In this context, the current study investigates whether certain pedagogical practices in educational sciences can be supported by findings of evolutionary psychology and explores whether these practices offer an advantage in creating richer learning experiences. This study is designed on this basic assumption. The aim is not to suggest that certain pedagogical practices are unnecessary or ineffective, but rather to explore their potential benefits in light of evolutionary psychology. Each pedagogical practice carries educational value and is based on valid scientific evidence. The primary aim of this study is to explore whether certain pedagogical practices, in alignment with findings from evolutionary psychology, can offer a richer learning experience by seeking evolutionary underpinnings. Consequently, the study first focuses on evolutionary psychology and then discusses which pedagogical practices may contain more variables that contain evolutionary advantages.

1.1. Evolutionary Psychology

Evolutionary psychology is the application of principles and generalizations from evolutionary biology to psychological theory and research. Its fundamental assumption is that

the human brain is composed of numerous specialized mechanisms shaped by natural selection over long periods to address the information-processing challenges faced by the ancestors. These issues often include topics such as food selection, the formation of social hierarchies, the distribution of resources among offspring, and mate selection (Durrant & Ellis, 2013). Karaca (2023) describes evolutionary psychology as a discipline that explains human behavior in relation to the species' evolutionary history and opens inquiries into human nature. He emphasizes that scientific debates related to evolutionary psychology encompass topics such as adaptation, levels of natural selection, gene-centered approaches, and whether the human mind is modular. Evolutionary psychology assumes that human behavior and cognitive processes are evolutionarily shaped, and that these behaviors can be traced back to common ancestral patterns. Evolutionary psychologists believe that the programs constituting the human mind were designed by natural selection to solve adaptive problems regularly encountered by our hunter-gatherer ancestors, such as mate selection, cooperation with others, hunting, foraging, child-rearing, navigation, avoiding predators, and preventing exploitation (Tooby & Cosmides, 2005). Hundreds of psychological and behavioral phenomena, which could not have been discovered without the guiding framework of evolutionary psychology, have been experimentally documented by researchers working in this field (Buss, 2005). Tooby and Cosmides (2005) note that the long-term scientific goal of evolutionary psychologists is to map out the universal aspects of human nature.

Karaca (2023) argues that evolutionary psychology is influenced by E. O. Wilson's sociobiology, which he began developing in the 1970s. He notes that while sociobiology primarily focuses on population-level adaptive features in both human and animal species, evolutionary psychology is more concerned with individual behavior and its evolutionary origins. However, since both disciplines are shaped by biological and genetic determinism, they are, according to him, subject to similar criticisms. In the literature (Abed & Smith, 2022; Buss, 2005; Karaca, 2023), evolutionary psychology presents some concrete conclusions based on the evolutionary development of humankind. These conclusions aim to reveal the evolutionary foundations of certain human behaviors, group relationships, and the development of mental traits. Some of these conclusions regard the following:

a. Sexual selection and mating strategies

b. Parenting behaviors

c. Cognitive processes, visual perception, and attention

d. Emotions and emotional expression from an evolutionary perspective

e. Interaction and mate selection

f. Attachment within the framework of evolutionary psychology

g. Aggression in terms of evolutionary processes

h. Morality and moral development

i. Schizophrenia, substance abuse and childhood trauma

j. An evolutionary perspective on depression and suicide

k. Group processes in terms of evolutionary psychology

These conclusions represent the scientific fields of study that evolutionary psychology explores to understand human behaviors and cognitive processes. The findings derived from these areas are discussed by evolutionary psychologists as well as anthropologists and researchers in the social sciences, with ongoing discussions reflecting diverse perspectives. Buss (2005) also highlights that the conceptual foundations of areas such as the nature and specificity of psychological adaptations and the significance of individual differences are still the focus of debate.

