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The Impact of Artificial Intelligence-Powered Writing Assistance Systems on Metacognitive Writing Strategies in the EFL Learning Context

Master's Thesis

Ece Hatice Berk

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This MA thesis titled "The Impact of Artificial Intelligence-Powered Writing Assistance Systems on Metacognitive Writing Strategies in the EFL Learning Context" written by Ece Hatice Berk at the Department of Foreign Language Teaching was accepted by our jury.

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STATEMENTS

Style and Reference Manual Statement

Having reviewed this thesis written under my supervision, I confirm that it has been written in accordance with APA (7th Edition) Manual of Style and used its [footnote/in text] reference format consistently throughout the entire text.

Signature

Prof. Dr. Selami Aydın

Declaration of Originality

I hereby declare that all information in this dissertation has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conducts, I have fully cited and referenced all material and results that are not original to this work.

Signature

Ece Hatice Berk

GENİŞ ÖZET

Yapay Zekâ Destekli Yazma Sistemlerinin Yabancı Dil Olarak İngilizce Öğrenme Bağlamında Üstbilişsel Yazma Stratejileri Üzerindeki Etkisi

Berk, Ece Hatice

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Danışman: Prof. Dr. Selami Aydın

Haziran, 2024

Yazma becerileri, yabancı dil olarak İngilizce öğrenme bağlamında büyük önem taşımaktadır. Yazma, yaratıcılığı ve kendini keşfetmeyi ifade etmek için bir araç olarak görüldüğünden (Ghufron ve Ermawati, 2018)), öğrencilerin mantıksal düşünme ve bilişlerini geliştirmelerine ve aynı zamanda yaratıcılık ve iletişim kapasitelerini geliştirmelerine yardımcı olabilir (Q. Li, 2019; B.C. Liu, 2020). Bir metin oluşturma süreci olduğu için öğrencilerin kelime bilgisi, dil bilgisi ve yapı gibi öğrendiklerini kullanma becerilerini geliştirebilir. (J. X. Yu, 2021). Bununla birlikte, öğrencileri düşünmeye, odaklanmaya ve düşüncelerini organize etmeye teşvik ederken özetleme, analiz etme ve eleştirme yeteneğini güçlendirebilir (Rao, 2007). Yazma, çoğu standartlaştırılmış testlerde, özellikle de öğrencilerin akademik başarısını ve yazma yeterliliğini ölçme amacıyla kullanılmasıyla da önemli bir beceridir (Harmer, 2004; Tan, 2011). Bu nedenle de öğrenilenleri yansıtabildiği için bir yeterlik göstergesi olarak düşünülür (Wait, 2019). Ek olarak, öğrenenlerin ele aldıkları içerik, yazma süreci, hedef dil, tür ve bağlamdan haberdar olmalarını gerektirdiği için (Hyland, 2003) bilişsel, sosyal ve kültürlerarası becerilerin bir birleşimidir (Lin, 2016).

Yazma becerilerinin önemi ile ilgili olarak, üstbilişsel yazma stratejileri yabancı dil olarak İngilizce öğrenme bağlamında oldukça önemli bir yer tutar. Üstbilişsel yazma stratejileri planlamayı, izlemeyi ve değerlendirmeyi içerdiği için, yazarların yazılarını yönetmesine, yönlendirmesine ve düzenlemesine olanak sağlayabilir (Al-Jarrah ve diğerleri, 2018). Bu sayede, öğrenenleri öz düzenlemeye ve yazma becerilerini geliştirmeye teşvik edebilir (Cer, 2019). Aynı zamanda bu stratejiler, yazının kelime dağarcığını, mekaniğini, içeriğini ve organizasyonunu etkiler (Dülger, 2011). Üstbilişsel yazma stratejilerini kullanmak, öğrencilerin dilsel öğelere, görev gereksinimlerine, kendi öğrenme süreçlerine, metin, doğruluk ve söylem öğelerine daha fazla odaklanmasını sağlar (Magogwe, 2013; Mekala vd., 2016). Üstbiliş, öğrencilerin bilgiyi bilişsel amaçlar doğrultusunda ayarlama kapasitesiyle ilişkili olduğundan (Santelmann ve diğerleri, 2018; F. Teng, 2016, 2019a, 2019b), öğrencilerin yazma süreçlerini değişen taleplere uyarlamalarına yardımcı olur (Goctu, 2017). Son olarak üstbilişsel yazma stratejileri, öğrencilerin hedeflerine ulaşmalarını, davranışlarına ve öğrenmelerine daha iyi hakim olmalarını sağlar ve yazarken daha özgüvenli ve planlı olmalarına yardımcı olur (N. Rahmat ve İsmail, 2014).

Eğitimde yapay zekâdaki en son gelişmeler, İngilizce yazma süreçlerinde kullanıcılara yardımcı olacak yapay zekâ destekli yazma araçlarının ortaya çıkmasına yol açtığı için

(Barrot, 2020; Coenen ve diğerleri, 2021), bu yazma sistemleri yabancı dil olarak İngilizce öğrenme bağlamında önemli bir rol oynamaktadır. Yapay zekâ destekli yazma araçları metin çevirisi, yazımı geliştirme, metin analizi, metni yeniden yazma, özetleme ve intihal tespiti gibi çeşitli amaçlar için kullanılabilir (Burkhard, 2022). Aynı zamanda bu araçlar kişiselleştirilmiş öğrenme deneyimleri sunarak dil yeterliliğini potansiyel olarak geliştirebilir (Kasimi ve Fidan, 2023). Kişiselleştirilmiş öğrenme, öğrencilerin kendi kendini yönetmesini ve özerk olmasını sağlayan Yapılandırmacılık gibi teorilerle ilişkili olduğundan (Loizzo ve diğerleri, 2017), yapay zekâ destekli yazma sistemlerini kullanmak, İngilizceyi yabancı dil olarak öğrenen öğrencilerin öğrenmelerinin sorumluluğunu almalarını ve daha aktif bir şekilde yazmalarını sağlayabilir. Örneğin, Language Tool veya Grammarly gibi araçlar, öğrencilerin bir dilin çeşitliliğine ilişkin öz farkındalık geliştirmelerine yardımcı olabilir (T. Schmidt ve Strassner, 2022). Bu sayede, öğrenciler, dilin yalnızca yazım ve dilbilgisi kontrolü değil bağlam ve tutarlılık içerdiği konusunda aydınlanabilir (T. Schmidt ve Strassner, 2022).

Yabancı dil olarak İngilizce öğrenme bağlamında, yazma becerileri ile ilgili bazı zorluklar olabilir. Yazma süreci sadece fikir üretmeyi değil, aynı zamanda bu fikirlerin hedef dile çevrilmesini (Richards ve Renadya, 2002) ve bunun yanı sıra özgün metinlerin yazılmasını da gerektirir. Dolayısıyla, okuyucu ve yazar arasındaki etkileşimi temsil ettiğinden, yabancı dil öğrenenler kompozisyonları aracılığıyla okuyucuların dikkatini çekmekte zorlanabilirler (Rao, 2007). Konu hakkında bilgi eksikliği, yetersiz dil pratiği ve geri bildirim, yazmayı zorlaştırabilir. Yazma, görev başarısı, dilbilgisi ve sözlüğün geniş kapsamı ve doğruluğu, bağdaşıklık ve tutarlılık gibi dilsel beceriler gerektirir (Ebadi ve Rahimi, 2018), bu becerilerin eksikliği öğrencilerin yazmasını engelleyebilir. Son olarak, öğrenciler yazma sürecinde yazma problemlerinin farkında olmayabilirler, bu da niteliksiz yazma ve hayal kırıklığına yol açabilir (A. Chen, 2022).

Öğrenciler aynı zamanda üstbilişsel yazma stratejileriyle ilgili bazı sorunlarla da karşılaşabilmektedir. Düşük başarı seviyesindeki öğrenciler üstbilişsel stratejileri yazılı olarak uygulayamayarak pratik ama verimsiz bir strateji seçebilirler (Cohen, 2011), bu da üstbilişsel stratejilerin yararlı olmadığını düşünmelerine neden olabilir. İçerdiği aşamalardan dolayı üstbilişsel yazma stratejileri öğrencileri yorabilir ve bu nedenle yazarken ana görev gereksinimlerinin takibini kaybedebilirler. Yazma derslerinde üstbilişsel stratejilerin öğretilmesi, özellikle de test odaklı ve çıktı odaklı yabancı dil eğitimi bağlamında zorlayıcı olabilir (Farahian ve Avarzamani, 2018). Benzer şekilde, ders saatlerinin sınırlı olması nedeniyle üstbilişsel stratejileri ve bunları kapsayan aşamaları açıkça öğretmek zor olabilir (Alfaifi, 2021).

Yukarıda bahsedilen sorunlara yönelik olarak yapay zekâ destekli yazma sistemleri birçok açıdan çözüm sunabilmektedir. Öncelikle, kısa ve kapsamlı açıklamalarla öğrencilere kompozisyonları hakkında dil bilgisi geribildirimi sunabilirler (Sumakul vd., 2022). Aynı zamanda bilişsel ve üstbilişsel geri bildirimler verebilir, bu da öğrencilere özerklik kazandırır (E. Yu, 2023). Grammarly gibi yapay zekâ destekli araçlar, hedef kitleye, formaliteye, türe, üsluba ve yazma amacına uygun şekilde hitap eden bağlamla ilgili öneriler sunabilir (T. Schmidt ve Strassner, 2022). Böylece, bağlamla ilgili sorunlara yardımcı olabilirken görev gereklilikleri ve yazma süreci konusunda öğrencilerin farkındalık kazanmalarını sağlayabilir. Bu araçlar zaman ve ortamdan bağımsız olarak kullanılabilirler. Öğrencilerin kaygı düzeylerini azaltabilecek ve

ürünlerini izleyip değerlendirebilecekleri için üstbilişsel becerileri artırabilecek yargılamadan uzak bir ortam yaratabilirler.

Mevcut çalışma, yapay zekâ destekli yazma yardım sistemlerinin yabancı dil olarak İngilizce öğrenme bağlamında üstbilişsel yazma stratejileri üzerindeki etkisini incelemeyi amaçlamaktadır. Bununla birlikte geleneksek sınıf içi aktivitelerin de üstbilişsel yazma stratejilerine etkisini incelemektedir. Aynı zamanda geleneksel aktivitelerin kullanımı ile yapay zekâ destekli yazma yardım sistemlerinin kullanımı arasında üstbilişsel stratejilerin kullanımı açısından bir farklılık olup olmadığını incelemeyi hedeflemektedir.

Bu çalışmada rastgele atanan gruplar yerine önceden var olan gruplara belirli ve kontrollü prosedürler uygulanarak inceleme yapıldığı için yarı deneysel bir araştırma tasarımı benimsenmiştir (Seliger ve Shohamy, 1989). Çalışma 2023-2024 akademik yılı Bahar döneminde uygulanmış olup İstanbul'da yer alan bir devlet üniversitesinin Yabancı Diller Yüksekokulu İngilizce hazırlık programına kayıtlı 40 öğrencisi ile gerçekleştirilmiştir. Çalışmaya önceden var olan ve aynı İngilizce yeterlilik düzeyine sahip (A2) iki sınıf rastgele seçilmiştir. Ayrıca, çalışmanın bulgularının ardındaki olası nedenleri ortaya çıkarmak ve araştırmak için deney ve kontrol gruplarından bir odak grup oluşturulmuştur. Her gruptan rastgele seçilen beş katılımcı ile toplamda 60 dakikalık bir toplantı gerçekleştirilmiştir. Çalışmada öğrencilerin yaşı, cinsiyeti, bölümü ve İngilizce yeterlilik seviyeleri hakkında veri toplamak amacıyla bir arka plan anketi kullanılmıştır. Daha sonra C. Qin ve arkadaşları tarafından geliştirilen (2022) 30 maddelik Üstbilişsel Yazma Stratejileri Ölçeği uygulanmıştır. Araştırmanın başında kontrol ve deney gruplarına ön test verilmiştir. Beş hafta boyunca kontrol grubu paragraflarını yazmak için sadece kalem ve kağıt kullanırken, deney grubu paragraflarını planlamak, izlemek ve değerlendirmek için bir yapay zekâ aracı olan ChatGPT'yi de kullanmıştır. Uygulama sürecinin ardından katılımcılara son test uygulanmıştır. Son testlerin ardından her gruptan beşer katılımcı ile odak grup görüşmesi yapılmıştır. Görüşme, yaşları 18 ile 21 arasında değişen yedi kız ve üç erkek öğrenci ile yüz yüze gerçekleştirilmiştir. Her grup ile çalışmanın kendilerine ait bulguları paylaşılmış ve bulgulara dair yorum ve düşünceleri not edilmiştir.

SPSS analizlerine dayanan çalışmanın sonuçlarına göre hem kontrol grubunun hem de deney grubunun genel üstbilişsel yazma stratejilerinin deney öncesi ve sonrası yüksek seviyede olduğu görülmektedir. Bu da öğrencilerin yazarken üstbilişsel süreçlerle meşgul oldukları anlamına gelmektedir. Öte yandan çalışmada geleneksel etkinliklerin kullanılmasının üstbilişsel bilgi dışında genel üstbilişsel yazma stratejilerini geliştirmediği gözlemlenmiştir. Bu da demek oluyor ki yabancı dil olarak İngilizce öğrenme bağlamında, öğrenciler kişi, görev ve strateji değişkenlerinin farkındadır ancak bu makalelerini planladıkları, izledikleri ve değerlendirdikleri anlamı taşımaz. Bundan farklı olarak yapay zekâ destekli yazma sistemlerinin, öğrencilerin genel üstbilişsel stratejilerini ve üstbilişsel düzenlemelerini geliştirdiği görülmektedir. Bu, öğrencilerin makalelerini planlayarak, izleyerek ve değerlendirerek üstbilişsel stratejilerden yararlandıkları anlamına gelmektedir. Ancak bu sistemler öğrenenlerin üstbilişsel bilgilerini olumlu yönde etkilememektedir. Bir başka deyişle öğrencilerin üstbilişsel düzenlemeler yapmaktadır fakat bu üstbilişsel bilgilerinin farkında olduklarını göstermeyebilir. Ek olarak, yapay zekâ destekli araçların ve geleneksel etkinliklerin

etkisi incelendiğinde, yabancı dil olarak İngilizce öğrenme bağlamında yazma becerisi konusunda yapay zekâ sistemlerinin üstbilişsel stratejiler açısından geleneksel etkinliklere göre daha fazla katkı sağladığı görülmektedir. Ancak genel bağlamda iki araç arasında belirgin bir farklılık gözlenmemektedir. Özetle, yapay zekâ destekli yazma sistemleri ile uygulanan makale yazma aktivitelerinin İngilizceyi yabancı dil olarak öğrenen öğrenciler üzerinde bir etkisinin olduğu ancak bu etkinin geleneksel yöntemlerle makale yazan öğrencilere kıyasla önemli bir fark yaratmadığı ortaya konulmuştur.

Bu çalışmadaki sonuçları dikkate alarak bazı öneriler sunulabilir. İlk olarak, öğrencilerin üstbilişsel yazma stratejilerini geliştirmek için İngilizce yabancı dil öğrenme bağlamında yapay zekâ destekli yazma yardım sistemleri kullanılmalıdır. Bu stratejilerin yazma becerilerini geliştirdiği bilindiğinden (Cer, 2019), bu sistemlerin öğrenme ortamlarına entegre edilmesi yazma becerilerini geliştirme potansiyeline sahiptir. Ayrıca yapay zekâ yazma araçlarını kullanmak, üstbilişsel yazma stratejilerini geleneksel sınıf içi etkinliklerden daha fazla etkilemese bile, bu araçlar etkileşim ve anında öneriler sunar ve üstbilişsel strateji kullanımını geliştirmek için ek destek sağlayan bireysel öğrenme ihtiyaçlarını karşılar. Teknolojiyi öğrenme ortamına dahil edebilmek için öğretmenlerin aynı zamanda bu sistemleri en iyi şekilde nasıl kullanacakları konusunda da eğitim almaları gerekmektedir. Örneğin, yaratıcılık düzeyini azaltan ve öğrenme sürecine katılımı sınırlayan yapay zekâ sistemlerine aşırı bağımlılık geliştirme olasılığının farkında olmalıdırlar. Bununla birlikte, yapay zekâ destekli yazma sistemlerini ters yüz sınıf modeli gibi öğrenme ortamlarına kolayca dahil edebilmeleri için sınıfın pedagojik tasarımının da göz önünde bulundurmalıdırlar. Ek olarak, öğretmenlerin herhangi bir tehdidi önlemek için veri gizliliğinin yanı sıra intihal girişimleri için bu araçlarla ilgili etik hususlar hakkında bilgi sahibi olmaları gerekmektedir. Müfredat geliştiricilerin de ders planı hazırlayan öğretmenlerin herhangi bir uyumsuzluk yaşamaması için yapay zekâ araçlarının öğrenme ortamlarına entegrasyonunu teşvik etmeleri önerilmektedir. Teknik sorunları önlemek için teknolojinin kullanılacağı ortamın internet kullanımına uygun olması gerekmektedir. Böylece öğrencilerin öğrenme sürecini aksatabilecek olası sorunlarla karşılaşmadan yapay zekâ destekli yazma yardım sistemleriyle kolayca etkileşime geçmeleri teşvik edilebilir. Yapay zekâ araçları ortam kısıtlamalarından muaf olduğundan, öğrencilerin de bu sistemleri sınıf içinde ve dışında kullanmaları teşvik edilmelidir. Son olarak, hem geleneksel hem de yapay zekâ entegreli ortamların avantaj ve dezavantajlarının olduğu unutulmamalıdır. Bu nedenle tek bir öğrenme ortamına bağlı kalmak yerine, bu ortamların öğrenenlerin farklı ihtiyaçlarına, ilgilerine ve öğretilecek derse uygun, uyumlu bir şekilde kullanılması gerekmektedir.

Anahtar Kelimeler: Yabancı dil olarak İngilizce öğretimi, Üstbilişsel yazma stratejileri, Üstbilişsel bilgi, Üstbilişsel düzenleme, Yapay zekâ

ABSTRACT

The Impact of Artificial Intelligence-Powered Writing Assistance Systems on Metacognitive Writing Strategies in the EFL Learning Context

Berk, Ece Hatice

Master's Thesis, Department of Foreign Language Education

Supervisor: Prof. Dr. Selami Aydın

June 2024

Writing plays an important role in the EFL context as it is a tool to express ideas, apply what has been learned, stimulate higher-order skills, and be a measurement of writing proficiency. Since metacognitive writing strategies involves planning, monitoring, and evaluating stages, they can improve writing performance and encourage self-regulation so that learners can control their learning process (Al-Jarrah et al., 2018; Cer, 2019). As a facilitator for self-directed learning (Nazari et al., 2021; Pokrivcakova, 2019), AI-powered systems in writing have a significant role in the EFL context by leading learners to manage their learning process and empower their metacognitive skills for writing. However, there has been a limited number of studies carried out on the impact of AI-powered writing assistance systems on metacognitive writing strategies in the EFL learning context. Therefore, this study aims at examining the possible effects of integrating AI-powered writing tools on EFL learners' metacognitive writing strategies. In addition, it also investigates the impacts of using traditional activities on metacognitive writing strategies to make a comparison between AI-powered tools and conventional activities regarding the use of metacognitive strategies. Adopting a quasi-experimental design, the study was conducted with 40 EFL learners studying at a preparatory school of a state university in Türkiye. The data was collected by using a background questionnaire and the Metacognitive Writing Strategies scale developed by C. Qin et al. (2022). Two groups were selected randomly and assigned as control and experimental groups. Both groups took the pre-test before writing paragraphs for five weeks and took the post-test after the implementation. While the control group used only pen and paper to write their paragraphs, the experimental group used also ChatGPT to plan, monitor, and evaluate their paragraphs. The results were analyzed through SPSS. The findings revealed that AI tools had a considerable impact

on learners' metacognitive writing strategies while traditional activities did not affect these strategies significantly. However, it was found that there was no significant difference between the use of traditional activities and AI-powered systems in terms of using metacognitive writing strategies. Therefore, it is recommended that the advantages and disadvantages of both means should be taken into consideration and AI systems should be used as a supplementary tool to provide interaction, immediate suggestions, and to address individual learning needs in order to enhance metacognitive strategy use.

