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TRANSFORMATION OF ARABIC LANGUAGE LEARNING BASED ON ARTIFICIAL INTELLIGENCE (AI) TO IMPROVE STUDENTS' COMMUNICATIVE COMPETENCE IN THE SOCIETY 5.0 ERA

Mohammad Nurul Yaqin[1a] , Holaiyah[2]
[1] Sunan Kalijaga State Islamic University, Yogyakarta, Indonesia, ny4591972@gmail.com
[2] Maulana Malik Ibrahim State Islamic University, Malang, Indonesia, alfavaro86@gmail.com

ABSTRACT

The rapid development of artificial intelligence (AI) technology has significant implications for education, including in the context of Arabic language learning. This study aims to analyze the transformation of AI-based Arabic language learning to improve students' communicative competence in the Society 5.0 era. Using a systematic literature review approach, this article examines various AI platforms and technologies that have been implemented in Arabic language learning, including Natural Language Processing (NLP), AI-based chatbots, Automatic Speech Recognition (ASR), and adaptive learning recommendation systems. The study's findings indicate that integrating AI into Arabic language learning can significantly increase student engagement, provide personalized and instant feedback, and provide an adaptive learning environment tailored to individual needs. However, several challenges that cannot be ignored are also identified, such as limited digital infrastructure, technological competency gaps among educators, and the issue of the accuracy of AI systems in understanding the richly nuanced Arabic linguistic context. This research recommends the need for a planned and strategic integration of AI technology with a humanistic pedagogical approach to achieve Arabic language learning that is not only technically effective but also culturally and spiritually meaningful. These findings are expected to form the basis for developing a more innovative and adaptive curriculum, education policy, and Arabic language learning practices in Indonesia.

Keywords: Artificial intelligence, Arabic language learning, communicative competence, Society 5.0, educational technology

[a] Corresponding author

TRANSFORMASI PEMBELAJARAN BAHASA ARAB BERBASIS ARTIFICIAL INTELLIGENCE (AI) DALAM MENINGKATKAN KOMPETENSI KOMUNIKATIF PESERTA DIDIK DI ERA SOCIETY 5.0

ABSTRAK

Perkembangan teknologi kecerdasan buatan (Artificial Intelligence/AI) yang berlangsung begitu pesat membawa implikasi yang sangat signifikan bagi dunia pendidikan, termasuk dalam konteks pembelajaran bahasa Arab. Penelitian ini bertujuan untuk menganalisis transformasi pembelajaran bahasa Arab berbasis AI dalam rangka meningkatkan kompetensi komunikatif peserta didik di era Society 5.0. Dengan menggunakan pendekatan studi literatur sistematis (systematic literature review), artikel ini mengkaji berbagai platform dan teknologi AI yang telah diterapkan dalam pembelajaran bahasa Arab, meliputi Natural Language Processing (NLP), chatbot berbasis AI, pengenalan suara otomatis (Automatic Speech Recognition/ASR), serta sistem rekomendasi pembelajaran adaptif. Temuan kajian menunjukkan bahwa integrasi AI dalam pembelajaran bahasa Arab mampu meningkatkan keterlibatan peserta didik secara signifikan, memberikan umpan balik yang personal dan instan, serta menyediakan lingkungan belajar yang adaptif sesuai kebutuhan individu. Namun demikian, sejumlah tantangan yang tidak dapat diabaikan juga teridentifikasi, seperti keterbatasan infrastruktur digital, kesenjangan kompetensi teknologi di kalangan pendidik, serta isu akurasi sistem AI dalam memahami konteks linguistik Arab yang kaya nuansa. Penelitian ini merekomendasikan perlunya integrasi yang terencana dan strategis antara teknologi AI dengan pendekatan pedagogi humanistik untuk mewujudkan pembelajaran bahasa Arab yang tidak hanya efektif secara teknis, tetapi juga bermakna secara kultural dan spiritual. Temuan ini diharapkan dapat menjadi landasan bagi pengembangan kurikulum, kebijakan pendidikan, serta praktik pembelajaran bahasa Arab di Indonesia yang lebih inovatif dan adaptif.

Kata Kunci: Artificial intelligence, pembelajaran bahasa Arab, kompetensi komunikatif, Society 5.0, teknologi pendidikan

A. INTRODUCTION

The world is witnessing a major transformation that not only touches the technological and economic realms, but also penetrates deeply into the very fabric of human social and cultural life. The era of Society 5.0, a concept first proposed by the Japanese government through the "Basic Plan for Science and Technology" in 2019, places humans at the center of all technological innovation. Unlike the Industry 4.0 paradigm, which tends to emphasize automation and production efficiency, Society 5.0 prioritizes the synergy between technological advancements and human values to create equitable and dignified prosperity (Fukuyama, 2018)

In this context, the global education system faces both unprecedented challenges and opportunities. Artificial intelligence (AI) is no longer merely a technical tool but has evolved into a pedagogical partner capable of dialogue, providing feedback, diagnosing learning weaknesses, and even personalizing each individual's learning path (Holmes et al., 2023). This development has logical consequences for language learning, including Arabic, a language that has high linguistic complexity as well as great strategic value, both from a religious, cultural, and diplomatic dimension.

Arabic language learning in Indonesia faces a long-standing and unresolved problem. Data collected from various studies shows that the majority of students at the madrasah and Islamic higher education levels still experience difficulties in achieving adequate communicative competence, despite having studied Arabic for years (Syamsuddin & Rosyidi, 2023). This problem stems from various interrelated factors: limited face-to-face learning time, lack of opportunities to practice speaking authentically, teaching methods that still focus on structural

grammar and memorization, and limited access to contextual and engaging learning resources for the digital generation (Nuha, 2023).