Among the conclusions mentioned above, it can be stated that the evolutionary findings related to 'cognitive processes,' 'visual perception and attention,' and 'group processes' are the ones most likely to directly influence educational processes. Group processes, including cooperation and altruistic behaviors, are particularly significant as they provide considerable evolutionary advantages. These conclusions of evolutionary psychology can be further expanded when considered in relation to educational processes in general. Insights into aggression, emotions and their expression, and moral development can also provide foundational considerations for educational practices. Other conclusions are more closely related to mate selection, reproduction, and various psychological processes in humans.

This study primarily focuses on the evolutionary foundations of cooperation and cognitive processes. Within this framework, the study firstly addresses the findings of evolutionary psychology on cooperation, altruistic behavior and group processes. It then explores which educational practices might incorporate these processes.

Teber (2017) considers the intensification of socialization needs among humans as one of the significant evolutionary milestones. The need to socialize and cooperate in hard-to-

defend, enemy-rich grasslands is an essential characteristic among advanced primates. Teber (2017) emphasizes the importance of socialization and cooperation by noting that individuals who fall outside their society quickly lose the skills they have developed within it. He even suggests that in environments where such conditions are absent, there could be evolutionary regressions in certain features (talking, walking on two legs, etc.). Huxley (1942) highlighted that when Darwin formulated the theory of evolution, the key assumptions were "natural selection" and "adaptation.", and that natural selection inherently involves competition among organisms. Only in this way can surviving organisms reproduce and pass on their genes to their offspring. From this perspective, cooperation and altruistic behavior might not seem to provide an evolutionary advantage. While altruistic behaviors can sometimes be costly for the behaving organism (decreasing the probability of survival), they also create an advantage (increasing the probability of survival) for them. In this case, acting for the benefit of others at the expense of reducing the probability of one's own survival does not seem very adaptive in evolutionary terms (Üzümçeker, et al., 2019). The theory of evolution predicts that altruistic behaviors detrimental to the organism will disappear either through the organism's learning process or due to its inability to pass on its genes to the next generation. However, there is substantial evidence showing that altruistic and cooperative behaviors are still common (Bahçekapılı, 2023). Socialization and cooperation may have been advantageous in the evolutionary process by producing behaviors such as the sense of belonging, trust, and the pursuit of closeness, thereby increasing humans' chances of survival and reproduction. Yerlikaya and Doğruyol (2020) state that many living things in the natural environment must cooperate to survive and sustain their vitality with less energy consumption. Initially thought to be directed primarily towards close relatives (as cited in Yerlikaya & Doğruyol, 2020, from Hamilton, 1964), these types of behaviors later emerged as being directed toward non-relatives as well. In some cases, it has even been emphasized that, beyond cooperative behavior, altruistic actions are taken to secure future reputation and potential assistance (as cited in Yerlikaya & Doğruyol, 2020, from Nowak & Sigmund, 2005). All these helping and cooperative behaviors are defined as prosocial behaviors (Karadağ & Mutafçılar, 2009; Yerlikaya & Doğruyol, 2020). Demirsoy (2023) notes that within the human species, “Homo erectus” was the first species to distinguish itself from others by learning to live and hunt together through cooperation with its kind. He believes that this species not only used fire effectively but also developed the ability to shape its mouth to produce sounds, and thus, over time, the ability to speak. This, in turn, paved the way for resolving disputes through conversation, giving the human lineage a powerful tool. Dursunoğlu (2016) states that

Peter Kropotkin brought a new dimension to Darwin's theory of evolution by interpreting it within the framework of cooperation and solidarity. According to Kropotkin (1902), cooperation and solidarity are not only factors in the evolution of humans but also in the evolution of many species within the animal kingdom (as cited Dursunoğlu, 2016). The struggle for survival and successfully overcoming it may not only be possible through self-sufficient and independent individuals. Altruism among humans is unique in nature, and cooperation plays a significant role in such behaviors. Humans cooperate on a much larger scale compared to most other mammals (Üzümçeker, et al., 2019).

The literature includes various explanations and theories regarding the emergence of altruistic behavior. These can be classified into individual and gene-based theories, and theories based on different group processes (Bahçekapılı, 2023; Üzümçeker, et al., 2019). These theories address evolutionary, psychological, and cultural processes to explain human cooperation and altruism. Below is a table that presents this classification in detail.