Keywords: English as a foreign language, Metacognitive writing strategies, Metacognitive knowledge, Metacognitive regulation, Artificial intelligence

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LIST OF ABBREVIATIONS

AI **:** Artificial Intelligence

CEFR **:** The Common European Framework of Reference for Languages

EFL **:** English as a Foreign Language

L2 **:** Second Language

MSW **:** Metacognitive Writing Strategies

SPSS **:** Statistical Package for the Social Sciences

SRT **:** Self-regulation Theory

ZPD **:** The Zone of Proximal Development

1. INTRODUCTION

This section represents the rationale behind the study including the background of the study, the statement of the problems, the aims of the study, the significance of the study, and research questions. First, the importance of writing, metacognitive writing strategies, and AI-powered writing assistance systems are provided. Second, the problems related to EFL writing and metacognitive writing strategies are mentioned followed by possible solutions that AI-powered tools may offer. Then, the purpose and significance of the study along with research questions are presented.

1.1. Background of the Study

Writing is of great importance in the EFL context for several reasons. First, it can help learners develop their logical thinking and cognition and enhance their capacity for creativity and communication (Q. Li, 2019; B. C. Liu, 2020) as it is seen as a tool for expressing creativity and self-discovery (Ghufron & Ermawati, 2018). Second, it can improve learners' ability to employ what they have learned such as word knowledge, grammar, and structure (J. X. Yu, 2021), since it is a process of text construction. Third, it encourages learners to think, focus, and organize their thoughts and promotes the ability to summarize, analyze, and criticize (Rao, 2007). Fourth, it is an essential skill as it is examined in most standardized assessments, particularly those used to measure learners' academic progress and writing proficiency (Harmer, 2004; Tan, 2011). In the same vein, it is considered as the common indicator of learners' competence (Wati, 2019) since this complex process has the potential to display learners' language, making ideas visible and available for reflection. Last, it is a combination of cognitive, social, and intercultural skills (Lin, 2016) since it requires learners to be aware of the content, writing process, target language, genre, and context they address (Hyland, 2003). It is equally important to develop an awareness of metacognition to reach the writing benefits.

Concerning the importance of writing skills, metacognitive writing strategies are crucial in the EFL context. First, as metacognitive writing strategies involve planning, monitoring, and evaluating, they can allow writers to manage, direct, regulate, and

guide their writing (Al-Jarrah et al., 2018). Therefore, these strategies can stimulate learners to self-regulate and improve their writing skills (Cer, 2019). Second, metacognitive strategies influence vocabulary, mechanics, content, and organization of the writing, which take their significant role beyond global levels (Dülger, 2011). Thus, learners can enhance their target language knowledge and be more strategic learners. Third, using metacognitive writing strategies leads learners to concentrate more on linguistic elements, task requirements, their own learning processes, text, accuracy, and discourse elements (Magogwe, 2013; Mekala et al., 2016). Fourth, they help learners adapt writing processes to changing demands (Goctu, 2017) as metacognition is related to learners' capacity to adjust knowledge for cognitive purposes (Santelmann et al., 2018; F. Teng, 2016, 2019a, 2019b). Last, metacognitive writing strategies enable learners to reach their goals, have better command over their behavior and learning, and help them be more confident and well-planned in writing (N. Rahmat & İsmail, 2014). At this stage, with their recent popularity, AI-powered writing tools can be considered to reap the benefits of metacognitive strategies in writing.

The latest advancements in AI in education have led to the emergence of AI-powered writing tools to assist users in English writing processes (Barrot, 2020; Coenen et al., 2021). Therefore, AI-powered systems in writing play a significant role in the EFL context. First, these tools can be used for a variety of tasks, such as text translation, improving spelling, text analysis, text rewriting and summarization, and plagiarism detection (Burkhard, 2022). Thus, they can offer thorough advice and recommendations for adjustments of text elements detection (Burkhard, 2022) which serve easiness to learners. Second, AI-powered tools can provide personalized learning experiences, potentially improving language proficiency (Kasımi & Fidan, 2023). Since personalized learning is related to theories such as Constructivism, which enables learners to be self-directed and autonomous (Loizzo et al., 2017), using AI-powered writing systems might make EFL learners take responsibility for their learning and engage in writing more effectively. Third, tools like Language Tool or Grammarly may assist learners' development of self-awareness of a language's variety (T. Schmidt & Strassner, 2022). Learners might be enlightened that language is more than just checking for spelling and grammar; it also firmly relies upon context and coherence (T. Schmidt & Strassner, 2022).

Overall, writing has been playing an important role in the EFL context as a tool to express ideas, apply what has been learned, stimulate higher-order skills, and be a measurement of writing proficiency. Additionally, it helps learners bring social, cognitive, and intercultural skills for reflection. At this stage, encompassing planning, monitoring, and evaluating, metacognitive strategies can accelerate writing performance and encourage self-regulation so that learners can control their learning process. As a facilitator for self-directed learning (Nazari et al., 2021; Pokrivcakova, 2019), AI-powered writing systems can lead learners to manage their learning process by empowering their metacognitive skills to be used for writing. Since the writing process, employing metacognitive strategies, and integrating AI-powered writing tools can be challenging in the EFL context, the problems learners encounter in these processes should be taken into consideration in great detail.

1.2. Statement of the Problem

There have been several problems in relation to writing skills in the EFL context. First, the writing process not only involves producing ideas but also necessitates translating them into the target language (Richards & Renadya, 2002) along with demanding the combination of neurological, physical, cognitive, and affective skills (Murray & Moore, 2006). Second, since writing represents the interaction between the reader and the writer, EFL learners may struggle to attract readers' attention through their compositions (Rao, 2007). Third, the lack of knowledge about the topic and insufficient language practice and feedback might be why writing poses challenges to EFL learners. Fourth, writing requires linguistic skills including task achievement, wide range and accuracy of grammar and lexicon, cohesion, and coherence (Ebadi & Rahimi, 2018), which may prevent learners from writing if they lack them. Furthermore, in the EFL context, learners have little exposure to the target language because of time constraints in classrooms. This may make it difficult for learners to adjust their knowledge to the context the task requires, which might reduce their writing motivation level and self-confidence. Last, learners might be unaware of writing problems during the writing process, leading to unqualified writing and frustration (A. Chen, 2022). Thus, metacognitive writing strategies should be essential to get rid of the problems by

being aware of the writing process.

On the other hand, learners might encounter some problems concerning metacognitive writing strategies. First, low achievers may not be able to implement metacognitive strategies in writing; rather, they might choose a practical but inefficient strategy (Cohen, 2011). This may lead less successful learners to think that metacognitive strategies are not helpful. Second, as metacognitive strategies include monitoring, planning, and evaluating, learners might be overwhelmed by the stages or monitor themselves too much; therefore, they may lose track of main task requirements while writing. Third, there are certain steps to teach metacognition: making learners aware of the importance of metacognition, empowering their knowledge of cognition, instructing how to control cognition, and offering a meaningful context to promote metacognitive awareness (Schraw, 1998). Teaching metacognitive strategies in writing courses, especially in a test-driven and output-oriented EFL context, could be challenging (Farahian & Avarzamani, 2018). In a similar vein, it is challenging to explicitly teach metacognitive strategies and stages encompassing them due to the limited class hours for strategy learning (Alfaifi, 2021). Therefore, metacognitive writing strategies might seem time-consuming for teachers and students. However, as AI-powered writing tools may provide personalized learning and ease of monitoring and evaluating the writing process by giving recommendations, implementing them in the EFL context could be considered.

Regarding these problems mentioned above, AI-powered writing systems can provide solutions in many ways. First, they may offer learners grammatical feedback on their composition with brief and comprehensive explanations (Sumakul et al., 2022), which can eradicate the problems of insufficient feedback on writing. In addition, these tools may give learners cognitive and metacognitive feedback, which gives learners autonomy (E. Yu, 2023). Second, AI-powered tools such as Grammarly can serve context-related recommendations that appropriately address the target audience, the formality, the genre, the tone, and the intention of writing (T. Schmidt & Strassner, 2022). This can help learners with context-related problems in their writing and make them aware of task requirements and the writing process. Third, AI-powered writing tools are free from restrictions of time and environments. Therefore, they can solve the problems of limited class hours in the classroom and also can assist teachers' workload in guiding

learners in their writing process. Additionally, AI applications may create a judgment-free environment (Abdalkader, 2022), which may reduce the anxiety level of learners and increase metacognitive skills as they can monitor and evaluate their products. Although AI-powered writing systems may have potential assistance in metacognitive writing strategies, research on using AI-powered writing assistance systems on metacognitive writing strategies in the EFL Learning Context seems scarce.

1.3. Aims of the Study

As previously mentioned, writing has been seen as challenging in the EFL context because of its demanding process, students' inability to attract readers' attention, lack of linguistic knowledge, insufficient feedback, limited exposure to the language, and students' unawareness of problems while writing. Metacognitive writing strategies, on the other hand, can be problematic as it takes time to attain them, especially in the EFL context, where there is limited time for planning, monitoring, and evaluating. With their advantages in the writing process, AI-powered writing tools can help learners acquire metacognitive strategies. Considering these concerns, the current study aims to examine the impact of AI-powered writing assistance systems on metacognitive writing strategies in the EFL context.

1.4. Significance of the Study

This study has an important place in the EFL context for several reasons. First, it has been emphasized that students who employ metacognitive writing skills produce better writing outcomes (Connor, 2007; Hayes, 2000; Nightingale, 1988). Regarding these metacognitive writing strategies, several studies focus on their use, especially in flipped classrooms and online contexts in general, due to the growing prevalence of technology in the EFL classroom. Given that this technology integration in the EFL context is significant, and it has a positive influence on metacognitive writing strategies, this study can enlighten EFL learners about metacognition. Considering that EFL learners have a consensus that writing is one of the most challenging tasks (A. Chen, 2022), the study can shed light on both learners and teachers on how to write effectively

in the EFL context. Second, AI technology has advanced significantly since the early days of computer-aided education (Akbulut, 2007; Mohsen & Balakumar, 2011) and helps learners improve language learning. As it is crucial to build a learner-centered learning environment and utilize intelligent technology to develop innovative talent-training programs and teaching strategies (Z. Wang, 2020), the study can contribute to the literature by revealing the potential benefits of integrating AI-powered writing assistance systems in the EFL context. Since there is no specific focus on the relationship between AI-powered writing systems and writing strategies, this study can enrich existing literature by expanding the scope of EFL writing. Third, previous studies mostly focus on how AI-powered writing tools applied for L2 writing rating (Ai, 2017; Cotos, 2010; Koltovskaia, 2020), L2 writing translation (Chon, 2021), improve writing skills (Cavaleri & Dianati, 2016; Fitria, 2021; O'Neill & Russell, 2019), and automated writing evaluation (C. F. E. Chen & Cheng, 2008; Grimes & Warschauer, 2010; Wilson et al., 2021; Xu & Zhang, 2021). However, limited research has been done to reveal the impact of AI-powered writing tools specifically on metacognitive writing strategies. As previous research reveals that the pedagogical design of the class plays a significant role in the metacognitive developments of learners, implementing AI-powered tools in the EFL context can pave the way for enhancing metacognitive writing strategies and overall writing quality. Moreover, in the Turkish EFL context, most studies focus on metacognitive awareness of reading skills (Tosuncuoglu & Kirmizi, 2019) rather than writing. Considering these, the study has the potential to fill the gap in the current literature and to offer practical implications for EFL learners and teachers.

1.5. Research Questions

Regarding the problems related to metacognitive writing strategies in the EFL context and limited research on the impact of AI-powered writing tools specifically on metacognitive writing strategies, there is a need to examine whether AI-powered writing assistance systems have an impact on metacognitive writing strategies. To this end, the study aims to find an answer to the following research questions:

1. What is the level of using metacognitive strategies among EFL learners?
2. Does the use of traditional activities affect metacognitive writing strategies among EFL learners?
3. Does the use of artificial intelligence-powered writing assistance systems affect metacognitive writing strategies among EFL learners?
4. Is there a difference between the use of traditional tools and AI-powered writing assistance systems regarding using metacognitive strategies?

2. RELATED LITERATURE

This section has two parts. The first part presents an elaborate explanation of the theoretical framework encompassing EFL writing, writing strategies, metacognition, metacognitive writing strategies, and artificial intelligence. The second part includes the research results concerning writing strategies, metacognitive writing strategies, and the use of AI-powered writing assistance systems in EFL writing.

2.1.Theoretical Background

2.1.1. Writing

There have been several definitions related to *writing skills* in the EFL context. According to Güneyli (2016), writing is a process in which writers use linguistic rules and letters to convey ideas, thoughts, emotions, and past experiences. Similarly, Rouhani et al. (2016) argue that writing is a way of communicating and elucidating information in written formats. As for Hadley (2003), writing is a tool to expand ideas, record knowledge, and reformulate it. On the other hand, N. H. Rahmat et al. (2018) state that writing is a social-cognitive process as the writer should guarantee that the audience's messages are clear and understandable. According to Gentil (2011), writing is multifaceted; therefore, it necessitates the convergence of various disciplines. Writing involves metacognitive and cooperative learning skills (Ortega, 2012). Additionally, Zimmerman and Kitsantas (2007) argue that writing is a metacognitive process encompassing being readable and aesthetic in the affective part rather than a procedure solely relying on ability. Oshima and Hogue (2007) define writing as a continuing creative action which entails four stages: prewriting, organizing, drafting, and polishing.

There are five main writing approaches in the EFL context: *product-oriented, process-oriented, genre-oriented, process-genre approach,* and *reader-dominated approach*. The *product-oriented approach* emerged based on Audilingualism in the 1960s (Raimes, 1991b). Grounded in Behaviorism, the *product-oriented approach* views writing as primarily about linguistic knowledge and perceives writing progress as

primarily about imitating input in the instructor's written format (Badger & White, 2000). Therefore, the focus is more on formal accuracy rather than meaning at both sentence and paragraph levels (Silva, 1990). Product-oriented teaching has four writing stages: familiarization, controlled writing, guided writing, and free writing (Badger & White, 2000). First, the teacher provides learners with model texts emphasizing certain parts such as topic sentences and thesis statements. Second, textual features are presented to learners through repetition and drilling in the form of controlled practices. This stage is followed by a concentration on the organization of ideas. Last, learners are to implement what they have learned to present the product with sufficient fluency and competency (Steele, 2004). However, it is argued that this approach may restrain learners' creativity and limit the originality of writing (Pasand & Haghi, 2013) since it is a model-oriented approach and prioritizes form over meaning. On the other hand, the *process-oriented approach* emerged as a reaction to the *product-oriented approach* (Raimes, 1991b; Susser, 1994). According to Kostelnick (1989), awareness and intervention are two important elements of this approach. First, the *process-oriented approach* emphasizes helping students understand that writing is a process by nature, which may involve selecting vocabulary, taking the audience into account, and determining formats than it does on language forms and their appropriate use (S. Yu et al., 2020). Intervention is the second key component of the process of writing. The role of the teacher is to assist students in organizing their thoughts before writing and revising (Applebee, 1986). In this approach, students employ recursive processes of mind mapping, brainstorming, drafting and revising, editing, and publishing (Sasaki, 2000; Tribble, 1996). With some guidance from the teachers, students can choose any topic they want to write about, and they do not feel afraid to write as the goal of writing is not to produce grammatically perfect work (Suriyanti & Yaacob, 2016). Consequently, through discussions, assignments, drafting, feedback, and informed choices, the *process-based approach* gives students more control over their writing and encourages them to take responsibility for enhancing their writing skills (Nueva, 2016). Unlike this writer-dominated process approach, the *genre-oriented approach* is more focused on the reader as it is presumed that language learning is a type of socialization in the target community (Horowits, 1986). This approach gives importance to the social and cultural context while writing (Hammond & Derewianka, 2001). That is, writing

serves to accomplish certain communicative objectives in line with particular social contexts (Pham & Truong, 2021). Writing elements such as register, lexis, and style are taken as representatives of institutional and personal purposes of writers (S. Yu et al., 2020). The idea that teachers should give students clear, systemic explanations of how language functions in social circumstances lies at the core of the *genre-based approach* (Ngubane et al., 2020). Therefore, teachers should encourage students to investigate and utilize texts from various genres to become proficient communicators in various contexts for a range of audiences (Ngubane et al., 2020). The need to combine social, cognitive, and linguistic focuses in writing has led to a new approach. As a result of a discussion between researchers, the *process-genre approach* taken as a synthesis of the abovementioned approaches has been put forward (Badger & White, 2000). According to Badger and White (2000), the key component of this process idea is that the writing class understands that writing in genre approach requires knowledge about language which genre and product approach also necessitates, awareness of the context with regard to purpose of writing as in genre approaches, and ability to use language as in process approach. In the *process-genre approach*, teachers present learners with sample writing texts and ask them to first consider real-life situations, audience and then practice language use in a particular genre (Thanh Tuyen et al., 2016). Hyland (2003) also put an emphasis on a process in which writers learn and internalize a variety of genres instead of paying attention only to a particular variant of genre or an end product. Once the social context has been established, students use techniques like planning, drafting, and proofreading to draw on their understanding of language and structure that are suitable for that particular genre (Huang & Jun Zhang, 2019). In the *process-genre approach*, linguistic resources are not limited to teachers, peers, and sample essays; content knowledge and rhetorical inputs can also be potential resources (Huang & Jun Zhang, 2019). On the other hand, the *reader-dominated approach*, also referred to as the English for Academic Purposes approach, highlights the importance of both form and content (Özdemir, 2015). The aim of the *reader-dominated approach* is to integrate into the academic discourse community, with a focus on the expectations of academic readers beyond language classrooms (Raimes, 1991b). Learners consider the anticipated expectations of their audience, carefully selecting and structuring their essays to align with these expectations (Özdemir, 2015). The expectations of readers are significant in a

reader-dominated approach, but academic writing is not the only context (Aygun & Aydin, 2016). With the goal of meeting the needs and expectations of the academic community, teachers use *reader-dominated approach* to teach theme-based lessons in which they introduce different academic discourse genre -such as compare and contrast, cause and effect, problem analysis, and persuasion- where form and content are both emphasized (Raimes, 1991a). Within the parameters of this approach, students are motivated and given time to write drafts, revise them, and receive feedback from peers and teachers (Raimes, 1991a). Meaning, creativity, and different outlines became the new concerns as writing ability rather than process and accuracy became the focus (Raimes, 1991b).

2.1.2. Writing Strategies

In the EFL context, *writing strategies* have been defined in many ways. Flower (1998) defines *writing strategies* as choices made by the writer to address issues that arise in the process of writing. Creswell (2000) and Graham (2006) argue that *writing strategies* have been offered as a tool to write more effectively and overcome writing problems while writing. According to He et al. (2011), *writing strategies* are behaviors that writers adopt to fulfill their tasks. As for Raimes (2009), *writing strategies* are taken as tools used by learners to control and improve their writing in three main processes: planning, drafting, and revising. Li et al., (2022) discuss that *writing strategies* are essential to writing instruction and greatly impact students' learning outcomes and writing competencies. Oxford (1990) classifies *writing strategies* into two parts: direct strategies which entail memory, cognitive, and compensation strategies, and indirect strategies which include social, affective, and metacognitive strategies. On the other hand, O'Malley and Chamot (1990) divide *writing strategies* into three categories: social/affective, cognitive, and metacognitive strategies. While metacognitive strategies are higher-order thinking skills that encompass planning for monitoring and assessing the outcome, cognitive strategies, such as rehearsal and deduction, work directly on incoming information and regulate it to enhance learning (Yapici & Bada, 2004). In addition, social/affective strategies such as peer cooperation

are a broad category that includes cognitive regulations of emotions or interaction with people (Yapici & Bada, 2004).

There have been two types of writing strategy approaches in the EFL context: "narrow" and "broad" (Manchon, 2001; Manchon et al., 2007). Narrow models define writing strategies as particular actions a writer performs during the writing process (Manchon, 2001) to be able to include tasks such as organizing, planning, translating, reviewing, and revising (Lei, 2008). On the other hand, broad models argue that writing strategies directly or indirectly are equated with any action related to the writing process which is generally understood to include methods through which writers position themselves in relation to roles and expectations specific to a community (Lei, 2016). While the narrow model includes the *cognitive approach*, broad models entail *sociocognitive* and *socio-cultural approaches*. The *cognitive learning theory* is concerned with the learning processes, which may imply that learners can construct meaning about writing processes in the context of EFL writing (Adugna, 2019). According to this theory, writing has an impact on students' thinking during the stages of organizing, planning, writing, and revising (Cheung et al., 2021). The *cognitive theory* is predicated on four main points: (1) writers go through a series of unique thought processes when creating written work; (2) between these processes, there is a higher-order organization system; (3) goal-setting is necessary for composition; (4) and writers set both macro and micro goals in order to finish the writing task (Flower & Hayes, 1981). According to Chandrasegaran (2013), socio-cognitive is a concept which combines cognitive processes and aspects of social-cultural perspectives such as genre-based approaches to writing instruction. In other words, the *socio-cognitive approach* in EFL writing is grounded in a combination of cognitive theories and genre and emphasizes the readers, the purpose of writing, and the context (Cheung et al., 2021). The primary characteristic of writing classes is the clear explanation and instruction of the thinking processes that underlie the performance of the customs of the genre that students are required to write (Chandrasegaran, 2013). According to the *socio-cultural approach* in EFL writing strategies, cognition and environment are dialectically related (Vygotsky, 1978). The person-in-context approach is better at revealing the connection between social environment and cognitive development than the traditional cognitive approach, which highlights cognition (Lei, 2016). Prior (2006) states that writing has

always been seen as an individual task**,** but with the rise of *socio-cultural theory*, writing is increasingly being encouraged as a cooperative, social activity where inexperienced writers can learn from scaffolders. In addition, writing encompasses a range of factors outside of the classroom and current setting, such as past knowledge, linguistic comprehension, motivation, and technological influences (Hodges, 2017). The writers practice writing skills within a context that they interact with (Lantolf & Thorne, 2006).

2.1.3. Metacognition

There have been various definitions regarding *metacognition* in the EFL context. Flavell (1979) asserts that *metacognition* is a conscious process of thinking about thinking. Through interactions of metacognitive knowledge, strategies, and experiences, cognition can be observed (Flavell, 1979). Similarly, Anderson (2012) states that *metacognition* is thinking about cognition. Agili and Prabhashini (2021) take *metacognition* as a cognitive process that helps students acquire integrated knowledge. Efklides (2008) defines *metacognition* as a subset of cognition that operates at a higher level and is linked to the object world by means of metacognitive monitoring and control. Schraw (1998) classifies *metacognition* into two main categories: knowledge of cognition which includes declarative (what a learner knows), procedural (how knowledge is used), and conditional knowledge (when and why specific strategies are used), and regulation of cognition which encompasses planning, monitoring, and evaluating. On the other hand, Cross and Paris (1988) divide mental activities in *metacognition* into two classifications: self-assessed knowledge in cognitive processes and self-control about one's own thinking.

Flavell's Metacognitive Model: Regarding metacognition in the EFL context, several models of metacognition have been put forward. Flavell (1979) proposed four main models of metacognition: metacognitive knowledge, metacognitive experiences, tasks (goals), and strategies (actions). Metacognitive knowledge is the understanding of the world we retain as cognitive beings (Haque, 2018). This knowledge is made up of concepts and beliefs about oneself, tasks, objectives, strategies, or mental processes (Flavell, 1979). Metacognitive knowledge is essentially declarative knowledge

consisting of factual information (Efklides, 2006; M. A. J. Veenman, 2011, 2012). However, it might also be procedural (if the individual knows "how" to employ learning strategies), and conditional (if the person knows "when" and "why" to implement learning procedures) (Schraw & Dennison, 1994). Flavell classified three factors of metacognitive knowledge: person, task, and strategy variables. The person variable encompasses one's knowledge and beliefs about himself/herself as a learner, and one's opinions about the thought process of others (Flavell, 1979). Task variable includes information that an individual can learn about a suggested task, and the strategy variable is related to choosing which cognitive processes to employ to achieve goals and sub-goals (Flavell, 1979). On the other hand, metacognitive experiences are related to intellectual endeavors and conscious and affective experiences (Flavell, 1979). These experiences consist of what an individual aware of and how an individual feels when encountering a task or processing it (Efklides, 2008). Metacognitive experiences monitor the strategy being used, evaluate its effectiveness, and report back on the results to the behavioral control process (Moores et al., 2006). Tasks (goals) represent the aims of a cognitive enterprise, and strategies (actions) are the ways in which those purposes are met (Haque, 2018).

Nelson and Naren Metacognitive Model: Nelson and Naren put forward a "metacognitive model of consciousness" (Nelson, 1996; Nelson & Narens, 1990, 1992).

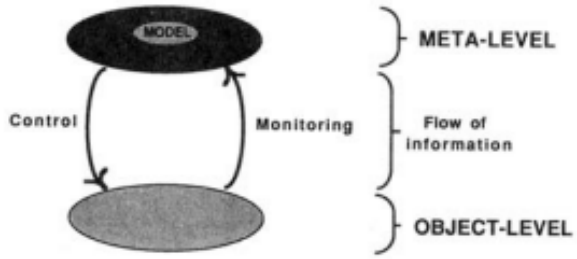


Figure 1. *Illustration of the Hierarchical Organization of Meta-Level and Object-Level*

This model has three key features: (1) there are cognitive processes which are divided into two levels - the object-level and the meta-level; (2) the meta-level includes the object-level's dynamic model; (3) the information flow between these two levels consists of two tools: monitoring and control (Hacker, 2018). The object-level stores a

person's thoughts, actions, memories, and situational descriptions, while the meta-level oversees and manages the object-level (Son & Kornell, 2005). Conscious processes are not always involved in the meta-level control processes (Timmermans et al., 2012; Levinsson, 2008; M. V. J. Veenman et al., 2006). However, evidence for the potential presence of unconscious meta-levels would support the notion that multiple meta-levels are conceivable (Csíkos, 2022).

Efklides' Metacognitive Model: Efklides (2008) proposes a metacognition model comprising metacognitive knowledge, experience, and metacognitive skills. In this model, metacognitive knowledge is knowledge about cognition situated in long-term memory (Flavell, 1979). Since it offers a framework for comprehending one's own and other people's cognition, metacognitive knowledge is crucial for guiding the interpretation of situational data and enabling the making of appropriate control decisions (Nelson et al., 1998). Metacognitive experience is related to the affective side of metacognition (Efklides, 2006). It is pertinent to awareness and feelings towards a task (Efklides, 2008). Therefore, it encompasses judgments and feelings on a task in the learning process (Efklides, 2001; Flavell, 1979). On the other hand, the intentional application of techniques (i.e., procedural knowledge) to regulate cognition is known as metacognitive skills (Efklides, 2008). This skill involves strategies for planning, orientation, regulation of cognition, monitoring, and assessing the outcome (M. Veenman & Elshout, 1999). From this perspective, it is different from the metacognitive model proposed by Nelson and Narens (Bogar, 2018). According to this model, an individual's responsibilities, objectives, and strategies are contained in their metacognitive information, and metacognitive experiences help learners become more conscious of how and when to use the information (Bogar, 2018).

Anderson's Metacognitive Model: According to Anderson, metacognition is the synthesis of different participatory thinking and reflective processes, and it includes (1) organizing and preparing for learning, (2) choosing and applying learning strategies; (3) observing the application of strategies, (4) coordinating different strategies, and (5) assessing the application of strategies and learning (Anderson, 2002). Specifically, in the first step, students consider their goals and how they plan to achieve them in a specific context, and the second element is based on students' thinking and conscious decision-making (Nosratinia et al., 2015). Third component, which mainly focuses on

ensuring that strategies are applied correctly by reviewing their application, enables learners to take responsibility for their learning (Nosratinia et al., 2015). The fourth element pertains to recognizing the need to use multiple strategies for specific materials suggesting the ability to manage multiple strategies at the same time, which is closely related to the stage before (Öz, 2005). The last step necessitates the person to consider and assess the efficacy of their actions (Öz, 2005). According to Anderson, this is the stage where the entire cycle is appraised (Anderson, 2002).

2.1.4. Metacognitive Writing Strategies

Metacognitive strategies have been argued from the perspective of writing in the EFL context. Schmidt (2001) defines *metacognitive writing strategies* as intentional actions employed by learners to monitor writing improvement. These writing strategies are described as logical and structured, pertaining to the mental control level (Hayes, 2000). Since *metacognitive strategies* are hidden, teachers' involvement in this kind of instruction is essential because they cannot predict each student's development in the same way that they can for other skills (Alfaifi, 2021). According to Stewart et al. (2015), students who receive metacognitive writing instruction will be better able to comprehend and modify their writing processes to meet the needs of the assignment. Rubin and Chisnell (2008) assert that *metacognitive writing strategies* are directly related to a writing task and encompass three basic types: planning, evaluating, and monitoring. Similarly, Goctu (2017) claims that *metacognitive writing strategies* entail planning, monitoring, and self-evaluation stages. He notes that the writer controls, directs, and regulates their production through these stages.

Self-Regulation Theory: *Self-regulation* pertains to internally driven thoughts, feelings, and actions that are focused on achieving objectives (Zimmerman, 2000). The extent of a student's *self-regulation* is determined by their metacognitive, motivational, and behavioral involvement in the learning process (Zimmerman, 1989b). The *self-regulation* of learning requires the purposeful use of distinct processes customized to each learning task. These processes comprise establishing particular proximal goals, employing effective strategies, selectively monitoring performance for indications of progress, reorganizing the physical and social environment to align with goals,

managing time efficienlty, self-evaluation methods, assigning causality to outcomes, and adapting future approaches (Zimmerman, 2002). The self-regulated learning process is structured into three phases: the performance phase, the self-reflection phase, and forethought phase (Zimmerman, 2000; Zimmerman & Schunk, Dale, 2004). In the initial stage, a person employs a certain approach that based on reflections on past performances (Çetin, 2017). The forethought phase encompasses future-oriented practices such as identifying motive and goal-setting, while self-reflection involves a writer's methods for identifying, assessing, and responding to new successes or issues (Roderick, 2019). Zimmerman and Risemberg's (1997) social cognitive model of writing further illustrates self-regulatory processes, categorizing them into environmental (involving contextual changes to support writing), behavioral (taking action), and personal strategies (cognitive or affective strategies), which interact to provide a feedback loop that informs the effectiveness of strategies in achieving specific outcomes (Varier et al., 2020).

Information Processing Theory: *Information Processing Theory* is applied in language learning environments to help students bridge the gap between their declarative knowledge and new procedural knowledge. From an information-processing perspective, early-stage learning is characterized by the application of controlled processes, with focal attention on task requirements (McLaughlin et al., 2006). Attention demands decrease, and automatic processes grow as the learner gains familiarity with the situation, which in turn enables other controlled operations to be performed alongside automatic processes, contributing to enhanced performance (McLaughlin et al., 2006). The information processing model of learning delves into the 'how' of learning, focusing on how humans perceive, comprehend, and remember information from their environment contrary to Behaviorism attempting to look at “what” of learning. In this context, a "metacognitive strategy" is an executive function that refers to how students organize, monitor, and assess their learning tasks. These techniques include making plans for learning, reflecting on the learning process, monitoring production or comprehension, and assessing learning outcomes after an activity is finished.

2.1.5. Artificial Intelligence

There have been various definitions of *artificial intelligence*. John McCarthy first used the term in 1955 when he and his associates prepared a proposal for the 1956 Dartmouth Summer Research Project on Artificial Intelligence (Sumakul et al., 2022). In the submission, AI was defined as machines that utilize language, create abstractions and concepts, solve problems that are currently only solved by humans, and develop themselves (McCarthy et al., 2006). Nilsson (2014) defines AI as an integration of various methods that support or enhance behaviors or models that can be characterized as rational, mental, or intelligent such as acquiring, judging, and language comprehension (Quesada et al., 2017). It is also defined as a technology that imitates human behavior and intelligence (Anagnostopoulou et al., 2020; Maneehaet & Wannapiroon, 2019; Tang & Hai, 2021; J. Yu, 2021). In addition, AI is characterized as a broad field of automated decision-making that simulates human behavior without the need for human intervention (Tapalova & Zhiyenbayeva, 2022). As for Nabiyev (2012), *Artificial Intelligence* is the ability of a computer to carry out tasks related to processes that necessitate logic, such as perceiving, interpreting, generalizing, learning from prior experiences, and solving problems as humans do.

Activity Theory:

Activity Theory stems from Vygotsky's (1978) triad model consisting of subject (doer of an action), object (specific result or accomplishment of an action), and tools (instruments used to carry out an action) for psychological development. Engeström (2001) extended this model to include rules, community, and division of labor as contextual elements (see Figure 2).

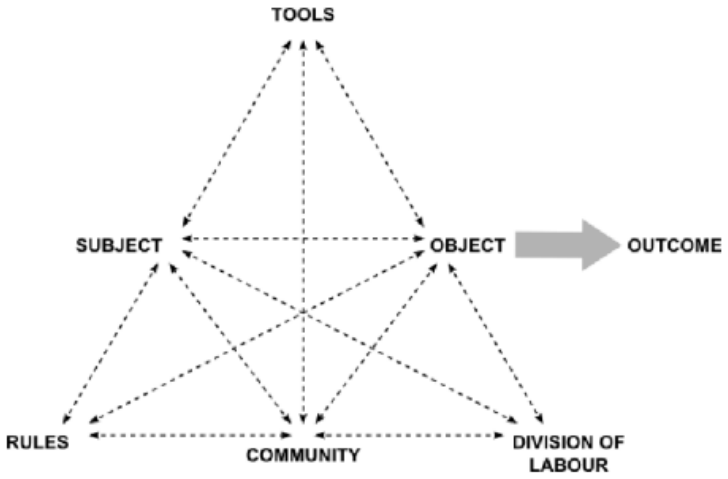


Figure 2. *Engeström's (Engeström, 2001) Activity Theory Diagram*

The rules determine the norms that the subject abides by and how participants cooperate. The division of labor involves organizing the tasks and social roles. On the other hand, the community is a social group that shares a common objective (Zheng et al., 2020). *Activity Theory* and *sociocultural theory* are related in that they consider teaching, student participation, and evaluation to be components of a social construct (Alshakhi, 2021). In the *Activity Theory* framework, the components are interrelated, affecting each other directly or indirectly (Kim & Kim, 2022). It views language learning as a goal-directed endeavor mediated by numerous variables (Engeström, 2000, 2001). These elements may be tangible tools (such as a computer, pen, and paper) or symbolic objects (such as language and moral standards) that moderate the quality of the interaction between the person performing the activity and the environment (Lantolf & Thorne, 2006; Vygotsky, 1978). Three fundamental concepts underpin *Activity Theory* (Engeström, 2001; Kaptelinin et al., 1995): (1) object-orientedness, which holds that all human activity is focused on objects or goals; (2) tool-mediation, emphasizing that an agent uses a tangible or conceptual tool to achieve the goal; and (3) continuous development, implying that an activity system is dynamically changing and full of contradiction. A given activity system can be defined and analyzed using this approach, which can also be used to identify potential issues and offer a framework for employing innovations (Thorne, 2004).

Constructivism: *Constructivism* is founded on both *cognitive* and *social Constructivism* (Kaufman, 2004; Schcolnik et al., 2006). *Cognitive Constructivism*, based on Piaget's work (Piaget, 1954, 1955, 1970; Piaget & Inhelder, 1971), illuminates

cognitive development and the way individuals construct knowledge, while *social Constructivism*, grounded in Vygotsky's work, emphasizes social construction of knowledge (Vygotsky, 1986). According to the constructivist learning theory, two main ideas form individual construction of knowledge: assimilation and accommodation (Shen, 2013). Assimilation causes individuals to integrate new experiences with the old ones. Therefore, it leads to the development of new perspectives, the reexamination of prior misconceptions, and ultimately, a change in perception (Shen, 2013). On the other hand, accommodation leads to reinterpreting the outside world and novel experiences within the confines of individuals' existing mental framework (Shen, 2013). Within the perspective of *social Constructivism*, Vygotsky's Zone of Proximal Development (ZPD) is regarded as the distance between the individual's actual ability and the potential ability under adult guidance or collaboration with more capable peers (Vygotsky, 1978). With the assistance of a guide, the ZPD can provide students with sufficient interactive opportunities for their growth through the zone, establishing their intellectual capacities in the learning environment (R. L. Oxford, 1997). The difference between these two notions is that whereas social constructivists underscore the critical role of learners' interactions with one another and the environment in learning, cognitive constructivists emphasize the significance of the mind in learning (Schcolnik et al., 2006). Consequently, Piaget's primary goal was to shed light on how learners' cognitive structures develop, although he did not decline the importance of social interaction. On the other hand, Vygotsky concentrated on how social interaction affected learning, but he did not reject the cognitive role (Fosnot, 1996). According to Laney (1990), computers can help people develop higher order thinking abilities such as identifying issues, evaluating information, addressing issues, and reaching conclusions. With its reliance on incorporating technology into the curriculum, the computer can be used information gathering, inquiry, and collaboration (Rice & Wilson, 1999).

Adaptive Learning Theory: As an educational approach, *adaptive learning* makes use of computer algorithms to structure the interactive learning process and customize it to each student's unique needs (Kolchenko, 2018). Specifically, it caters to the individual needs of learners by tailoring the learning materials to their level of knowledge and personalizing the learning process when there is no direct access to a teacher (Harati et al., 2021). Therefore, *adaptive learning* is considered a personalized

education component (Kolchenko, 2018). Every *adaptive learning* system has a similar "closed loop" core structure, which collects learner data and uses it to forecast progress, suggest activities, and offer customized feedback (S. Wang et al., 2023). Taken as the next generation of online education, with these affordances, *adaptive learning* offers a customized curriculum as an alternative to the one-size-fits-all approach (Harati et al., 2021). According to Li et al. (2010), the constructivist theory and the theory of cognitive flexibility serve as the foundation for adaptive learning. It is considered as an active learning approach since students can track their progress and select the learning materials and techniques that best meet their needs (Gohar & El-Ghool, 2016).