Table 1

Classification of theories explaining human altruism

Gene and Individual-Based Theories as Units of Evolution			
Theories	**Level of Selection**	**Mechanism of Selection**	**Species in Which Selection is Observed**
Kin Selection Theory (Hamilton, 1971)	Gene	Selection of shared genes	All organisms
Reciprocal Altruism Theory (Connolly & Axelrod, 1984)	Individual	Inter-individual competition	Social creatures
Social Contract Theory (Cosmides & Tooby, 1992)	Individual	Inter-individual competition	Social creatures
Costly Signaling Theory (Grafen, 1990)	Individual	Intrasexual competition, mate selection	All organisms
Group-Based Theories as Units of Evolution			
Theories	**Level of Selection**	**Mechanism of Selection**	**Species in Which Selection is Observed**
Group Selection Theory (Sober & Wilson, 2007)	Group	Inter-group competition	Humans and some insect species like bees and termites
Strong Reciprocity Theory (Gintis, 2000)	Group	Inter-group competition	Humans
Cultural Selection Theory (Henrich, 2004)	Group	Inter-group competition, conformist transmission	Humans
Theory of Reciprocal Dependence (Tomasello, 2018)	Individual, Group	Inter-group competition, hunting	Humans

Source: Üzümçeker, et al., 2019, p. (95).

As illustrated in Table 1, the place of altruism in social life has been classified based on genes and group selection. Gene-based classifications correspond to a general understanding where altruistic behaviors provide evolutionary advantages and genes associated with such behaviors are selected and proliferated within populations. Group selection refers to the process where altruistic and cooperative behaviors that produce positive outcomes within groups are selected and passed on to future generations through inter-group competition (Bahçekapılı, 2023; Wilson, 1997). According to Üzümçeker, et al. (2019), in groups where cooperation and altruistic behaviors have become norms, prosocial behaviors facilitate the adaptation of individuals bearing genes associated with such behaviors. Consequently, these individuals are expected to have more advantages in the long run. Culture-based group selection may ensure the survival of groups with prosocial members, which over time may lead to the incorporation of genes associated with such behaviors into the human genotype. Despite the intense competition in nature, the presence of prosocial and altruistic behaviors in individuals that can be attributed to different reasons (genes, group, and cultural factors) can be seen as a consequence of their advantages in social processes. This type of behavior seems to have become widespread in society as a reflection of natural selection in individuals. Prosocial and altruistic behaviors in individuals can reinforce various attributes, including a sense of usefulness, self-confidence, appreciation, approval, stress reduction, and psychological resilience (Aknin, et al., 2018; Hoffman, 1978; Lazar & Eisenberger, 2022; Parmaksız, 2021; Schroeder & Graziano, 2015; Yavuzer, 2017). These benefits can indeed be classified into individual and societal advantages. Additionally, Midlarsky (1991) identified several reasons why prosocial behaviors benefit individuals, which include facilitating distance from personal problems, enhancing the understanding of values and meaning, increasing perceived competence, improving mood, and ensuring social integration. All these attributes contribute to psychological well-being. On a societal level, the widespread adoption of sharing, reduction of freeloading and selfishness, effective resource utilization, and maintenance of social trust can help decrease intense competition and conflict within communities.

The prevalence of individuals with prosocial behaviors within populations is widely recognized in the literature as providing an evolutionary advantage for the survival of human communities. Incorporating perspectives and approaches that reproduce the positive evolutionary outcomes of prosocial behaviors and foster learners' development both cognitively and socio-emotionally within the teaching-learning process can lead learners to achieving greater learning outcomes. Since these approaches reproduce the diverse and advantageous