Connectivism: *Connectivism* was first introduced in 2004 as a new theory that deals with learning in intricate, social, and networked contexts. (Siemens & Conole, 2011) It has developed into an educational theory that highlights how technology affects the EFL context in particular as well as education more broadly (Hussein, 2021). Siemens (2005) and Downes (2008) put forth *Connectivism* as a new theory of learning in response to the shifts brought about by the digital era. Through these connections, people can easily obtain trustworthy information from millions of sources, which they can then copy, reproduce, and distribute among their social networks, along with extracting irrelevant and incorrect information (Kropf, 2013). Based on their learning objectives and needs, self-directed, autonomous, and self-regulatory learners on networks design their learning environments (Bozkurt & Ataizi, 2020). According to Siemens (2005), *Connectivism* emerged as a continuation of behaviorism, cognitivism, and Constructivism, asserting the limitations of these three theories: (1) instead of taking learning as a social activity, they emphasize the individuality of learning; (2) they overlook learning realized outside people such as technology; (3) and they mainly focus on the actual process of learning externalizing value judgments formed in information-rich environments.

The Cognitive Load Theory: The *Cognitive Load Theory* was first introduced in the 1980s, and since the 1990s, scholars from various fields have worked to develop it (Schnotz & Kürschner, 2007). It sheds light on how students absorb knowledge and posits that educational materials should be developed to maximize learning (Sweller et al., 1998). The theory comprises three cognitive load types: intrinsic, extraneous, and germane (Van Merrienboer & Ayres, 2005).

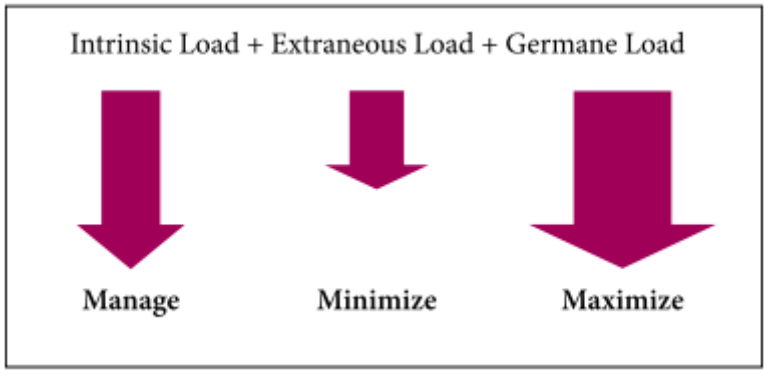


Figure 3. *Illustration of cognitive loads in Cognitive Load Theory (Frumuselu, 2018)*

Intrinsic load comprises components that are vital to learning, and extraneous load consists of characteristics that result from instructional procedures and are not required for learning (Toboula, 2023). On the other hand, the germane cognitive load is known as the mental effort that students use to process new information and incorporate it into their preexisting knowledge systems (Frumuselu, 2018). According to the theory, effective learning outcomes depend on cognitive capacity in working memory (Van Merrienboer & Sweller, 2005). For example, a learner who has substantial prior knowledge of the task stored in long-term memory -also referred to as an advanced learner- will face less cognitive load than a learner with little prior knowledge (Janssen & Kirschner, 2020). However, if an advanced learner is given instruction that combines new and redundant material, learning will be hindered (Janssen & Kirschner, 2020). Toboula (2023) discusses that learning can be done more effectively and efficiently by using the theory to guide the development of AI-powered language learning systems.

The developing field of AI can offer opportunities for improving metacognitive writing strategies in the context of EFL learning. Machine learning technology has enhanced the sophistication of AI tools, facilitating the provision of personalized feedback; therefore, AI-powered systems promote the growth of learners' cognitive capacities and autonomy by providing both cognitive and metacognitive feedback (E. Yu, 2023). Since these tools act as mediating artifacts, there can be a link between the Activity Theory principle of tools mediating human activity and AI-powered writing assistance systems. Examination of the impact of AI tools on the writing process through this lens can provide valuable insights into their potential to enhance metacognitive strategies and develop successful writing techniques. On the other hand,

AI is considered a noteworthy application and a contemporary trend that expands on Vygotsky's notion of ZPD to encompass learning experiences beyond the learners' immediate environment such as interacting on social networking sites and engaging with software applications (Abdalkader, 2023). Therefore, applications of AI learning are closely related to connectivism theory (Abdalkader, 2023) which addresses learning within complex, social, and interconnected environments (Siemens & Conole, 2011). AI provides personalized learning opportunities, suggesting the potential for students to learn independently without direct teacher instruction (Sumakul et al., 2022). This aligns with the SRT, which puts an emphasis on learners actively overseeing and directing their learning processes. Consequently, AI-powered solutions may help students develop metacognitive strategies, which will enhance their EFL writing skills, by serving them the resources and assistance they need to track their development, identify areas of their weakness, and modify their writing techniques accordingly.

2.2.Research Results

2.2.1. Writing Strategies

In the broadest sense, research on writing strategies mainly focuses on emotional aspects, educational settings, and proficiency levels. For instance, Hu (2022) investigated how Chinese EFL learners used writing strategies, specifically planning, executing, monitoring, and revising, in writing. It also examined the pleasure and anxiety that Chinese EFL students experienced, as well as the relationship between the emotional elements and the use of writing strategies. The study utilized a mixed-method approach to gather both qualitative and quantitative data. The Foreign Language Writing Strategy Survey Questionnaire (FLWSSQ) and the Foreign Language Writing Emotion Survey Questionnaire (FLWESQ) were administered to a total of 54 Chinese undergraduate students. With the selected participants, a semi-structured interview was conducted. The findings indicated that learners had a moderate degree of anxiety and enjoyment of writing and a moderate frequency of using writing strategies. Additionally, a positive correlation between participants' enjoyment of writing and their use of writing strategies was found. Similarly, Ming-Hao and Yan (2021) aimed to reveal the writing anxiety of Chinese English learners and examine how it relates to

their writing strategies and accomplishments. Ninety Chinese senior high students completed writing strategies and writing anxiety questionnaires. The findings indicated that students' levels of anxiety were moderate. There was a significant negative correlation between learners' writing anxiety and their writing strategies. Students with high anxiety levels tended to employ English writing strategies infrequently, while those with low anxiety levels frequently used them when completing a writing task. Additionally, the results show a significant negative correlation between writing anxiety and writing achievements. Asmari (2013) aimed to investigate the connections between EFL university students' use of writing strategies and writing anxiety, the relationship between students' writing achievement and the use of writing strategies, and the variations in writing strategy use between students with high and low writing anxiety. Data were collected from a sample of 198 EFL-major university students. The participants completed writing anxiety and writing strategy questionnaires and selected students were interviewed. The study's findings cast doubt on the widely held belief that the writing apprehension observed in Saudi undergraduates is directly related to their writing achievement. The findings showed that students who experienced less writing anxiety used writing strategies more frequently than those who experienced more anxiety. Also, there was a significant negative relationship between students' writing apprehension and writing achievement. On the other hand, as educational settings play an important role in the EFL contexts, researchers investigated their effects on writing strategies. For example, Lee (2020) investigated the English writing strategies employed by Korean university students, specifically focusing on the connection between their experiences of studying abroad and their use of English writing strategies. Ten Korean university students studying English as a foreign language were involved in this study. Group A consisted of five students who had studied abroad, whereas Group B consisted of five students who had never studied abroad. They wrote five essays in English and one personal narrative reflecting on their experience with English writing. Their writing strategies were gathered through a range of methods, including questionnaires, interviews, process logs, and stimulated recalls. The findings indicated that English writing strategies used by Korean university students were impacted by their study abroad experience. Chen (2022) investigated the impact of incorporating writing strategies into EFL writing instruction on learners' use of strategy and writing

achievement. The study included two classes of EFL adult students. While the experimental group was given writing strategies training, the control group was not given explicit guidance. In this experimental study, writing strategy questionnaires and writing performance tests were involved. The results revealed that significantly positive differences were found in learners' writing strategies and writing performance. The study concluded that writing strategy training can influence learners' strategy awareness, writing strategy use, and writing proficiency positively. Zhang et. al. (2019) investigated the effects of utilizing English reading and writing strategies training to develop low-level students' writing performance. In this quasi-experimental study, a total of 70 non-English major undergraduate learners were involved. While 35 students took the intervention of English reading and writing strategies over a 24-lesson period in 6 weeks, the rest of the participants did not take the strategy training. The one-way ANCOVA findings revealed that the students receiving reading and writing strategies training had a significant development in these skills. Last, since there might be a relationship between learners' writing strategies and their proficiency level, research also focuses on this issue. For instance, Fajrina et. al. (2021) examined writing strategies employed by 135 Indonesian EFL students with varying levels of English proficiency and the correlation between their English proficiency, as measured by their receptive vocabulary knowledge, and the overall quality of the written texts they generate. Writing strategies questionnaire -to reveal learners' strategies in the pre-writing, drafting, and revising stages- and Vocabulary Size Test -to measure English proficiency- were used. The participants were also required to write an essay. The findings indicated that the majority of the students used 15 of the 38 strategies mentioned in the questionnaire. Additionally, there was no significant differences in the strategies selected by students with high and low levels of English proficiency. Bai et. al. (2014) investigated the correlation between the use of writing strategies and English proficiency in Singapore primary schools. The study included 1,618 students from two nearby primary schools. ANOVA analyses were conducted to assess the association between the participants' use of writing strategies and their level of English language proficiency. The results demonstrated that students in Singapore's upper primary schools employed a variety of writing strategies with a moderate frequency. The participants' English language scores exhibited significant correlations with their

planning, text generation, revising, monitoring and evaluating, as well as resource management strategies.

2.2.2. Metacognitive Writing Strategies

Various studies emphasize that metacognitive writing strategies are influenced by factors such as online environments and learner diversity. For instance, Khosravi (2023) investigated the impact of utilizing metacognitive writing strategies through flipped classrooms on the academic performance, anxiety levels, and self-efficacy in writing of Iranian EFL learners. This experimental study indicated that employing metacognitive writing strategies in flipped classrooms significantly increased students' writing self-efficacy and reduced their writing anxiety. Similarly, Judy Shih and Huang (2022) examined the advancement of metacognitive knowledge and the utilization of metacognitive strategies among EFL students in a university flipped classroom, in contrast to a traditional classroom setting. Eight students participated in two semi-structured interviews. The results revealed that, within the flipped classroom environment, there were qualitative shifts in learners' metacognitive knowledge throughout the semester. Likewise, the flipped classroom design promoted a more engaged and profound application of metacognitive strategies. Thus, it was concluded that the pedagogical design of the class plays a crucial role in the metacognitive advancement of students in the flipped classroom. Additionally, Liu et al. (2022) employed a mixed-methods approach with a sequential explanatory design to investigate how the flipped classroom model influences EFL learners' writing metacognitive strategies and writing skills. The findings indicated that both flipped and traditional classes led to enhancements in EFL learners' metacognitive writing strategies, writing performance, content, and organization. However, one-way ANCOVA analyses demonstrated that the flipped class surpassed the non-flipped class in these areas. Fitrianti and Susanti (2021) aimed to explore the relationship between students' application of metacognitive strategies and the quality of their writing in the context of online learning. The participants were 35 students majoring in English from universities in Indonesia. Results revealed that students demonstrated greater responsibility and autonomy in managing their learning processes. Consequently, a moderate positive correlation was observed between students' metacognitive strategies

and writing quality in online learning. Research on metacognitive writing strategies also focuses on learner diversity such as proficiency level, learning style, and gender. For example, Qin and Zhang (2019) examined the correlation between reported metacognitive strategy knowledge and English writing performance among EFL writers in multimedia environments within a Chinese tertiary context. Data were gathered from 126 participants using a self-report questionnaire to assess metacognitive strategy knowledge and EFL writing scores. The findings revealed that compared to the low EFL-proficiency group, the high EFL-proficiency group reported having significantly more metacognitive knowledge about the three clusters of metacognitive strategies (planning, monitoring, and evaluating). Similarly, Tsai (2016) aimed to investigate the metacognitive performance of proficient and less proficient EFL writers within an integrated setting. The data included students' self-monitoring annotations and reflective journal entries. The findings demonstrated that less proficient writers mainly focused on lower-order aspects in their writing process, showing less selective and less productive experiences in strategy use. In contrast, proficient EFL writers focused mostly on higher-order concerns, demonstrating a greater focus on captivating readers with their texts. On the other hand, Nosratinia and Adibifar (2014) investigated how metacognitive strategy instruction has an impact on the writing performance of intermediate learners with varying degrees of field-dependence and field-independence. There were 62 participants in this experimental study. The findings showed that the experimental group demonstrated statistically significant progress in their post-test results. Furthermore, in the post-test, field-independent students performed better than those with a field-dependent style. Al Moqbali et al. (2020) examined the extent to which Omani EFL grade twelve students employ metacognitive writing strategies. Additionally, it investigated the gender differences in the application of these strategies and the relationship between their metacognitive strategies and writing performances. The findings showed that students frequently employ the three categories of metacognitive writing strategies: planning, monitoring, and evaluating. The results, however, did not show a connection between students' language proficiency and their use of the three categories of metacognitive strategies. Compared to male students, female students were inclined to use metacognitive strategies.

2.2.3. The Use of AI-Powered Writing Assistance Systems in EFL Writing

The results of a limited number of studies on the use of AI-powered writing assistance systems indicate that these systems have the potential to improve learners' writing and students have positive perceptions towards using them in the EFL context. For example, Ebadi et. al. (2023) investigated the impact of the automated writing evaluation software Grammarly on the occurrence of article errors in EFL writing among Iranian students. Ninety students majoring in English language and literature were chosen using convenience sampling. They were separated into three groups: (1) experimental group 1 receiving Grammarly and teacher feedback, (2) experimental group 2 receiving Grammarly feedback, and (3) control group receiving teacher feedback. To analyze the data, inferential and descriptive statistics were used in addition to one-way ANOVA, frequency analysis, and thematic analysis. Findings revealed that, in the post-test, the Grammarly and teacher feedback groups performed better than the other groups. The study suggested that EFL instructors should use online grammar checkers as writing aids in their EFL writing classes. Fauziah and Minarti (2023) aimed to shed light on the application of AI-assisted writing applications to enhance academic writing abilities and provide guidelines for using these tools in EFL academic writing. Data were collected by examining writing tasks and conducting interviews regarding the integration of Artificial Intelligence in academic writing. The study showed that using AI-assisted applications is helpful for students. These applications could assist students with paragraph construction, structure correction, and paragraph paraphrasing. Thanks to their easiness and various features, AI-assisted applications could be used as a new model to improve students' writing skills. However, it was stated that as AI-assisted writing applications are merely tools, writing academic articles still requires creativity and logical reasoning. Nazari et. al. (2021) set out to determine how well an AI-powered writing tool worked in a group setting for second-year postgraduate English language learners in EFL academic writing. Students were randomly assigned to either the AI-equipped group or the non-equipped AI group. The findings indicated that, when compared to the non-equipped AI group, students in the AI intervention group showed statistically significant enhancements in scores for behavioral engagement, emotional engagement, cognitive engagement, writing self-

efficacy, positive emotions, and negative emotions at the post-intervention stage. Based on formative feedback and assessment, the findings implied that AI-powered writing tools could be a useful tool to support non-native postgraduate students in English academic writing in terms of learning behavior and attitudinal technology acceptance. Some research focused on only the perceptions of students and teachers on using AI-powered writing assistance systems in EFL writing. For instance, Marzuki et. al. (2023) investigated various AI writing tools and evaluated their impact on student writing from the perspective of EFL teachers, specifically in terms of organization and content. The study used a qualitative approach with a case study design. Semi-structured interviews were used to gather data on the variety of AI writing tools available and how they affect students' writing. The research provided insight into using AI writing tools in EFL classrooms, gathering data from four EFL learners at three different Indonesian universities. These teachers agreed that AI writing tools had a positive impact on the caliber of writing produced by their students, especially regarding content and organization. Therefore, it was concluded that the utilization of AI writing tools can improve writing quality. Ginting et. al. (2023) explored EFL students' perspectives on AI as a writing tool for their final project. Using a convenience sample method, the study included 50 eighth-semester students from public and private colleges in North Sumatra, Indonesia. Data were gathered using questionnaires and interviews. The findings suggested that students are in favor of using artificial intelligence when writing their final project. The study indicated that although AI is somewhat scarce, this did not lessen their positive opinion of the necessity of using AI as a writing tool. It was concluded that the effectiveness and quality of students' written work were influenced by their favorable opinion of using artificial intelligence in their final assignments. Similarly, Burkhard (2022) collected data from 365 freshmen learners to reveal their perceptions towards AI-enhanced writing tools. The k-means clustering method was used to distinguish different student types in relation to AI-powered writing tools. The study concluded that students had different perceptions of using these tools. Some students might use them carelessly, which could result in (un)voluntary plagiarism while some might not use writing tools at all, which could be due to factors such as a general lack of meaningful learning strategies and skepticism. The study

concluded that tailored instructional strategies may be useful to encourage or advise caution when using these tools, considering the diverse profiles of students.

2.3.Conclusion

The examination of relevant literature emphasizes the significant impact of writing strategies in the EFL context. Studies suggest that various factors play a role in influencing these strategies such as emotional aspects, educational settings, and proficiency levels. Concerning emotional aspects which involve anxiety and pleasure, research demonstrates that learners who have a low level of writing anxiety tend to use writing strategies more compared to those with a high level of writing anxiety. In addition, learners who have an enjoyment of writing are inclined to employ writing strategies more often. Regarding educational settings, research reveals that EFL learners who have experiences of studying abroad are prone to utilizing writing strategies more, and writing strategy instructions in the EFL classroom have a positive impact on writing strategies. Pertaining to the proficiency levels of learners, while some research shows that learners with high levels of proficiency apply writing strategies frequently, others claim that there is no significant correlation between learners' proficiency level and their use of writing strategies. Several studies focus on metacognitive writing strategies and reveal factors affecting them such as online environments and learner diversity. Research demonstrates that using metacognitive writing strategies in flipped classrooms has the tendency to increase writing self-efficacy and reduce writing anxiety promoting a more engaged environment. In addition, employing metacognitive writing strategies in online learning gives greater responsibility and autonomy to learners and positively influences their metacognitive writing strategies as well as writing quality. Studies also show that learner diversity plays an important role in using metacognitive writing strategies in the EFL context. It is revealed that students with high proficiency levels focus more on higher-order aspects in writing while low proficiency level students focus on lower-order aspects. Other elements such as field-independency/field-dependency and gender affect learners' use of metacognitive writing strategies in that field-independent learners benefit more from metacognitive strategy instruction in contrast to field-dependent learners and female students tend to employ these strategies

more compared to male students. However, only a few studies focus on the use of AI-powered writing assistance systems in EFL writing. Research demonstrates that these systems can enhance students' writing and that students feel favorably about using them in an EFL setting. It has been emphasized that these tools can help learners with paragraph paraphrasing, construction, and correction, which lead them to improve their writing. Additionally, they can enhance emotional engagement, writing self-efficacy, cognitive engagement, and behavioral engagement of learners.

3. METHODOLOGY

This section outlines the methodology and procedures utilized in the study. First, the research design is explained. Next, the participants are presented. Then the data collection instruments are introduced. Finally, the procedures are described in detail, followed by data analysis.

3.1.Research Context

The study mainly focuses on the impact of AI-powered writing assistance systems on metacognitive writing strategies in the EFL learning context. It is analytical in that it seeks to analyze the data into its constituent parts and integrate them to explore metacognitive writing strategies in greater detail. In addition to being analytic, the study also has a deductive purpose since it examines whether AI-powered writing assistance systems influence metacognitive writing strategies in the EFL context. As the result of the research is examined by administering specific and controlled procedures to pre-existing groups rather than randomly assigned groups, it can be regarded as a quasi-experimental research design (Seliger & Shohamy, 1989). The participants in both experimental and control groups are administered pre-tests and post-tests in this research design. However, only the participants in the experimental group receive a specific intervention, while the control group serves as a reference point for comparison (Seliger & Shohamy, 1989). Although relying on intact groups may have shortcomings due to its potential influence on results and the limitation of drawing strong conclusions unlike the true experiment, it still provides valuable evidence regarding the effectiveness of treatments within naturally formed groups (Clark & Creswell, 2015).