behaviors shaped through evolution, they can be prioritized by teachers and effectively employed in learning environments. In terms of teaching strategies, methods, and techniques, "cooperative learning" is thought to be the approach that embodies all these advantageous aspects. Cooperative learning not only promotes cognitive development in instructional processes but also can evoke and reproduce prosocial behaviors that provide evolutionary advantages, resulting in lasting learning outcomes. In other words, the benefits of cooperative learning in education are fundamentally rooted in evolutionary processes. Cooperative learning brings the advantageous traits produced by evolution into the classroom setting. Slavin (1999) even describes cooperative learning as one of the greatest success stories in educational innovation. Felder and Brent (2007) highlight the numerous benefits of cooperative learning in the teaching-learning process, including the development of higher-level reasoning and critical thinking skills, deeper understanding of the material, lower levels of anxiety and stress, increased intrinsic motivation for learning, the ability to view situations from others' perspectives, more positive and supportive relationships with peers, a more favorable attitude towards subject areas, and higher self-esteem. Learning in cooperative groups can facilitate the emergence of a wide range of developmental traits and support their reinforcement within the group. In addition to socio-emotional learning, cognitive processes are also strongly supported through cooperative learning. Bell and Hernandez (2017) emphasize that group learning is crucial for the transfer of adaptive knowledge, noting that group activities in modern education reinforce this claim. Açıkgöz (1995) highlights the multifaceted benefits of cooperative learning in the teaching-learning process, noting the following:

> *"Cooperative learning positively contributes to cognitive learning outcomes and processes, enhances motivational and emotional aspects such as motivation, anxiety, and attitudes, fosters the creation of a supportive learning environment, facilitates the development of complementary learning outcomes like leadership, sharing, and critical thinking, and aids in the individualization of instruction (p.171-172)."*

The multidimensional learning environment created by cooperative learning may not be as fruitful when other teaching methods and techniques are employed. Traditional teacher-centered approaches, often characterized as conventional, appear to fall short in fostering socio-emotional traits, encouraging productive learning, and achieving cognitive depth to the same extent as cooperative learning groups. Moreover, some teaching methods, rather than enhancing prosocial behaviors, may inadvertently promote the undesirable feeling of

"competition" within the learning process. Bell and Hernandez (2017) emphasize that cooperative learning typically results in increased academic achievement and positively influences inter-ethnic group relations, self-esteem, attention, and other school-related behaviors that enhance performance. They explain the scholastic benefits of cooperative learning groups by noting that these groups address challenges through social interaction, thereby enhancing learning outcomes. This social interaction, in turn, leads to the emergence of prosocial behaviors and altruism, the natural products of evolution, and enables their reproduction within group processes. Johnson and Johnson (2015) emphasize that hundreds of studies have shown that cooperation tends to result in higher achievement and productivity, more positive interpersonal relationships, and greater psychological well-being when compared to competitive and individual efforts. They identify "social interdependence theory" as the fundamental theory underpinning cooperative learning. This theory posits that the intrinsic motivation created by interpersonal factors in working together and the shared desire to achieve a common goal lay the foundation of cooperative efforts.

The connection of this multidimensionality in cooperative learning processes with evolutionary processes and the sense of common goal produced by the underlying social interdependence can similarly manifest itself in team sports. The fact that team sports are followed by a large fan base around the world may stem from their ability to reproduce many phenomena that provide advantages in evolutionary processes within the “sport” and that the loyalty it reveals is consumed by the fans. From a young age, individuals who participate in team sports experience sharing, teamwork, common goals, positive commitment, psychological well-being, and socialization. Through these activities, they deeply engage with the traits that evolution has bestowed upon them. Ağacı and Bakırcı (2014) notes that team sports foster a sense of commitment and provide opportunities to experience characteristics such as strategy development and collaborative work, which are reminiscent of those found in group hunting. They emphasizes that our commitment to team sports and team-based activities may be rooted in our evolutionary "hunter genes". According to WorldAtlas 2024 statistics, the predominance of team sports among the top 10 most popular sports globally can be considered a concrete indicator of this phenomenon. In this context, whether as consumers of team sports or as participants within the teams, individuals enjoy many experiences that provide evolutionary advantages. This contributes to the creation of a global fanbase, and a substantial economy based on this commitment.