3.2.Participants

The study participants were 40 EFL learners from two different classes studying at a preparatory school of a state university in Istanbul, Turkiye. While students' minimum age was 17, the maximum age was 41, and the mean was 19.48. There were 26 (65%) female students and 14 (35%) male students in total. The language level of students was elementary (A2) according to the Proficiency exam conducted by the Preparatory school based on the Common European Framework of Reference for Languages (CEFR). As for departments, the participants were mostly enrolled in engineering departments: four (10%) were from Chemical Engineering, four (10%) were from Metallurgical and Materials Engineering, two (5%) were from Mechanical Engineering, one (2.5%) was from Environmental Engineering, and one (2.5%) was from Industrial Engineering. The remaining participants were from different departments: five (12.5%) were from Dentistry, five (12.5%) were from Public Relations and Publicity, three (7.5%) were from Business, three (7.5%) were from Chemistry, two (5%) were from Political Science and International Relations, two (5%) were from Radio, Television and Cinema, one (2.5%) was from English Language Teaching, one (2.5%) was from Journalism, one (2.5%) was from Management Information Systems, one (2.5%) was from Physics, one (2.5%) was from Political Science and Public Administration, one (2.5%) was from Psychology, one (2.5%) was from Theology, and one (2.5%) was from Tourism and Hotel Management. The participants received 22 hours of English instruction over the course of one week and each week, they have four hours of English writing. The rationale behind the chosen group was that the groups were available and accessible to the researcher and they had comparable mean writing test scores. In addition, their writing class hours were identical when considering the varying writing class hours in the university where the study was conducted. Moreover, a focus group was formed from the experimental and control groups to uncover and explore potential reasons behind the findings of the study. Each group consisted of five randomly chosen participants, and each group had a 30-minute meeting. The participants' ages ranged between 18 to 21. There were seven female and three male students in the interview.

Table 1. Background Information of the Participants

	Control Group			Experimental Group			Total		
	Min.	Max.	M.	Min.	Max.	M.	Min.	Max.	M.
Age	18	41	19.85	17	27	19.1	17	41	19.48
Gender	12 Female (60%) 8 Female (40%)			14 Female (70%) 6 Male (30%)			26 Female (65%) 14 Male (35%)		
Department	5 Dentistry (12.5%), 5 Public Relations and Publicity (12.5%), 4 Chemical Engineering (10%), 4 Metallurgical and Materials Engineering (10%), 3 Business (7.5%), 3 Chemistry (7.5%), 2 Mechanical Engineering (5%), 2 Political Science and International Relations (5%), 2 Radio, Television and Cinema (5%), 1 English Language Teaching (2.5%), 1 Environmental Engineering (2.5%), 1 Industrial Engineering (2.5%), 1 Journalism (2.5%), 1 Management Information Systems (2.5%), 1 Physics (2.5%), 1 Political Science and Public Administration (2.5%), 1 Psychology (2.5%), 1 Theology (2.5%) , 1 Tourism and Hotel Management (2.5%)								

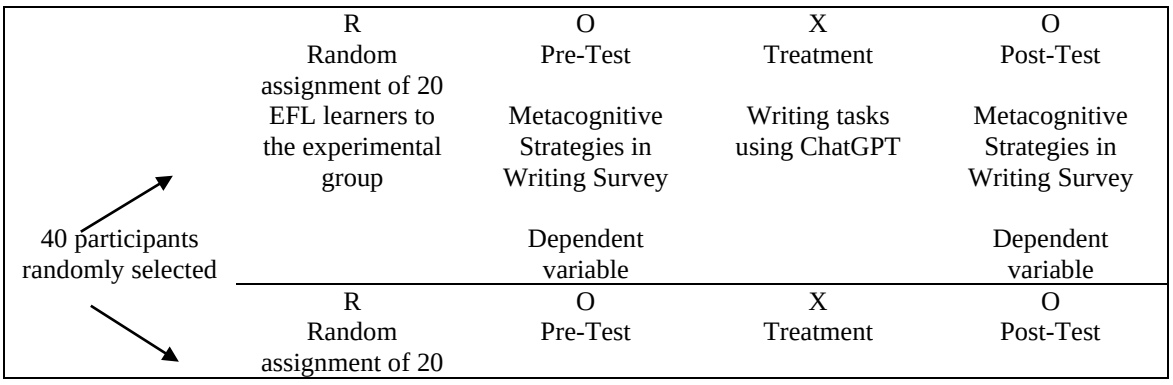
3.3.Tools

In the study, two data collection instruments were used (See Appendix 1) and a focus group interview was conducted, involving five participants from both groups. First, a background questionnaire was utilized to gather information about students' age, gender, department, and English proficiency level. Then, the MSW developed by C. Qin et al. (2022) was administered to measure students' metacognitive writing strategies. The MSW consists of 30 items and involves a seven-point Likert scale asking learners to rate from one to seven (1=strongly disagree, 2=disagree, 3=more or less disagree, 4=undecided, 5=more or less agree, 6= agree, 7=strongly agree). The MSW focused on metacognitive knowledge, including factors such as person, task, and strategies, and metacognitive regulation, encompassing factors such as planning, monitoring, and evaluating. The parameters consisting of metacognitive knowledge and metacognitive regulation serve as fundamental components of metacognition. While person, task, and strategies illustrate learners' understanding and beliefs regarding themselves, planning, monitoring, and evaluating depict the development of self-regulatory skills for

improving writing (L. S. Teng & Zhang, 2016; M. F. Teng et al., 2022). The six factors' Cronbach's alpha ranges from 0.81 to 0.90, which ensures the internal consistency of the responses to the items. However, % of variance was not reported in the study.

3.4.Procedure

Following necessary approval from the ethical committee of the Faculty of Education Sciences at Istanbul Medeniyet University (See Appendix 2), the administration of the particular state university where the study was to be conducted was notified to get permission. Next, the participants were informed about the study's objectives, significance, and implementation. Participants were also assured about the confidentiality of their responses and personal information. The study was conducted in the Spring Semester of the 2023-2024 academic year. First, two pre-existing classes were selected randomly, with one designated as the control group and the other as the experimental group. Then both groups took the pre-test before writing paragraphs for five weeks using different means. While the control group used only pen and paper to write their paragraphs, the experimental group used also ChatGPT to plan, monitor, and evaluate their paragraphs. After the implementation process, participants took the MSW as a post-test. Following the post-tests, a focus group interview was held with ten participants, consisting of five participants from each group. Their parts of findings were shared with them, and their comments and reflections were noted, which lasted 60 minutes in total. The interview was conducted face-to-face separately to prevent the potential biases that groups may impose on each other. The whole procedure is shown in Figure 4.



	EFL learners to the control group	Metacognitive Strategies in Writing Survey Dependent variable	Writing tasks using a pen and paper	Metacognitive Strategies in Writing Survey Dependent variable

Figure 4. *The flowchart of the randomized pretest-posttest control and experimental group design* (Fraenkel et al., 2012)

Both groups followed the same curriculum and covered identical subjects and themes from the same booklet with the same instructor. This ensured that they received consistent instructions and educational resources throughout the study. To prevent potential influence, any biased remarks or suggestive questions were avoided. In the control group, participants completed five tasks through conventional writing methods, whereas in the experimental group, they completed the same tasks using ChatGPT. The experimental group was informed about how to use ChatGPT to get answers according to their proficiency level such as mentioning their level and asking for guidance. The link to ChatGPT was shared via WhatsApp group. Depending on their preferences, the participants either logged in with their Gmail accounts or accessed directly through the internet to use ChatGPT.

3.4.1. Pre-test administration

Before the study, participants completed the background questionnaire included in the MSW, which aimed to gather information on their age, gender, departments, and English proficiency level. Then, the MSW consisting of 30 items assessing students' metacognitive writing strategies, was administered. Students were instructed to select the most suitable response for them at their own pace. The questionnaire was presented in English since the participants' proficiency level allowed them to fully understand each statement and provide an appropriate response. The instructor, however, was available to offer guidance and translations in case of any uncertainties, ambiguities, or confusion.

3.4.2. The practice process

The writing tasks were conducted as integrated activities as a part of the curriculum. The participants were to write an essay ranging from 200 to 250 words on provided topics by the booklet and the instructor. They had prior exposure to paragraph

organization through their writing classes, where they learned about various types of essays such as cause or effect and opinion. In these classes, they examined model essays in their writing booklets and engaged in activities to enhance their understanding of organization, content, grammar, vocabulary, and coherence. Throughout five weeks, participants were given instructions, and they planned, monitored, and evaluated their writing process once a week (See Appendix 3).

3.4.3. Post-test administration

After the five-week practice period, the MSW was administered again in the final stage of the study to identify any changes in the participants' metacognitive writing strategies level.

Week 1

In the first week, the participants were instructed on how to write a cause or effect essay revising the elements of an essay such as a thesis statement, supporting sentences, and a concluding sentence. The guidance included the organization and coherence of a cause-and-effect essay with several examples from the writing school booklet. The instructions also involved suitable phrases to use such as result in, lead to, and result from. Then students were given the topic of the first task, a cause or effect essay about global warming. Students gathered ideas to plan their writing before constructing the essay. While the control group used only pen and paper to create a list, the experimental group used ChatGPT to consult ideas. After they listed the reasons or results of global warming, they were to start writing paragraphs. While writing paragraphs according to a cause-and-effect essay structure, they were encouraged to refer to their outlines, monitor their writing process, and make adjustments accordingly. The control group tried to reflect on their writing progress by identifying the challenges for improvement. On the other hand, the experimental group checked in with ChatGPT for feedback and suggestions while writing. After the participants completed their tasks, they revised what they wrote taking into consideration a set of criteria. The experimental group inputted some of their writing to ChatGPT to revise what they had written on their papers.

Week 2

In the second week, steps for writing a cause-and-effect essay were introduced to the participants. Model essays were examined to show the organization styles and appropriate language use. In addition, commonly used phrases and linkers in cause-and-effect writing were revised. Then the second writing task, writing a cause-and-effect essay about unemployment, was administered. The participants gathered ideas to plan what reasons and results they were going to write about. While the control group relied solely on pen and paper to generate a list, the experimental group utilized ChatGPT for brainstorming ideas. After they outlined, they started writing the essay. During the writing stage, the control group self-monitored themselves on the use of correct grammar, word usage, and effectiveness in conveying ideas and the experimental group monitored their writing process by consulting ChatGPT when necessary. They also referred to ideas gathered in the planning process. After completing their tasks, the control group reviewed their work, considering a specific set of criteria. On the other hand, the experimental group entered some of the writing into ChatGPT to check whether their writing effectively addressed the purpose and audience, especially for the crucial parts of the essay which were the thesis statement, topic sentences, and the concluding sentence.

Week 3

In the third week, the participants were instructed about how to use connectors for better writing. The guidance included coordinating conjunctions, subordinating conjunctions, and transitions. The relationship between sentences while using connectors was shown through samples and how the use of connectors enhances the readability and coherence of the study was discussed. Then the third writing task, which involved writing a story about a superhero who discovered his/her supernatural power, along with a background story, was administered. Students planned their writing based on the strengths and weaknesses of the superhero before writing. The control group listed the ideas that they generated while the experimental group used ChatGPT for this process. After they collected ideas and decided on which strengths and weaknesses they intended to use for their superhore, they started writing their story. While writing, they focused on using connectors effectively to link their ideas. The control group monitored their writing focusing on the key elements and organization of the story and the

experimental group consulted ChatGPT when they had confusion or uncertainty about the use of connectors or other aspects of their writing. They also referred to ideas gathered in the planning process. As for the evaluation process, while the control group assessed their writing in terms of connector usage by reflecting on what they had written, the experimental group consulted ChatGPT, focusing on the use of connectors by inputting specific excerpts or paragraphs from their stories and edited their papers.

Week 4

In the fourth week, the participants were introduced to how to write an opinion essay. They were instructed on multiple perspectives and persuasive language. Model essays were examined along with useful expressions for giving opinions such as I am against, I am in favor of, and it strikes me that. Then the fourth writing task, which involved writing about the extent to which participants believed community service was better than prison for certain crimes, was administered. Participants planned their ideas before writing. The control group brainstormed ideas and outlined without consulting anything while the experimental group used ChatGPT for gathering ideas. During the writing stage, the control group monitored the logical organization of their writing and correct grammar and the experimental group monitored their writing process by consulting ChatGPT when necessary. After completing their tasks, the control group reviewed their work, considering a specific set of criteria such as coherence and clarity. On the other hand, the experimental group entered some of the writing into ChatGPT to check the same specific criteria on the things they found problematic and revised their paper.

Week 5

In the fifth week, the revision of how to write an opinion essay was conducted. Participants discussed the given topics to consolidate what they had learned about using the necessary expression for sharing opinions. Then the fifth writing task, regarding whether schools should enforce dress codes, was administered. The control group planned their writing by generating ideas on the topic while the experimental group used ChatGPT to gather ideas. Throughout the writing phase, the control group observed their work's logical organization and grammar accuracy, while the experimental group monitored their writing by consulting ChatGPT as needed. After completing their tasks, the control group reviewed their work, considering a specific set

of criteria such as the coherence and the use of expressions. On the other hand, the experimental group entered some of the writing into ChatGPT to check the same specific criteria and corrected their writing on their paper accordingly.

3.5.Data Analysis

The collected data were analyzed using the Statistical Package for Social Sciences. First, the mean, maximum, and minimum values of participants' ages were calculated. Next, a descriptive analysis focusing on participants' gender and departments to unveil the mean scores, frequencies, and percentages was conducted. Then the reliability coefficients were computed through Cronbach's Alpha. The reliability coefficient value for overall metacognitive strategies as pre-tests was .93 and it was .94 for the post-test. As for the subsections of the MSW, it was .85 for the pre-test and .88 for the post-test regarding metacognitive knowledge while it was .92 for pre-test and .92 for post-test regarding metacognitive regulation. The percentage of variance for the pre-test was 76.86 whereas it was 77.28 for the post-test for overall metacognitive writing strategies. Concerning the subsections of the MSW, % of variance for metacognitive knowledge was found to be 67.40 for the pre-test, and 69.95 for the post-test while for the metacognitive regulation it was found to be 75.63 for the pre-test and 70.14 for the post-test. The results presented in Table 2 showed that the data was valid and reliable.

Table 2. Reliability Coefficient and % of the Variance of the Pre-test and Post-test

	Sections	**Reliability Coefficients (Cronbach's alpha)**	**% of variance**
Pre-tests	Metacognitive Knowledge	.85	67.40
	Metacognitive Regulation	.92	75.63

	Overall Metacognitive Writing Strategies	.93	76.86
Post-tests	Metacognitive Knowledge	.88	69.95
	Metacognitive Regulation	.92	70.14
	Overall Metacognitive Writing Strategies	.94	77.28

Regarding the analysis of the data, non-parametric methods were selected to compare and analyze the data in more detail since the sample size was too small to presume a normal distribution. First, descriptive analysis was conducted to uncover the mean scores of the pre and post-tests, aiming to assess the levels of metacognitive writing strategies within each group both before and after the treatment. Second, the Wilcoxon analysis was performed on each item in the scale to determine if there were any notable discrepancies in metacognitive writing strategies levels between the pre- and post-tests results of both groups. Finally, the Mann-Whitney U analysis was carried out to identify any distinctions in metacognitive writing strategy levels between the control and experimental groups after the implementation process. Additionally, a focus group interview was conducted, and the data gathered from it were thoroughly examined. The results of the study were displayed during the face-to-face interview to ten students, half from the experimental group and half from the control group. Each group were interviewed separately, which lasted 60 minutes in total. The responses of participants were noted and then analyzed comprehensively by the researcher. The purpose of the analysis was to assess participants' perspectives and identify distinctions between the control and experimental groups. Participants' personal information was kept confidential, and the gathered data were presented anonymously.

4. FINDINGS

This section presents the research questions and the results of the gathered data based on the analysis. First, the metacognitive writing strategy levels of the participants are displayed. Second, the effects of using traditional activities on metacognitive writing strategies are provided. Third, the effects of using AI-powered writing assistance systems on metacognitive writing strategies are presented. Last, the data from both the control and experimental groups are compared and provided.

4.1.What is the level of using metacognitive strategies among EFL learners?

4.1.1. The Metacognitive Writing Strategies Level of the Control Group

Table 3 demonstrates the mean scores, standard error, and standard deviation of the pre- and post-tests of the control group regarding metacognitive knowledge, metacognitive regulation, and overall metacognitive writing strategies. According to the table, the participants had a moderate to high level of metacognitive knowledge before the implementation with the mean score of 4.38, and a high level of metacognitive knowledge after the implementation with the mean score of 4.65. As for metacognitive regulation, the participants displayed a high level of metacognitive regulation both before and after the treatment with mean ranks of 4.75, and 4.83. The participants exhibited a high level of metacognitive writing strategies both before and after the implementation, with mean scores ranging from 4.56 to 4.74.

Table 3. Descriptives for Metacognitive Writing Strategies in the Control Group

	Sections	N	Mean		Std. Deviation
		Statistic	Statistic	Std. Error	
Pre-test	Metacognitive Knowledge	20	4.38	.17	.77
	Metacognitive Regulation	20	4.74	.20	.92
	Overall Metacognitive Writing Strategies	20	4.56	.18	.81
Post-test	Metacognitive Knowledge	20	4.65	.17	.78
	Metacognitive Regulation	20	4.83	.16	.75
	Overall Metacognitive Writing Strategies	20	4.74	.15	.71

Table 4 demonstrates the positive and negative ranks, mean ranks, sum of ranks, and significance level of the control group regarding pre- and post-tests. According to the table, there was a statistically significant change in metacognitive knowledge after the treatment and fourteen participants showed a positive difference with a mean rank of 10.32. As for metacognitive regulation, the significance level was .45, and thirteen participants showed a positive difference after the implementation, meaning that there was a change in the metacognitive regulation; however, it was not statistically significant. Similarly, there was a difference in overall metacognitive writing strategies, but it was not statistically significant.

Table 4. Metacognitive Writing Strategies for the Control Group (The Wilcoxon Test)

	Sections	Ranks	N	Mean Ranks	Sum of Ranks	Asymp. Sig. (2-tailed)
Post-test-Pre-test	Metacognitive Knowledge	Negative Ranks	5	9.10	44.50	.04
		Positive Ranks	14	10.32	144.50	
		Ties	1			
		Total	20			
Post-test-Pre-test	Metacognitive Regulation	Negative Ranks	7	12.14	85.00	.45
		Positive Ranks	13	9.62	125.00	
		Ties	0			
		Total	20			
Post-test-Pre-test	Overall Metacognitive Writing Strategies	Negative Ranks	6	8.17	49.00	.06
		Positive Ranks	13	10.85	141.00	
		Ties	1			
		Total	20			

4.1.2. The Metacognitive Writing Strategies Level of the Experimental Group

Table 5 shows the mean scores, standard error, and standard deviation of the pre- and post-tests of the experimental group regarding metacognitive knowledge, metacognitive regulation, and overall metacognitive writing strategies. According to the table, the participants had a high level of metacognitive knowledge, metacognitive regulation, and overall metacognitive writing strategies both before and after the treatment. As seen in the table, there was an increase in the mean scores for metacognitive knowledge, metacognitive regulation, and overall metacognitive writing

strategies level of the experimental group after the implementation from 4.55 to 4.80, from 4.83 to 5.03, and from 4.69 to 4.92 respectively.