In conclusion, interacting with peers in various contexts (such as being a team member or part of cooperative learning groups) offers individuals the opportunity to encounter different ideas and perspectives, which can facilitate the construction of new knowledge. Cooperative efforts have a unique potential for cognitive development. Educators have traditionally focused on individual work to explain cognitive development. However, cognitive research has shown that socio-cognitive activities such as well-managed cooperative learning and in-class discussions can encourage learners to clarify, elaborate, reorganize, and conceptualize knowledge (Bruning, et al., 2011). Moreover, cooperative groups can facilitate learners' engagement with the process by providing not only cognitive benefits but also a range of socio-emotional outputs.

Another topic that can be considered within the framework of evolutionary pedagogy is the evolutionary development of the mind and mental processes and its implications in educational sciences. The cognitive abilities achieved by humans via evolution represent a significant distinction between us and other species. Since the 1950s (Piaget, 1950; Bruner, 1960; Bandura, 1977), the focus in educational sciences has shifted towards cognitive learning theories, leading to the development of models related to the structure of the mind and the functioning of the brain. Within this framework, cognitive processes, memory, and its structure, learning styles and strategies, and learner-centered methods and techniques have gained prominence in educational research. These elements have increasingly become integral to the classroom environment. With the development of models related to the structure of the mind, recommendations have been made to both educators and curriculum developers based on these models. It is believed that implementing educational processes aligned with these developmental structures can enhance the effectiveness of teaching by ensuring that the time and effort invested are well-rewarded. Cognitive development is an integral part of educational processes. Bruning, et al. (2011) note that many individuals have played significant roles in the cognitive revolution. These people and their works are as follows.

• Jerome Bruner and David Ausubel's work on mental structures and organizational schemas

• Ulrich Neisser's 1967 publication “Cognitive Psychology”

• G. A. Miller’s 1956 article “The Magical Number Seven, Plus-Or- Minus Two: Some Limits on Our Capacity for Processing Information”

• J. J. Jenkins’s 1974 article ‘‘American Psychologist’’

• Marvin Minsky's 1975 work "frames paper"

The process of cognitive development through evolution is also considered one of the areas of focus within evolutionary psychology. Cognitive processes such as the evolution of the brain, language development, and problem-solving skills are being explained through evolutionary mechanisms. Sakınç (2015) emphasizes that evidence for the emergence of tool-making, language, and culture in the middle and late stages of the Homo genus can be interpreted as a reflection of the development of a larger brain and intellect, coupled with a more complex structure. In other words, as the brain's volume increased, so did the cranial capacity, and this relationship inevitably led to the rise of intelligence. At this point, it seems crucial to examine how the brain and memory structures evolved. Because what distinguishes humans from other living beings is the development of the brain and, consequently, the intellect. This development is made possible by the presence of highly advanced brain regions (Sakınç, 2015). Kaya (2023) notes that when it comes to the formation of the mind, two fundamental mechanisms are primarily debated: domain-general and domain-specific processes. According to Cosmides and Tooby (1994), as cited in Kaya (2023), traditional cognitive psychologists argue that cognitive architecture is domain-general and content-independent. On the other hand, the evolutionary perspective posits that domain-specific cognitive mechanisms play a significant role in the formation of the mind. These cognitive mechanisms, which encompass processes such as memory, attention, decision-making, and learning, are designed to serve the purposes of reproduction and survival (Kaya 2023). Compatibly, the human brain is considered a collection of specialized "domain-specific modules" (Berge & Van Heijewijk, 1999; Amici & Aureli, 2017). Barton and Venditti (2014) note that the biological underpinnings of humans' unique cognitive abilities and mental dexterity have largely been attributed to the enlarged neocortex, but the human cerebellum, which contains four times more neurons than the neocortex, is increasingly gaining attention in cognitive processes due to its wide range of cognitive functions. All in all, despite different explanations and approaches, evolution endowed us with a "memory" whose functioning is awe-inspiring. Important points regarding the formation and characteristics of memory are stated by Demirsoy (2021) as follows:

1. Our ability to learn, our capacity to retain what we have learned, and our interpretative skills are primarily limited by the hereditary structure of our neural membrane.