Table 5. Descriptives for Metacognitive Writing Strategies in the Experimental Group

	Sections	**N**	**Mean**		**Std. Deviation**
		Statistic	**Statistic**	**Std. Error**	
Pre-test	Metacognitive Knowledge	20	4.55	.19	.89
	Metacognitive Regulation	20	4.83	.23	1.05
	Overall Metacognitive Writing Strategies	20	4.69	.20	.90
Post-test	Metacognitive Knowledge	20	4.80	.21	.94
	Metacognitive Regulation	20	5.03	.23	1.03
	Overall Metacognitive Writing Strategies	20	4.92	.20	.92

Table 6 illustrates the positive and negative ranks, mean ranks, sum of ranks, and significance level of the experimental group regarding pre- and post-tests. According to the table, there was not a significant difference between pre- and post-tests of metacognitive knowledge; however, fourteen participants showed a positive difference after the treatment. As for metacognitive regulation, a significant change was found with a significance level of .03 and the post-test scores of thirteen participants were higher than their pre-test scores. Regarding the overall metacognitive writing strategies, a significant change was found with the significance number .04, and fourteen participants revealed a positive difference after the implementation of ChatGPT.

Table 6. Metacognitive Writing Strategies for the Experimental Group (The Wilcoxon Test)

	Sections	Ranks	N	Mean Ranks	Sum of Ranks	Asymp. Sig. (2-tailed)
Post-test-Pre-test	Metacognitive Knowledge	Negative Ranks	6	9.00	54.00	.06
		Positive Ranks	14	11.14	156.00	
		Ties	0			
		Total	20			
Post-test-Pre-test	Metacognitive Regulation	Negative Ranks	4	8.00	32.00	.03
		Positive Ranks	13	9.31	121.00	
		Ties	3			
		Total	20			
Post-test-Pre-test	Overall Metacognitive Writing Strategies	Negative Ranks	6	8.58	51.50	.04
		Positive Ranks	14	11.32	158.50	
		Ties	0			
		Total	20			

4.2.Does the use of traditional activities affect metacognitive writing strategies among EFL learners?

Table 7 demonstrates the findings of the Wilcoxon test for each item in the questionnaire based on the comparison of the pre-tests and post-tests in the control group (See Appendix 4). As seen in the table, there was no significant difference between pre- and post-test scores regarding metacognitive knowledge, except for two items which were related to strategy, and metacognitive regulation apart from one item related to planning. First, concerning metacognitive knowledge, the third item that had a significant difference between pre- and post-test scores was the strategy that learners

adopted when they were writing. The participants defined their composing process as analyzing the writing prompt, generating ideas, planning, outlining, drafting, and revising with the significance level .02. Second, the fourth item of strategy which was about repeating one or more of the writing steps to revise the essay based on the situation showed a considerable change with the significance score .02. Last, related to metacognitive regulation, the second item which was about paying attention to the purpose before writing demonstrated a significant difference with the significance value .03.

Table 7. The Wilcoxon Test for the Control Group

Sections	**Items**	**Ranks**	**N**	**Mean Rank**	**Sum of Ranks**	**Asymp. Sig. (2-tailed)**
Metacognitive Knowledge	**Strategy**					
	3. My composing process is usually like this: Analyzing the writing prompt, generating ideas, planning, outlining, drafting, and revising.	Negative Ranks	3	4.50	13.50	.02
		Positive Ranks	10	7.75	77.50	
		Ties	7			
		Total	20			
	4. Based on the situation, I would repeat one or more of the above writing steps to revise my essay.	Negative Ranks	2	6.75	13.50	.02
		Positive Ranks	11	7.05	77.50	
		Ties	7			
		Total	20			
Metacognitive Regulation	**Planning**					
	2. Before writing, I pay attention to the purpose (e.g., to express opinion, to thank someone, to complain about a service) of a writing task.	Negative Ranks	1	3.50	3.50	.03
		Positive Ranks	7	4.64	32.50	
		Ties	12			
		Total	20			

4.3.Does the use of AI-powered writing assistance systems affect metacognitive writing strategies among EFL learners?

Table 8 illustrates the findings of the Wilcoxon test for each item in the questionnaire based on the comparison of the pre- and post-tests in the experimental group (See Appendix 5). As seen in the table, there was no significant difference between pre- and post-test scores except for two items which were related to metacognitive knowledge. First, the second item of strategy which was about tackling the problems that they encountered during the writing process with appropriate remedial strategies had a significant difference with the significance value .04. Second, the fourth item of strategy which was about repeating one or more of writing steps to revise the essay based on the situation showed a considerable change with the significance score .03.

Table 8. The Wilcoxon Test for the Experimental Group

Sections	**Items**	**Ranks**	**N**	**Mean Rank**	**Sum of Ranks**	**Asymp. Sig. (2-tailed)**
Metacognitive Knowledge	**Strategy**					
	2. I tackle the problems that I encounter during the writing process with appropriate remedial strategies.	Negative Ranks	3	7.33	22.00	.04
		Positive Ranks	11	7.55	83.00	
		Ties	6			
		Total	20			
	4. Based on the situation, I would repeat one or more of the above writing steps to revise my essay.	Negative Ranks	2	4.00	8.00	.03
		Positive Ranks	8	5.88	47.00	
		Ties	10			
		Total	20			

4.4. Is there a difference between the use of traditional activities and AI-powered writing assistance systems regarding using metacognitive strategies?

Table 9 demonstrates the mean rank, sum of ranks, and significance numbers between the outcomes of the pre-tests of the control and experimental groups. Regarding metacognitive knowledge, the mean rank of the control group was 19.65 while it was 21.35 for the experimental group. The significance value of this section was .64. As for metacognitive regulation, while the mean rank was 19.80 for the control group, it was 21.20 for the experimental group. The significance value of this section was .70. Concerning overall metacognitive writing strategies, the mean rank was 19.55 for the control group while it was 21.45 for the experimental group. The significance value of this was .60. As can be seen in the table, there was no significant difference between the two groups in terms of metacognitive knowledge, metacognitive regulation, and overall metacognitive writing strategies before the implementation.

Table 9. Comparison of the Pre-tests of the Control and the Experimental Groups (Mann-Whitney U Test)

	Sections	**Groups**	**N**	**Mean Rank**	**Sum of Ranks**	**Asymp. Sig. (2-tailed)**
Pre-test	Metacognitive Knowledge	Control Group	20	19.65	393.00	.64
		Experimental Group	20	21.35	427.00	
	Metacognitive Regulation	Control Group	20	19.80	393.00	.70
		Experimental Group	20	21.20	424.00	
	Overall Metacognitive Writing Strategies	Control Group	20	19.55	391.00	.60
		Experimental Group	20	21.45	429.00	

Table 10 illustrates the two items that showed a considerable change in metacognitive knowledge and metacognitive regulation for the pre-test (See Appendix 6). First, the fourth item of strategy regarding metacognitive knowledge had a significant difference between the two groups. The experimental group showed a higher score for that item which was about repeating one or more of the writing steps to revise their essay with a significant value of .00. Second, the fifth item of evaluation regarding metacognitive regulation had a considerable change between the two groups. The experimental group demonstrated a higher score for that item which was about reflecting on the composing process of "compose and revise, revise and compose" after finishing writing with the significant value .01.

Table 10. Comparison of the items in the pre-tests of the Control and the Experimental Groups (Mann-Whitney U Test)

Sections	**Items**	**Groups**	**N**	**Mean Rank**	**Sum of Ranks**	**Asymp. Sig. (2-tailed)**
Metacognitive Knowledge	**Strategy**					
	4. Based on the situation, I would repeat one or more of the above writing steps to revise my essay.	Control Group	20	14.10	282.00	.00
		Experimental Group	20	26.90	538.00	
		Total	40			
Metacognitive Regulation	**Evaluation**					
	5. After finishing writing, I reflect on the	Control Group	20	16.25	325.00	.01
		Experimental Group	20	24.75	495.00	
		Total	40			

	composing process of "compose and revise, revise and compose"	

Table 11 demonstrates the mean rank, sum of ranks, and significance numbers between the results of the post-tests of the control and experimental groups (See Appendix 7). As for metacognitive knowledge, the mean rank of the control group was 19.25 while it was 21.75 for the experimental group. The significance value of this section was .49. Regarding metacognitive regulation, the mean rank was 19.28 for the control group while it was 21.73 for the experimental group. The significance value of this section was .50. Concerning overall metacognitive writing strategies, the mean rank was 18.85 for the control group while it was 22.15 for the experimental group. The significance value of this was .37. As seen in the table, there was no significant change between the two groups in terms of metacognitive knowledge, metacognitive regulation, and overall metacognitive writing strategies after the implementation.

Table 11. Comparison of the Post-tests of the Control and the Experimental Groups (Mann-Whitney U Test)

	Sections	**Groups**	**N**	**Mean Rank**	**Sum of Ranks**	**Asymp. Sig. (2-tailed**
Post-test	Metacognitive Knowledge	Control Group	20	19.25	385.00	.49
		Experimental Group	20	21.75	435.00	
	Metacognitive Regulation	Control Group	20	19.28	385.50	.50
		Experimental Group	20	21.73	434.50	
	Overall Metacognitive Writing Strategies	Control Group	20	18.85	377.00	.37
		Experimental Group	20	22.15	443.00	

Table 12 presents the three items that showed a significant change in metacognitive knowledge and metacognitive regulation for the post-test (See Appendix 7). First, the fourth item of strategy related to metacognitive knowledge had a

significant difference between the two groups. The experimental group showed a higher score for that item which was about repeating one or more of the writing steps to revise essays with a significant value .00. Second, the fourth item of evaluation related to metacognitive regulation demonstrated a considerable change between the two groups. The experimental group had a higher score for that item which was about reflecting on their essay holistically to see if it achieved the goals of the writing task after finishing writing with the significance value .04. Third, the fifth item of evaluation related to metacognitive regulation showed a significant difference between the groups. The experimental group had a higher post-test score for that item which was about reflecting on the composing process of "compose and revise, revise and compose" after finishing writing with the significance value .01.

Table 12. Comparison of the items in the post-tests of the Control and the Experimental Groups (Mann-Whitney U Test)

Sections	Items	Groups	N	Mean Rank	Sum of Ranks	Asymp. Sig. (2-tailed)
Metacognitive Knowledge	**Strategy**					
	4. Based on the situation, I would repeat one or more of the above writing steps to revise my essay.	Control Group	20	14.30	286.00	.00
		Experimental Group	20	26.70	534.00	
		Total	40			
Metacognitive Regulation	**Evaluation**					
	4. After finishing writing, I reflect on my essay holistically to see if it achieves the goals of the writing task.	Control Group	20	16.93	338.50	.04
		Experimental Group	20	24.08	481.50	
		Total	40			
	5. After finishing writing, I reflect on the composing process of "compose and revise, revise and compose"	Control Group	20	15.88	317.50	.01
		Experimental Group	20	25.13	502.50	
		Total	40			

5. CONCLUSIONS and DISCUSSION

This section outlines the conclusions and discussions of the study. First, the conclusions of the findings and discussions are presented. Second, the results are discussed in relation to those of previous research followed by practical recommendations. Third, the limitations of the study are provided. Last, recommendations for further research based on the limitations are elucidated.

5.1. Conclusions

According to the study which examines the impact of AI-powered writing assistance systems on metacognitive writing strategies in the EFL learning context, several conclusions were drawn. First, EFL learners have high levels of metacognitive writing strategies meaning that they engage in metacognitive processes in writing. Second, using traditional activities does not enhance overall metacognitive writing strategies apart from metacognitive knowledge. That is, EFL writers are aware of person, task, and strategy variables while they do not necessarily plan, monitor, and evaluate their essays. Third, AI-powered writing systems improve learners' overall metacognitive strategies and metacognitive regulation. This means that students make use of metacognitive strategies by planning, monitoring, and evaluating their papers. However, these systems do not affect learners' metacognitive knowledge positively. Last, when examining the impact of AI-powered tools and traditional activities, it can be seen that AI systems in EFL writing contribute more than conventional activities in terms of metacognitive strategies. However, both AI-powered tools and conventional activities bring different advantages to the EFL context; therefore, it is crucial to utilize the strengths of both pedagogical designs.

The findings from focus group discussions suggest that the aforementioned conclusions may derive from various factors. In terms of metacognitive knowledge, participants who receive traditional activities state that they become aware of their responsibilities concerning the writing process since they need to engage in their essay constantly. In other words, they assert that the process of planning, monitoring, and evaluating leads them to think that they are active participants in their essays and writing is not something to be left to its fate; it is something you need to take control of from starting point to the end. Therefore, they believe that the cycle of generating ideas,

observing the writing process, and evaluating the product makes them more aware of what they are doing while writing. The students also state that creating outlines and following them throughout the writing process helps them easily follow the key points and maintain coherence which saves time and eliminates the risk of missing the core requirements of the essay. Therefore, they think that understanding the purpose of the writing is the key to the achievement of the task. However, they state that even if they are aware of the importance of planning, monitoring, and evaluating processes, it could be difficult for them to employ these processes. They say that they do not find themselves qualified enough to observe what they are writing and find mistakes if there are any. Therefore, they claim that it might be a waste of time to find grammar mistakes and to check if they are clear about what they intend to convey continually. They say that even if they actively engage in their writing and try to generate strategies if there are any problems during writing or formed outlines, they feel exhausted controlling the whole process and lose interest in evaluating the written product. On the other hand, the participants who used ChatGPT in writing state that using an AI-powered tool is a relief for gathering ideas, making sure if they are clear while conveying ideas, and evaluating the parts of the essay that they doubt themselves. Therefore, concerning their metacognitive regulation, they assert that ChatGPT helps them plan their essay giving them a different perspective and a structured outline. They also state that ChatGPT offers them alternative sentences when they need it, and this encourages them to observe what they are writing. Since they can get these alternative sentences or vocabulary, they say that they can focus easily on the organization and coherence of the essay. They believe that when they are sure that they write grammatically correct sentences and use a wide range of vocabulary, they feel relieved and motivated to examine the organization and the clarity of the essay. However, they state that consulting ChatGPT constantly and taking suggestions sometimes makes them feel like a cheater. They exemplify this by saying that they do not need to lose time thinking about what to write and how to write it when they have an assistant giving immediate feedback and this feels like giving control to someone else rather than themselves. For this reason, they believe that they may not develop the sense of being aware of their potential.

5.2. Pedagogical Implications

Several practical implications can be drawn based on the results of the study. First, the findings demonstrated that AI-powered writing assistance systems significantly affect learners' metacognitive writing strategies. Because of limited research specifically on the effects of AI-powered writing tools on metacognitive writing strategies, previous studies regarding the impact of these systems on writing skills will be taken into consideration. According to these studies (Fauziah & Minarti, 2023; Mahapatra, 2024; Marzuki et al., 2023; Nazari et al., 2021; Yan, 2023; E. Yu, 2023) AI-supported approach has a significant positive impact on learners' writing abilities and can lead to metacognition improvement, which aligns with the present study. That is to say, these studies show a considerable change in EFL writing regarding AI use. As for the current study, there could be several reasons why these systems have a positive impact on learners' metacognitive writing strategies. For instance, since AI tools can offer customized learning experiences, they can adjust to learners' proficiency levels and make them more aware of their strengths and weaknesses to develop metacognitive strategies. Similarly, since its connectedness to theories such as Constructivism, this tailored learning may enable learners to be self-directed, which may lead to metacognitive skills development (Loizzo et al., 2017). Additionally, the advice, guidance, and suggestions AI tools provide may stimulate learners to regulate their cognitive processes. This may explain the positive influence of AI writing systems on learners' metacognitive regulation. In the same vein, why this increase in metacognitive regulation affected overall metacognitive writing strategies could be because metacognitive regulation can be seen as a key element that makes metacognition beneficial for writing. In a study conducted by Teng (2019) revealed that metacognitive regulation was critical for writing performance. Therefore, the study encourages EFL learners to improve their metacognitive regulation so that their writing performance can be enhanced. Even if there were notable changes in metacognitive regulation and overall metacognitive writing strategies, there could be several reasons why metacognitive knowledge did not show a significant difference. For example, metacognitive knowledge is known to influence learners to analyze the writing task and employ remedial strategies to do the task along with being aware of when and why to

adopt these strategies (Harris et al., 2009; Harris & Graham, 2009). However, since learners get immediate suggestions, they may not have an opportunity to reflect on their outcomes. Students may also develop over-reliance on AI systems by taking solutions without understanding the underlying reasons, which may hinder the enhancement of metacognitive knowledge. Unlike AI-powered writing systems, traditional activities contributed to a positive notable change in metacognitive knowledge. The reasons why traditional activities affected this knowledge could be because reflecting on their own experiences may help learners to gain a deeper understanding of themselves and learn effective strategies. According to a review of the literature, metacognitive knowledge improves learning outcomes by helping with recall, comprehension of written texts, completion of novel learning tasks, learning progress rate, and the level and pace of learners' cognitive engagement (R. Oxford, 1990; Wenden, 1987, 1998, 1999). However, significant changes in metacognitive knowledge did not affect learners' metacognitive regulation. This may be because students frequently know what their preferences are, but often struggle to turn that knowledge into useful activities that they can include in their educational experiences (Öz, 2005). Therefore, students may gain knowledge of metacognition, but they do not know how to use that knowledge to plan and manage their writing. Furthermore, the students were found to have high levels of metacognitive writing strategies before the treatment. Although research by Zimmerman and Schunt (2011) suggests that learners who employ metacognitive strategies are more likely to attain their desired learning outcomes and show greater control over their learning behaviors, the high level of strategies did not affect learners' metacognitive writing strategies. This may be because metacognitive strategies may not be the sole factor leading to learning achievement. Students should also be motivated to employ these strategies (Bandura et al., 1996; Zimmerman & Martinez-Pons, 1990). For example, some research revealed a strong correlation between students' intrinsic values and cognitive and metacognitive strategies (B. Bai & Jing, 2020; Pintrich & De Groot, 1990). In addition, learners' preferences for learning influence the selections of strategies they employ in order to learn the new material, whether due to their learning style or their beliefs about how languages are learned (Öz, 2005). Therefore, a mismatch may hinder the improvement of metacognitive strategies. Furthermore, there was no significant difference between the use of AI-powered writing systems and traditional activities in

terms of metacognitive writing strategies. This finding contradicts several studies (Judy Shih & Huang, 2022; Khosravi et al., 2023; G.-Z. Liu et al., 2022) that demonstrate the technological advantage over conventional learning. There might be several reasons behind this result. For example, even if AI-supported writing initially presented itself as a time-saving solution, it may be difficult to control since it frequently diverges from the topic and requires revision in all attempts (De Vicente-Yagüe-Jara et al., 2023). This may discourage learners from engaging in deeper cognitive processes in writing. It can also be related to the novelty of AI-based learning tools and consequently, their requiring clarification. Additionally, the potential of AI tools to promote over-reliance may hinder learners' self-editing skills as they rely on these systems for correction, paying less attention to understanding mistakes (Utami et al., 2023). Therefore, the students may not develop essential metacognitive writing strategies. Although there was no significant difference between the use of AI-powered tools and traditional activities, the positive effects of these systems within this study cannot be ignored. For instance, the integration of AI tools into learning environments gives learners more control over learning by fostering self-regulation skills (Jin et al., 2023; C.-Y. Wang & Lin, 2023; Xia et al., 2022). The study conducted by Song and Song (2023) supports this assertion that these tools helped learners reach writing self-regulation more quickly. As the characteristics of AI-powered writing systems support the growth of learners' metacognitive and self-regulatory abilities in addition to attending to their unique strengths and areas requiring development (Zimmerman, 1989a), it improves writing skills. Consequently, AI systems' ability to process massive datasets, identify complex learning trends, and customize instructions to individual needs can revolutionize teaching practices and student outcomes (Ouyang & Jiao, 2021; Roll & Wylie, 2016).

5.3. Practical Recommendations

Some practical recommendations can be noted based on the results of the current study. First, AI-powered writing assistance systems should be used in the EFL context to foster metacognitive writing strategies of learners. As it is known that these strategies improve writing skills (Cer, 2019), integrating these systems into learning environments has the potential to enhance writing abilities. Even if

using AI writing tools may not greatly influence metacognitive writing strategies more than the traditional activities, these tools offer interaction, and immediate suggestions, and address individual learning needs, which provides additional support and resources to enhance metacognitive strategy use. To be able to incorporate technology into the learning environment, teachers should also be trained about how to integrate these systems to make the best use of them. For example, they should be aware of the possible over-reliance on AI systems, which may decrease the creativity level, and limit engagement in the learning process. They should also be aware of the pedagogical design of the classroom so that they can easily incorporate AI-powered writing assistance systems into learning environments such as flipped classrooms. Additionally, they should be knowledgeable about ethical considerations related to these tools to get rid of any plagiarism along with data privacy to prevent any threat. Together with EFL teachers, curriculum developers should encourage AI tools integration into learning environments so that no mismatches happen on teachers' part while designing a lesson plan. The environment in which technology will be used should be suitable for using the internet to get rid of technical problems. By doing so, students are encouraged to engage with AI-powered writing assistance systems easily without encountering possible problems that might obscure the learning process. Since AI tools are free from environment restrictions, learners should also be encouraged to use these systems inside and outside of the classroom to reap their benefits. Last, it should be kept in mind that both traditional and AI-integrated environments have their advantages and disadvantages. Therefore, rather than relying on solely one learning environment, these environments should be used in harmony suitable for the different needs and interests of learners and the specific lesson to be taught.

5.4. Limitations

The present study is not without its limitations. First, the participants are limited to 40 EFL learners enrolled in a Preparatory School of a state university in Türkiye, including 20 participants for each group. Therefore, making broad statements about individuals, time, place, or methods would not be appropriate. Second, the study included a background questionnaire and a seven-point Likert

scale as data collection instruments. Therefore, the study is limited to the specific aspects without providing a broader perspective. Third, the study lasted for only five weeks since the preparatory school had a heavy pacing, which limited the duration of the implementation. An extended implementation process would offer more detailed results and shed light on different aspects. Fourth, the study employed a quasi-experimental research design due to the constraints imposed by school regulations. This makes it unfeasible to choose students randomly. Furthermore, the study only considered how AI-powered writing assistance systems affect learners' metacognitive writing strategies in a classroom setting. Consequently, it is not possible to generalize the findings to general language competency and all types of learning environments.

5.5. Recommendations for Further Research

Several recommendations can be noted for further research. First, a larger sample can be used to attain more reliable generalization. Different contexts should also be used to assess the extent to which findings are consistent about EFL writing since every culture has their own beliefs, values, and perceptions. Additionally, the participants with different ages and proficiency levels should be analyzed so that more explanations can be made in terms of the effects of age and proficiency level. Second, qualitative research should be implemented to gain more insight into learners' use of metacognitive writing strategies. In this way, learners' experiences, behaviors and perceptions can be examined in more detail, which may reveal their needs in their own voice. This would compelement the quantitative approach by deepening our understanding of the complexities of the social world. Third, the implementation process can be kept longer so that more accurate implications can be drawn. In this way, researchers can be given the opportunity to be more thorough in their data collection. Fourth, true experimental design can be employed to provide more control over extraneous variables. This can reduce the impact of external factors and enhance the validity of the findings. In addition, studies can be conducted to investigate the relationship between metacognitive writing strategies and writing improvements when AI-powered writing tools are integrated into the classroom by focusing on their contributions to writing aspects such as content and

organization. Since metacognition is internal and quite difficult to observe, writing outcomes may unveil its potential contribution to writing skills. Furthermore, AI-powered writing tools can be incorporated into different classroom environments such as using these systems in blended learning to reveal their effects on metacognitive strategies or using them with collaborative writing activities to evaluate their effectiveness on metacognition. Last, more research can be done to reveal the impacts of AI-powered assistance systems on metacognitive strategies in different skills. Consequently, the effectiveness of AI-powered tools in the EFL context can be discussed in greater detail.

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APPENDIX 1

Metacognitive Writing Strategies Level of Preparatory Students

Dear participants,

This survey is part of a master's degree research project conducted at İstanbul Medeniyet University. The purpose of the study is to find out the level of metacognitive writing strategies of preparatory students. The survey involves a background questionnaire and a metacognitive writing strategies scale.

The study has been reviewed and approved by ethics committee, ensuring that all procedures adhere to ethical standards. Your participation in this survey will be highly valuable and all responses provided by you will be kept confidential.

Many thanks in advance for your time and cooperation.

PART 1 –

(Background questionnaire)

Name:

Age:

Gender:

Department:

CEFR English Proficiency Level:

PART 2

Instructions: Please describe each of these statements on a scale going from 1. 'Strongly disagree', 2. 'Disagree', 3. 'More or less disagree' 4. 'Undecided' 5. More or less agree', 6. 'Agree', 7 ‘Strongly agree’

Section I Metacognitive knowledge (MK)							
Person							
	Strongly Disagree	Disagree	Mor e or less disa gree	Undecided	More orless agr ee	Agree	Strongly agree
1. I am very interested in English writing.							
2. I find English writing very easy.							
3. I am quite aware of my English writing competence.							
4. I am quite aware of how much I know about Englishwriting.							
5. I am well aware of some grading rubrics of English expository essays, e.g., the CET-4 essay.							

	Strongly Disagree	Disagree	Mor e or less disagree	Undecided	More orless agr ee	Agree	Strongly agree
Task							
1. I think it is very important to understand therequirements of a writing task.							
2. I usually set up my writing goals based on therequirements of a writing task.							
3. I write according to the genre (e.g., an exposition, aletter, a note) of an essay.							
4. I use my knowledge of English discourse (e.g., thesisstatement, topic sentences, coherence, transitional words) to complete a writing task.							
5. I have a strong awareness of my readers and mycommunication with							

them.							
Strategy							
1. I usually think in English when I write English essays.							
2. I tackle the problems that I encounter during the writing process with appropriate remedial strategies.							
3. My composing process is usually like this: Analyzingthe writing prompt, generating ideas, planning, outlining, drafting, and revising.							
4. Based on the situation, I would repeat one or moreof the above writing steps to revise my essay.							
5. When writing, I pay more attention to the contentdevelopment of my essay.							
Section II Metacognitive Regulation							
Planning							
1. Before writing, I pay attention to the genre (e.g., anexposition, a letter, a note) of a writing task.							
2. Before writing, I pay attention to the purpose (e.g.,to express opinion, to thank someone, to complain about a service) of a writing task.							
3. Before writing, I pay attention to the audience (e.g.,the instructor, customers, supervisor, classmates, general public...etc.) of a writing task.							

	Strongly Disagree	Disagre e	Mor e or less disagree	Undecided	More orless agr ee	Agree	Strongly agree
4. Before writing, I pay attention to specific parts ofthe language (e.g., the wording and grammar) of a writing task.							
5. Before writing, I consciously recall the model essaysrelated to the writing prompt							
Monitoring							

1. When writing, I check if my essay meets therequirements of the writing task.							
2. When writing, I check if the content of my essay isrelevant to the topic.							
3. When writing, I check if the organization of myessay is logical.							
4. When writing, I check if the language of my essay isclear enough.							
5. When writing, I check if my word usage is accurateenough.							
Evaluating							
1. After finishing writing, I reflect on the content of myessay to see if any addition or deletion is needed.							
2. After finishing writing, I reflect on the accuracy ofmy grammar.							
3. After finishing writing, I reflect on the organizationof my essay to see if it is clear enough.							
4. After finishing writing, I reflect on my essay holistically to see if it achieves the goals of the writingtask.							
5. After finishing writing, I reflect on the composing process of “compose and revise, revise and compose”.							

APPENDIX 2

The Ethics Committee Approval

T.C.
İSTANBUL MEDENİYET ÜNİVERSİTESİ REKTÖRLÜĞÜ
Rektörlük

Sayı : E-38510686-050.04-2400017237 08.03.2024
Konu : Ece Hatice Berk'in Başvurusu

İlgili Makama,

İMÜ Sosyal ve Beşeri Bilimler Etik Kurulu'nun 2024/2 sayılı ve 27.02.2024 tarihli kararıyla, İMÜ Lisansüstü Eğitim Enstitüsü (İngilizce Dili Eğitimi) yüksek lisans öğrencisi **Ece Hatice Berk**'in "Yapay Zeka Destekli Yazma Sistemlerinin Yabancı Dil Olarak İngilizce Öğrenme Bağlamında Üstbilişsel Yazma Stratejileri Üzerindeki Etkisi" başlıklı YL tezi kapsamında (dan. Prof. Dr. Selami Aydın) veri toplanmasına yönelik araştırma dosyası görüşülmüş, içerik bakımından etik bir sorun bulunmadığı sonucuna varılarak izin talebi uygun bulunmuştur.

Prof. Dr. Tuncay BAŞOĞLU
Kurul Başkanı

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APPENDIX 3

Weeks	**Instruction Content**	**Procedure**		**Materials**	
		Control Group	Experimental Group	Control Group	Experimental Group
Week 1	Cause or Effect Essay	**1. Planning Activity:** • Brainstorming ideas to plan the causes or effects of global warming. **2. Monitoring Activity:** • Writing paragraphs based on the ideas generated in the planning process. • Checking how the writing is progressing according to the outline. **3. Evaluating Activity:** • Reviewing the essay, with a focus on grammar correction, clarity, and coherence. • Evaluating the writing based on their own reflections.	**1. Planning Activity:** • Using ChatGPT to gather ideas to plan causes or effects of global warming. **2. Monitoring Activity:** • Writing paragraphs based on the ideas generated by ChatGPT in the planning process. • Checking in with ChatGPT for feedback and suggestions while writing periodically. **3. Evaluating Activity:** • Entering some of the writing into ChatGPT for evaluation, with a focus on grammar correction, clarity, and coherence. • Evaluating ChatGPT's feedback critically and making revisions accordingly.	Papers Pens	Mobile phones or tablets with internet access Papers Pens
Week 2	Cause and Effect Essay	**1. Planning Activity** • Brainstorming ideas to plan the causes and effects of unemployment. **2. Monitoring Activity** • Composing paragraphs using ideas developed during the planning stage. • Assessing writing progression according to outlined structure. **3. Evaluating Activity** • Reviewing the writing, paying particular attention to coherence, clarity, and grammar. • Evaluating the writing through personal reflections.	**1. Planning Activity:** • Using ChatGPT to gather ideas to plan the causes and effects of unemployment. **2. Monitoring Activity:** • Drafting paragraphs using the concepts that ChatGPT generates during the planning stage. • Adjusting paragraphs as needed based on ChatGPT's feedback. **3. Evaluating Activity:** • Entering some of the writing into ChatGPT for evaluation, with a focus on grammar correction, clarity, and coherence. • Evaluating ChatGPT's feedback critically and making revisions accordingly.	Papers Pens	Mobile phones or tablets with internet access Papers Pens

Week 3	Using Connectors for Better Writing	**1. Planning Activity** • Brainstorming ideas to plan the strengths and weaknesses of a superhero with a background of it. **2. Monitoring Activity** • Revising the use of connectors while writing periodically. • Analyzing the used connectors to ensure coherence. **3. Evaluating Activity** • Assessing the writing with a focus on the connectors and organization. • Evaluating the writing critically and making revisions accordingly.	**1. Planning Activity:** • Using ChatGPT to gather ideas to plan the strengths and weaknesses of a superhero with a background of it. **2. Monitoring Activity:** • Checking in with ChatGPT for feedback on the use of connectors. • Asking questions for establishing connections or strengthening the transitions between ideas. **3. Evaluating Activity:** • Entering some of the writing into ChatGPT for evaluation, with a focus on the use of connectors, after finishing drafts. • Evaluating ChatGPT's feedback critically and making revisions accordingly.	Papers Pens	Mobile phones or tablets with internet access Papers Pens
Week 4	Opinion Essay	**1. Planning Activity:** • Brainstorming ideas on the topic of whether community service is better than prison for some crimes. **2. Monitoring Activity:** • Creating paragraphs based on the concepts generated during the planning phase. • Reviewing the sentences after writing them to ensure correct grammar, content, and coherence. **3. Evaluating Activity:** • Assessing the writing, with a focus on grammar correction, clarity, and coherence. • Evaluating the writing critically and making revisions accordingly.	**1. Planning Activity:** • Using ChatGPT to gather ideas on whether community service is better than prison for some crimes. **2. Monitoring Activity:** • Creating paragraphs based on the concepts generated by ChatGPT during the planning phase. • Consulting with ChatGPT for feedback and suggestions during the writing process periodically. **3. Evaluating Activity:** • Entering some of the writing into ChatGPT for evaluation, with a focus on the organization of ideas, grammar, and coherence after finishing drafts. • Assessing the feedback from ChatGPT and revising accordingly.	Papers Pens	Mobile phones or tablets with internet access Papers Pens
Week 5	Opinion Essay	**1. Planning Activity** • Brainstorming ideas to plan whether schools should	**1. Planning Activity:** • Using ChatGPT to gather ideas to plan whether schools should	Papers Pens	Mobile phones or tablets with internet access

		enforce dress codes. **2. Monitoring Activity** • Composing paragraphs using ideas generated during the planning stage. • Reviewing the sentences after writing them to check grammar, organization of ideas, and coherence. **3. Evaluating Activity** • Assessing the writing as a whole with a focus on grammar correction, clarity, and coherence. • Evaluating the writing through personal reflections.	enforce dress codes. **2. Monitoring Activity:** • Writing paragraphs based on the ideas generated by ChatGPT in the planning process. • Checking in with ChatGPT for feedback and suggestions while writing periodically. **3. Evaluating Activity:** • Entering some of the writing into ChatGPT for evaluation, with a focus on grammar correction, clarity, and coherence. • Evaluating ChatGPT's feedback critically and making revisions accordingly.		Papers Pens

APPENDIX 4

The Wilcoxon Test Results for the Control Group

Sections	Items	Ranks	N	Mean Rank	Sum of Ranks	Asymp. Sig. (2-tailed)
Metacognitive Knowledge	**Person**					
	1. I am very interested in English writing.	Negative Ranks	4	3.50	14.00	.55
		Positive Ranks	4	5.50	22.00	
		Ties	12			
		Total	20			
	2. I find English writing very easy.	Negative Ranks	3	5.33	16.00	.42
		Positive Ranks	6	4.83	29.00	
		Ties	11			
		Total	20			
	3. I am quite aware of my English writing competence.	Negative Ranks	6	6.58	39.50	.96
		Positive Ranks	6	6.42	38.50	
		Ties	8			
		Total	20			
	4. I am quite aware of how much I know about English writing.	Negative Ranks	7	5.29	37.00	.71
		Positive Ranks	4	7.25	29.00	
		Ties	9			

		Total	20			
	5. I am well aware of some grading rubrics of English expository essays, e.g., the CET-4 essay.	Negative Ranks	4	7.00	28.00	.21
		Positive Ranks	9	7.00	63.00	
		Ties	7			
		Total	20			
	Task					
	1. I think it is very important to understand the requirements of a writing task.	Negative Ranks	3	4.00	12.00	.70
		Positive Ranks	4	4.00	16.00	
		Ties	13			
		Total	20			
	2. I usually set up my writing goals based on the requirements of a writing task.	Negative Ranks	5	5.60	28.00	.64
		Positive Ranks	6	6.33	38.00	
		Ties	9			
		Total	20			
	3. I write according to the genre (e.g., an exposition, a letter, a note) of an essay.	Negative Ranks	3	4.83	14.50	.32
		Positive Ranks	6	5.08	30.50	
		Ties	11			
		Total				
	4. I use my knowledge of English discourse (e.g., thesis statement,	Negative Ranks	6	9.33	56.00	.82
		Positive Ranks	8	6.13	49.00	

	topic sentences, coherence, transitional	Ties	6			
		Total	20			
	5. I have a strong awareness of my readers and my communicatio n with them.	Negative Ranks	4	8.38	33.50	.06
		Positive Ranks	12	8.54	102.50	
		Ties	4			
		Total	20			
	Strategy					
	1. I usually think in English when I write English essays.	Negative Ranks	1	3.50	3.50	.10
		Positive Ranks	5	3.50	17.50	
		Ties	14			
		Total	20			
	2. I tackle the problems that I encounter during the writing process with appropriate remedial strategies.	Negative Ranks	5	7.40	37.00	.17
		Positive Ranks	10	8.30	83.00	
		Ties	5			
		Total	20			
	3. My composing process is usually like this: Analyzing the writing prompt, generating ideas, planning, outlining, drafting, and revising.	Negative Ranks	3	4.50	13.50	.02
		Positive Ranks	10	7.75	77.50	
		Ties	7			
		Total	20			
	4. Based on the situation, I	Negative Ranks	2	6.75	13.50	.02

	would repeat one or more of the above writing steps to revise my essay.	Positive Ranks	11	7.05	77.50	
		Ties	7			
		Total	20			
	5. When writing, I pay more attention to the content development of my essay.	Negative Ranks	6	6.75	40.50	.25
		Positive Ranks	9	8.83	79.50	
		Ties	5			
		Total	20			
Metacognitive Regulation	**Planning**					
	1. Before writing, I pay attention to the genre (e.g., an exposition, a letter, a note) of a writing task.	Negative Ranks	4	3.00	12.00	.18
		Positive Ranks	1	3.00	3.00	
		Ties	15			
		Total	20			
	2. Before writing, I pay attention to the purpose (e.g., to express opinion, to thank someone, to complain about a service) of a writing task.	Negative Ranks	1	3.50	3.50	.03
		Positive Ranks	7	4.64	32.50	
		Ties	12			
		Total	20			
	3. Before writing, I pay attention to the audience (e.g., the instructor, customers, supervisor, classmates, general public...etc.) of a writing task.	Negative Ranks	3	6.67	20.00	.06
		Positive Ranks	10	7.10	71.00	
		Ties	7			
		Total	20			

	4. Before writing, I pay attention to specific parts of the language (e.g., the wording and grammar) of a writing task.	Negative Ranks	4	5.00	20.00	.21
		Positive Ranks	7	6.57	46.00	
		Ties	9			
		Total	20			
	5. Before writing, I consciously recall the model essays related to the writing prompt	Negative Ranks	8	8.38	67.00	.34
		Positive Ranks	6	6.33	38.00	
		Ties	6			
		Total	20			
	Monitoring					
	1. When writing, I check if my essay meets the requirements of the writing task.	Negative Ranks	5	6.00	30.00	.79
		Positive Ranks	5	5.00	25.00	
		Ties	10			
		Total	20			
	2. When writing, I check if the content of my essay is relevant to the topic.	Negative Ranks	8	6.38	51.00	.08
		Positive Ranks	3	5.00	15.00	
		Ties	9			
		Total	20			
	3. When writing, I check if the organization of my essay is logical.	Negative Ranks	3	9.83	29.50	.13
		Positive Ranks	11	6.86	75.50	
		Ties	6			