2. Proper nutrition and adequate oxygen intake during the embryonic and fetal stages play an active role in the formation of an individual's memory.

3. During the formation of memory, it is necessary to increase the rate and amount of protein localization in the memory by using various sensory organs or inputs. To achieve successful learning, it is essential to use all possible methods in education (visual, verbal, etc.) simultaneously.

4. The decrease in the rate of protein synthesis due to aging reduces our learning capacity.

Memory, as an integral part of cognitive processes, comprises several subsystems (Kaya, 2023). These subsystems are generally recognized in the literature as part of the "modal model" of memory. The modal model includes several distinct components of memory, each serving a specific function, much like the different gears in a car performing various tasks (Bruning, et al., 2011). This model suggests that memory consists of different pieces of information processed at stages such as encoding, storage, and retrieval. By examining different types of information processing and their real-world examples, we can gain a better understanding of how our minds work and why certain tasks require more effort than others. This knowledge appears to be highly valuable for improving educational practices and designing better problem-solving techniques (Cuncic, 2024). Despite some criticisms, the modal model remains widely accepted in the literature due to its usefulness as an organizing framework for mental processes, its potential for further development and its practical application in educational contexts. The modal model structures memory into sensory memory, working memory, and long-term memory (Bruning, et al., 2011).

In terms of the teaching-learning process, the insights provided by the modal model offer numerous applications for both learners and instructors in enhancing information processing skills. For instance, in designing instructional materials, presenting key content from a text in an engaging way can facilitate the transition from sensory memory to short-term memory. Using different colors and shapes as stimuli can play a crucial role in capturing learners' attention. Similarly, to support the transition from short-term to long-term memory, utilizing memory aids, repetition, and effective learning strategies can help ensure that information is retained in long-term memory. To this end, learners can independently develop their own learning strategies and try them out in their study processes. These practices are examples of educational applications within the "modal model" framework. Additionally, teachers can be provided with recommendations to enhance their teaching practices:

a. Presenting learning content in meaningful chunks appears to facilitate easier encoding.

b. Emphasizing key concepts during the teaching process and thereby capturing attention can direct learners' focus toward the important concepts within the learning content.

c. In the learning process, learners' use of what they have learned through activities can contribute to permanent learning in long-term memory.

d. A well-structured teaching process should not only achieve learning outcomes but also foster skills for learning how to learn. Instructors can support students' encoding processes by providing explanations and practices that raise awareness about these skills.

When the teaching-learning process is considered as a whole, the fundamental goal is to effectively encode learning content to ensure its retention in long-term memory and to facilitate retrieval when needed. Therefore, long-term memory plays a crucial role in educational experiences. The strategies and practices employed by learners aim to transfer information processed in short-term memory to long-term memory for permanent storage. Senemoğlu (2005) characterizes long-term memory as the type of memory in which well-learned information is continuously stored. New connections formed in the brain allow information to be retained permanently in long-term memory. Consequently, it is not possible to separate the concept of learning from encoding and memory.

In the context of evolutionary pedagogy, another point to consider regards how children’s efforts to impress their families and teachers can be explained through evolutionary principles. This has direct implications for the teaching-learning process. Primarily, children have a need to impress their families, which can be explained by evolutionary reasons. The need for attachment and survival, resource sharing, genetic continuity, and cooperation are among the reasons that can be highlighted in this context (OpenAI, 2024). Children may feel the need to impress their families and attract their attention to increase their chances of survival and ensure continued care and protection. This need, which provides evolutionary advantages, can explain why the desire for approval is so common and intense among children. A similar phenomenon occurs in the classroom environment where students may exhibit behaviors aimed at impressing their teachers among their peers. Such behaviors might include competing to answer questions quickly, complaining about classmates, and displaying compliance and cooperation within the class. For students, teachers are perceived as authority figures. Establishing a positive bond with authority can contribute to students feeling secure and making optimal use of available

resources. However, this desire for approval can sometimes lead to undesirable behaviors in the classroom from the teachers' perspective, such as peer complaints, which can be challenging for educators. While it is not scientifically accurate to attribute these behaviors solely to evolutionary processes, it is reasonable to consider that evolutionary factors might underpin such behaviors.

2. Discussion and Conclusion

Evolutionary pedagogy is a synthesis of evolutionary biology, evolutionary psychology, and pedagogy. Evolutionary psychology, which asserts that the basic features of human behavior can be explained through evolutionary processes, has become the subject of research in recent years. The evolution that underpins psychology represents a unique narrative of what it means to be human, thus potentially offering substantial contributions to evolutionary pedagogy. Education, fundamentally rooted in communication, relies on psychological processes. Many classroom practices are shaped by the nature of this interaction. Consequently, in the classroom, learners naturally reproduce and summarize characteristics shaped by evolution through these interactions.

In educational settings, the teaching methods and techniques, learner behaviors, and classroom management processes all reflect behaviors shaped by evolution. Methods such as collaborative teaching encompass many features created by evolution, allowing learners to benefit more comprehensively from the process. Pro-social and altruistic behaviors as well as cognitively rich experiences are exhibited in the classroom environment. These are all human behaviors that provide advantages in the evolutionary process and are shaped by culture. Cooperative teaching alone prepares the ground for the emergence of these behaviors in the classroom environment. This can make collaborative teaching methods appear more advantageous compared to other methods. In other words, the benefits produced by collaborative teaching can be traced back to and explained by evolutionary processes. Therefore, such methods, due to the substantial learning outcomes they generate, may be preferred by educators over other approaches. The widespread preference for team sports globally can be attributed to the fact that they enable individuals to experience behaviors distilled by evolution, both as team players and as spectators.

A similar situation applies to learning processes that align with mind structures carved by evolution. Using attention strategies, incorporating activities that aid in encoding, and organizing instructional materials accordingly can be viewed as pedagogical practices

compatible with evolutionary brain structures. When learners act strategically while studying a learning content, they are essentially utilizing practices that are compatible with these evolutionary mental frameworks.

It is possible to come across different concepts related to evolutionary processes in the literature. For example, in the 1890's, American psychologist Stanley Hall proposed explanations rooted in evolutionary processes regarding the origins of children's play. Şenyuva (2023) notes that, according to Hall, play is interpreted as a product of evolutionary biology. From this perspective, through play, children engage in activities that are inherent to their nature and that effectively summarize the behaviors of their ancestors. For instance, when children run, strike, or chase, they are reenacting movements that echo their ancestors' hunting behaviors. In this way, they revisit and replicate the actions of their ancestors. According to G. Stanley Hall (1882), children relive the evolution of the human species through play. This idea, known in the literature as the recapitulation theory (as cited Green, 2015), is based on the recapitulationist evolutionary theory of his contemporary Ernst Haeckel. While Haeckel proposed that the embryonic development of each organism mirrors the evolutionary history of its species, Hall argued that the postnatal development of a child's mind and behavior follows the evolutionary path of the human species as a group (Green, 2015).

Hall's reference to evolutionary processes regarding children's play overlaps with certain aspects of the foundational ideas in this study. Additionally, Hall's proposition that play evolves in tandem with development should be considered a distinctive aspect of his theory. As demonstrated, evolutionary processes not only shape human behaviors but can also be employed to explain the origins of children's play. Although the recapitulation theory has faced some criticisms (Sevinç, 2004), it remains a part of the classical play theories in the literature. When examined in detail, many pedagogical practices, not just those discussed here, can be grounded in evolutionary processes. At this point, especially the findings of evolutionary psychology are expected to shed light on evolutionary pedagogy.

CONFLICT OF INTEREST STATEMENT

The author declares that there is no conflict of interest in this study.

RESEARCH AND PUBLICATION ETHICS STATEMENT

The author declares that research and publication ethics are followed in this study.

AUTHOR LIABILITY STATEMENT

The author declares that he has done every step of this work herself.

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