		Total	20			
	4. When writing, I check if the language of my essay is clear enough.	Negative Ranks	4	6.50	26.00	.50
		Positive Ranks	7	5.71	40.00	
		Ties	9			
		Total	20			
	5. When writing, I check if my word usage is accurate enough.	Negative Ranks	4	5.50	22.00	.16
		Positive Ranks	8	7.00	56.00	
		Ties	8			
		Total	20			
	Evaluating					
	1. After finishing writing, I reflect on the content of my essay to see if any addition or deletion is needed.	Negative Ranks	7	6.64	46.50	.21
		Positive Ranks	4	4.88	19.50	
		Ties	9			
		Total	20			
	2. After finishing writing, I reflect on the accuracy of my grammar.	Negative Ranks	7	7.93	55.50	.18
		Positive Ranks	5	4.50	22.50	
		Ties	8			
		Total	20			
	3. After finishing writing, I reflect on the organization of my essay to	Negative Ranks	3	7.00	21.00	.07
		Positive Ranks	10	7.00	70.00	

	see if it is clear enough.	Ties	7			
		Total	20			
	4. After finishing writing, I reflect on my essay holistically to see if it achieves the goals of the writing task.	Negative Ranks	6	6.00	36.00	.37
		Positive Ranks	4	4.75	19.00	
		Ties	10			
		Total	20			
	5. After finishing writing, I reflect on the composing process of “compose and revise, revise and compose”.	Negative Ranks	4	4.50	18.00	.08
		Positive Ranks	8	7.50	60.00	
		Ties	8			
		Total	20			

APPENDIX 5

The Wilcoxon Test Results for the Experimental Group

Sections	Items	Ranks	N	Mean Rank	Sum of Ranks	Asymp. Sig. (2-tailed)
Metacognitive Knowledge	**Person**					
	1. I am very interested in English writing.	Negative Ranks	4	6.25	25.00	.75
		Positive Ranks	5	4.00	20.00	
		Ties	11			
		Total	20			
	2. I find English writing very easy.	Negative Ranks	5	6.00	30.00	.78
		Positive Ranks	6	6.00	36.00	
		Ties	9			
		Total	20			
	3. I am quite aware of my English writing competence.	Negative Ranks	9	7.33	66.00	.71
		Positive Ranks	6	9.00	54.00	
		Ties	5			
		Total	20			
	4. I am quite aware of how much I know about English writing.	Negative Ranks	3	6.50	19.50	.40
		Positive Ranks	7	5.07	35.50	
		Ties	10			
		Total	20			

	5. I am well aware of some grading rubrics of English expository essays, e.g., the CET-4 essay.	Negative Ranks	3	11.67	35.00	.13
		Positive Ranks	12	7.08	85.00	
		Ties	5			
		Total	20			
	Task					
	1. I think it is very important to understand the requirements of a writing task.	Negative Ranks	2	4.00	8.00	.07
		Positive Ranks	7	5.29	37.00	
		Ties	11			
		Total	20			
	2. I usually set up my writing goals based on the requirements of a writing task.	Negative Ranks	4	4.50	18.00	.08
		Positive Ranks	8	7.50	60.00	
		Ties	8			
		Total	20			
	3. I write according to the genre (e.g., an exposition, a letter, a note) of an essay.	Negative Ranks	5	6.10	30.50	.48
		Positive Ranks	7	6.79	47.50	
		Ties	8			
		Total	20			
	4. I use my knowledge of English discourse (e.g., thesis statement, topic sentences, coherence, transitional	Negative Ranks	4	5.00	20.00	.40
		Positive Ranks	6	5.83	35.00	
		Ties	10			

		Total	20			
	5. I have a strong awareness of my readers and my communicatio n with them.	Negative Ranks	6	6.00	36.50	.49
		Positive Ranks	7	7.86	55.00	
		Ties	7			
		Total	20			
	Strategy					
	1. I usually think in English when I write English essays.	Negative Ranks	2	3.50	7.00	.20
		Positive Ranks	5	4.20	21.00	
		Ties	13			
		Total	20			
	2. I tackle the problems that I encounter during the writing process with appropriate remedial strategies.	Negative Ranks	3	7.33	22.00	.04
		Positive Ranks	11	7.55	83.00	
		Ties	6			
		Total	20			
	3. My composing process is usually like this: Analyzing the writing prompt, generating ideas, planning, outlining, drafting, and revising.	Negative Ranks	5	6.50	32.50	.09
		Positive Ranks	10	8.75	87.50	
		Ties	5			
		Total	20			
	4. Based on the situation, I would repeat one or more of the above writing steps to	Negative Ranks	2	4.00	8.00	.03
		Positive Ranks	8	5.88	47.00	

	revise my essay.	Ties	10			
		Total	20			
	5. When writing, I pay more attention to the content development of my essay.	Negative Ranks	4	4.50	18.00	.30
		Positive Ranks	6	6.17	37.00	
		Ties	10			
		Total	20			
Metacognitive Regulation	**Planning**					
	1. Before writing, I pay attention to the genre (e.g., an exposition, a letter, a note) of a writing task.	Negative Ranks	0	.00	.00	.05
		Positive Ranks	4	2.50	10.00	
		Ties	16			
		Total	20			
	2. Before writing, I pay attention to the purpose (e.g., to express opinion, to thank someone, to complain about a service) of a writing task.	Negative Ranks	2	6.00	12.00	.20
		Positive Ranks	7	4.71	33.00	
		Ties	11			
		Total	20			
	3. Before writing, I pay attention to the audience (e.g., the instructor, customers, supervisor, classmates, general public...etc.) of a writing task.	Negative Ranks	4	5.88	23.50	.37
		Positive Ranks	7	6.07	42.50	
		Ties	9			
		Total	20			

	4. Before writing, I pay attention to specific parts of the language (e.g., the wording and grammar) of a writing task.	Negative Ranks	2	5.00	10.00	.24
		Positive Ranks	6	4.33	26.00	
		Ties	12			
		Total	20			
	5. Before writing, I consciously recall the model essays related to the writing prompt	Negative Ranks	4	5.00	20.00	.75
		Positive Ranks	5	5.00	25.00	
		Ties	11			
		Total	20			
	Monitoring					
	1. When writing, I check if my essay meets the requirements of the writing task.	Negative Ranks	3	4.00	12.00	.36
		Positive Ranks	5	4.80	24.00	
		Ties	12			
		Total	20			
	2. When writing, I check if the content of my essay is relevant to the topic.	Negative Ranks	4	5.50	22.00	.08
		Positive Ranks	9	7.67	69.00	
		Ties	7			
		Total	20			
	3. When writing, I check if the organization of my essay is logical.	Negative Ranks	6	7.50	45.00	.61
		Positive Ranks	6	5.50	33.00	
		Ties	8			

		Total	20			
	4. When writing, I check if the language of my essay is clear enough.	Negative Ranks	5	7.10	35.50	.47
		Positive Ranks	8	6.94	55.50	
		Ties	7			
		Total	20			
	5. When writing, I check if my word usage is accurate enough.	Negative Ranks	3	7.50	22.50	.09
		Positive Ranks	10	6.85	68.50	
		Ties	7			
		Total	20			
	Evaluating					
	1. After finishing writing, I reflect on the content of my essay to see if any addition or deletion is needed.	Negative Ranks	4	5.00	20.00	.76
		Positive Ranks	4	4.00	16.00	
		Ties	12			
		Total	20			
	2. After finishing writing, I reflect on the accuracy of my grammar.	Negative Ranks	5	3.50	17.50	.52
		Positive Ranks	2	5.25	10.50	
		Ties	13			
		Total	20			
	3. After finishing writing, I reflect on the organization of my essay to	Negative Ranks	3	4.50	13.50	.13
		Positive Ranks	7	5.93	41.50	

	see if it is clear enough.	Ties	10			
		Total	20			
	4. After finishing writing, I reflect on my essay holistically to see if it achieves the goals of the writing task.	Negative Ranks	3	6.50	19.50	.40
		Positive Ranks	7	5.07	35.50	
		Ties	10			
		Total	20			
	5. After finishing writing, I reflect on the composing process of “compose and revise, revise and compose”.	Negative Ranks	1	3.00	3.00	.09
		Positive Ranks	5	3.60	18.00	
		Ties	14			
		Total	20			

APPENDIX 6

Mann-Whitney U Test Results for the Pre-test of the Control and Experimental Groups

Sections	Items	Groups	N	Mean Rank	Sum Ranks	of Asymp. Sig. (2-tailed)
Metacognitive Knowledge	**Person**					
	1. I am very interested in English writing.	Control Group	20	21.45	429.00	.60
		Experimental Group	20	19.55	391.00	
		Total	40			
	2. I find English writing very easy.	Control Group	20	19.65	393.00	.63
		Experimental Group	20	21.35	427.00	
		Total	40			
	3. I am quite aware of my English writing competence.	Control Group	20	19.28	385.50	.50
		Experimental Group	20	21.73	434.50	
		Total	40			
	4. I am quite aware of how much I know about English writing.	Control Group	20	20.13	402.50	.83
		Experimental Group	20	20.88	417.50	
		Total	40			
	5. I am well aware of some grading rubrics of English expository essays, e.g., the CET-4 essay.	Control Group	20	23.43	468.50	.10
		Experimental Group	20	17.58	351.50	
		Total	40			
	Task					
	1. I think it is very important to understand the requirements of a writing task.	Control Group	20	23.48	469.50	.07
		Experimental Group	20	17.53	350.50	
		Total	40			
	2. I usually set up my writing goals based on the requirements of a writing task.	Control Group	20	23.03	460.50	.15
		Experimental Group	20	17.98	359.50	
		Total	40			
	3. I write according to the genre (e.g., an exposition, a letter, a note) of an essay.	Control Group	20	22.08	441.50	.36
		Experimental Group	20	18.93	378.50	
		Total	40			
	4. I use my knowledge of English discourse (e.g., thesis statement, topic sentences, coherence, transitional	Control Group	20	22.28	445.50	.31
		Experimental Group	20	18.73	374.50	
		Total	40			

	5. I have a strong awareness of my readers and my communication with them.	Control Group	20	19.78	395.50	.68
		Experimental Group	20	21.23	424.50	
		Total	40			
	Strategy					
	1. I usually think in English when I write English essays.	Control Group	20	18.48	369.50	.26
		Experimental Group	20	22.53	450.50	
		Total	40			
	2. I tackle the problems that I encounter during the writing process with appropriate remedial strategies.	Control Group	20	19.03	380.50	.41
		Experimental Group	20	21.98	439.50	
		Total	40			
	3. My composing process is usually like this: Analyzing the writing prompt, generating ideas, planning, outlining, drafting, and revising.	Control Group	20	18.90	378.00	.37
		Experimental Group	20	22.10	442.00	
		Total	40			
	4. Based on the situation, I would repeat one or more of the above writing steps to revise my essay.	Control Group	20	14.10	282.00	.00
		Experimental Group	20	26.90	538.00	
		Total	40			
	5. When writing, I pay more attention to the content development of my essay.	Control Group	20	18.45	369.00	.25
		Experimental Group	20	22.55	451.00	
		Total	40			
Metacognitive Regulation	**Planning**					
	1. Before writing, I pay attention to the genre (e.g., an exposition, a letter, a note) of a writing task.	Control Group	20	22.28	445.50	.31
		Experimental Group	20	18.73	374.50	
		Total	40			
	2. Before writing, I pay attention to the purpose (e.g., to express opinion, to thank someone, to complain about a service) of a writing task.	Control Group	20	20.53	410.50	.98
		Experimental Group	20	20.48	409.50	
		Total	40			
	3. Before writing, I pay attention to the audience (e.g., the instructor, customers, supervisor,	Control Group	20	19.90	398.00	.73
		Experimental Group	20	21.10	422.00	
		Total	40			

	classmates, general public...etc.) of a writing task.					
	4. Before writing, I pay attention to specific parts of the language (e.g., the wording and grammar) of a writing task.	Control Group	20	19.48	389.50	.56
		Experimental Group	20	21.53	430.50	
		Total	40			
	5. Before writing, I consciously recall the model essays related to the writing prompt	Control Group	20	23.68	473.50	.07
		Experimental Group	20	17.33	346.50	
		Total	40			
	Monitoring					
	1. When writing, I check if my essay meets the requirements of the writing task.	Control Group	20	21.68	433.50	.50
		Experimental Group	20	19.33	386.50	
		Total	40			
	2. When writing, I check if the content of my essay is relevant to the topic.	Control Group	20	23.60	472.00	.08
		Experimental Group	20	17.40	348.00	
		Total	40			
	3. When writing, I check if the organization of my essay is logical.	Control Group	20	17.78	355.50	.12
		Experimental Group	20	23.23	464.50	
		Total	40			
	4. When writing, I check if the language of my essay is clear enough.	Control Group	20	19.43	388.50	.55
		Experimental Group	20	21.58	431.50	
		Total	40			
	5. When writing, I check if my word usage is accurate enough.	Control Group	20	20.95	419.00	.80
		Experimental Group	20	20.05	401.00	
		Total	40			
	Evaluating					
	1. After finishing writing, I reflect on the content of my essay to see if any addition or deletion is needed.	Control Group	20	21.43	428.50	.60
		Experimental Group	20	19.58	391.50	
		Total	40			
	2. After finishing writing, I reflect on the accuracy of my grammar.	Control Group	20	19.08	381.50	.42
		Experimental Group	20	21.93	438.50	
		Total	40			
	3. After finishing writing, I reflect on the organization of my essay to see if it	Control Group	20	18.08	361.50	.17
		Experimental Group	20	22.93	458.50	
		Total	40			

	is clear enough.					
	4. After finishing writing, I reflect on my essay holistically to see if it achieves the goals of the writing task.	Control Group	20	18.60	372.00	.28
		Experimental Group	20	22.40	448.00	
		Total	40			
	5. After finishing writing, I reflect on the composing process of “compose and revise, revise and compose”.	Control Group	20	16.25	325.00	.01
		Experimental Group	20	24.75	495.00	
		Total	40			

APPENDIX 7

Mann-Whitney U Test Results for the Post-test of the Control and Experimental Groups

Sections	Items	Groups	N	Mean Rank	Sum Ranks	of Asymp. Sig. (2-tailed)
Metacognitive Knowledge	**Person**					
	1. I am very interested in English writing.	Control Group	20	21.73	434.50	.50
		Experimental Group	20	19.28	385.50	
		Total	40			
	2. I find English writing very easy.	Control Group	20	20.10	402.00	.82
		Experimental Group	20	20.90	418.00	
		Total	40			
	3. I am quite aware of my English writing competence.	Control Group	20	19.38	387.50	.53
		Experimental Group	20	21.63	432.50	
		Total	40			
	4. I am quite aware of how much I know about English writing.	Control Group	20	18.83	376.50	.35
		Experimental Group	20	22.18	443.50	
		Total	40			
	5. I am well aware of some grading rubrics of English expository essays, e.g., the CET-4 essay.	Control Group	20	23.40	468.00	.10
		Experimental Group	20	17.60	352.00	
		Total	40			
	Task					
	1. I think it is very important to understand the requirements of a writing task.	Control Group	20	21.88	437.50	.42
		Experimental Group	20	19.13	382.50	
		Total	40			
	2. I usually set up my writing goals based on the requirements of a writing task.	Control Group	20	21.60	432.00	.53
		Experimental Group	20	19.40	388.00	
		Total	40			
	3. I write according to the genre (e.g., an exposition, a letter, a note) of an essay.	Control Group	20	22.13	442.50	.36
		Experimental Group	20	18.88	377.50	
		Total	40			
	4. I use my knowledge of English discourse (e.g., thesis statement, topic sentences, coherence, transitional	Control Group	20	21.25	425.00	.67
		Experimental Group	20	19.75	395.00	
		Total	40			

	5. I have a strong awareness of my readers and my communication with them.	Control Group	20	20.90	418.00	.82
		Experimental Group	20	20.10	402.00	
		Total	40			
	Strategy					
	1. I usually think in English when I write English essays.	Control Group	20	18.50	370.00	.27
		Experimental Group	20	22.50	450.00	
		Total	40			
	2. I tackle the problems that I encounter during the writing process with appropriate remedial strategies.	Control Group	20	19.20	384.00	.46
		Experimental Group	20	21.80	436.00	
		Total	40			
	3. My composing process is usually like this: Analyzing the writing prompt, generating ideas, planning, outlining, drafting, and revising.	Control Group	20	18.78	375.50	.33
		Experimental Group	20	22.23	444.50	
		Total	40			
	4. Based on the situation, I would repeat one or more of the above writing steps to revise my essay.	Control Group	20	14.30	286.00	.00
		Experimental Group	20	26.70	534.00	
		Total	40			
	5. When writing, I pay more attention to the content development of my essay.	Control Group	20	18.80	376.00	.34
		Experimental Group	20	22.20	444.00	
		Total	40			
Metacognitive Regulation	**Planning**					
	1. Before writing, I pay attention to the genre (e.g., an exposition, a letter, a note) of a writing task.	Control Group	20	19.95	399.00	.75
		Experimental Group	20	21.05	421.00	
		Total	40			
	2. Before writing, I pay attention to the purpose (e.g., to express opinion, to thank someone, to complain about a service) of a writing task.	Control Group	20	21.23	424.50	.68
		Experimental Group	20	19.78	395.50	
		Total	40			
	3. Before writing, I pay attention to the audience (e.g., the instructor, customers, supervisor,	Control Group	20	20.80	416.00	.86
		Experimental Group	20	20.20	404.00	
		Total	40			

	classmates, general public...etc.) of a writing task.					
	4. Before writing, I pay attention to specific parts of the language (e.g., the wording and grammar) of a writing task.	Control Group	20	18.55	371.00	.27
		Experimental Group	20	22.45	449.00	
		Total	40			
	5. Before writing, I consciously recall the model essays related to the writing prompt	Control Group	20	22.38	447.50	.29
		Experimental Group	20	18.63	372.50	
		Total	40			
	Monitoring					
	1. When writing, I check if my essay meets the requirements of the writing task.	Control Group	20	20.00	400.00	.77
		Experimental Group	20	21.00	420.00	
		Total	40			
	2. When writing, I check if the content of my essay is relevant to the topic.	Control Group	20	20.15	403.00	.84
		Experimental Group	20	20.85	417.00	
		Total	40			
	3. When writing, I check if the organization of my essay is logical.	Control Group	20	20.40	408.00	.95
		Experimental Group	20	20.60	412.00	
		Total	40			
	4. When writing, I check if the language of my essay is clear enough.	Control Group	20	18.73	374.50	.32
		Experimental Group	20	22.28	445.50	
		Total	40			
	5. When writing, I check if my word usage is accurate enough.	Control Group	20	19.90	398.00	.73
		Experimental Group	20	21.10	422.00	
		Total	40			
	Evaluating					
	1. After finishing writing, I reflect on the content of my essay to see if any addition or deletion is needed.	Control Group	20	20.28	405.50	.90
		Experimental Group	20	20.73	414.50	
		Total	40			
	2. After finishing writing, I reflect on the accuracy of my grammar.	Control Group	20	18.13	362.50	.19
		Experimental Group	20	22.88	457.50	
		Total	40			
	3. After finishing writing, I reflect on the organization of my essay to see if it	Control Group	20	18.95	379.00	.39
		Experimental Group	20	22.05	441.00	
		Total	40			

	is clear enough.					
	4. After finishing writing, I reflect on my essay holistically to see if it achieves the goals of the writing task.	Control Group	20	16.93	338.50	.04
		Experimental Group	20	24.08	481.50	
		Total	40			
	5. After finishing writing, I reflect on the composing process of “compose and revise, revise and compose”.	Control Group	20	15.88	317.50	.01
		Experimental Group	20	25.13	502.50	
		Total	40			

Özgeçmiş

KİŞİSEL BİLGİLER

Adı Soyadı: Ece Hatice BERK

Uyruğu: T.C.

EĞİTİM

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YABANCI DİLLER

İleri düzeyde İngilizce.