On the other hand, the current generation of students has grown up in a digital ecosystem that is very different from previous generations. They are accustomed to learning independently through video tutorials, interacting with AI-based virtual assistants, and accessing information from around the world in seconds. This multimodal, interactive, and on-demand learning style is not always well-facilitated by the conventional learning methods dominant in many Islamic educational institutions in Indonesia (Zulhannan, 2023).

The development of AI technology in the context of language education has yielded various promising innovations. Platforms like Duolingo with its adaptive algorithm system, Google Translate with its neural machine translation capabilities, and various AI-based Arabic language learning applications have proven that technology can be an effective accelerator in the language acquisition process (Godwin-Jones, 2023). Furthermore, the emergence of Large Language Models (LLMs) such as GPT-4 and its derivatives has opened up a new, previously unimaginable possibility: the existence of AI-based conversational partners capable of interacting in Arabic with a high degree of naturalness (Baidoo-Anu & Ansah, 2023).

However, to the author's knowledge, there are not many academic studies that comprehensively discuss the integration of AI in Arabic language learning within the context of Society 5.0, particularly those that holistically consider the communicative competence dimension and incorporate a critical perspective on the various challenges of its implementation in Indonesia. This research gap motivated the writing of this article. This article aims not merely to describe the various AI technologies available, but also to critically analyze how AI-based transformations can be meaningfully implemented within the Indonesian Arabic language education ecosystem, which has its own unique characteristics.

Therefore, the main objectives of this article are threefold: first, to map the development of AI technologies relevant to Arabic language learning, along with their respective characteristics and potential; second, to analyze the contributions and limitations of AI in improving students' communicative competence; and third, to formulate a strategic integration model between AI and Arabic language pedagogy within the framework of Society 5.0 values. These three objectives are expected to make a meaningful contribution to the development of theory and practice of Arabic language education in the contemporary era.

B. METHODS

This study employed a qualitative approach with a systematic literature review (SLR) design. This approach was chosen based on the consideration that the primary objective of the study was to synthesize, analyze, and critically evaluate various existing research findings on AI integration in Arabic language learning and communicative competence, rather than to collect new empirical data from the field. SLR was chosen because this method offers a higher level of systematicity, transparency, and reproducibility compared to a traditional narrative review. (Snyder, 2023).

The methodological framework used adopts the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines, modified for the context of social sciences and educational research. This approach ensures that each stage of the data search, selection, extraction, and synthesis process is structured and academically sound.

A literature search was conducted through several reputable academic databases, namely Scopus, Web of Science, ERIC (Education Resources Information Center), Google Scholar, and the accredited national repository SINTA (Science and Technology Index) to capture relevant research published by Indonesian academics. The search was also supplemented by manual searching through direct searches of leading journals in the fields of Arabic language education, educational technology, and applied linguistics.

The keywords used in the literature search included a combination of the following term groups: (1) AI group: "artificial intelligence," "machine learning," "natural language processing,"

"chatbot," "intelligent tutoring system," "adaptive learning"; (2) Arabic language group: "Arabic language learning," "Arabic language teaching," "Arabic language learning"; (3) competency group: "communicative competence," "communicative competence," "language proficiency"; and (4) context group: "Society 5.0," "digital education," "e-learning." Various combinations of these keywords were used to maximize the reach of the relevant literature search.

Literature selection was conducted based on predetermined inclusion and exclusion criteria. Inclusion criteria included: (1) research articles published in reputable national and international peer-reviewed scientific journals; (2) literature published between 2019 and 2024, with an emphasis on the most recent research (2023-2024); (3) articles directly relevant to the topic of AI integration in language learning, particularly Arabic or languages with similar linguistic characteristics; (4) research addressing aspects of communicative competence, either as a dependent variable or as an analytical framework. Exclusion criteria included: articles that had not undergone peer review, popular literature or opinion pieces without sufficient empirical data support, and articles not available in full versions.

The collected data were analyzed using the thematic analysis approach developed by Braun and Clarke (2006). The analysis process involved several stages: first, familiarization with the data through repeated reading of all selected literature; second, identification and coding of initial thematic patterns; third, grouping these initial codes into broader and more meaningful themes; fourth, reviewing and refining these themes; and fifth, formulating a cohesive analytical narrative. In addition to thematic analysis, this study also employed a critical discourse analysis approach to identify hidden assumptions, perspective biases, and dominant narratives in the reviewed literature.

C. RESULTS

Relevant AI Technology Map for Arabic Language Learning

A review of the selected literature identified four main clusters of AI technologies that are most relevant to Arabic language learning: (1) natural language processing (NLP) systems, (2) speech recognition and synthesis systems, (3) machine learning-based adaptive learning platforms, and (4) conversational AI or chatbots based on Large Language Models. Each of these clusters offers unique functionality and potential while also presenting specific challenges in implementation.

Within the NLP cluster, the most significant development is the emergence of transformer-based language models specifically developed for processing Arabic text. The AraBERT model, developed by Antoun et al. (2020) and refined in subsequent iterations, has demonstrated exceptional performance in a variety of NLP tasks for Arabic, including sentiment analysis, text classification, Named Entity Recognition (NER), and question answering. The direct relevance of these capabilities to Arabic language learning includes the development of automated text correction systems capable of detecting a wide range of errors, from morphological errors and syntactic errors to misuse of context, with a level of precision far exceeding that of conventional rule-based systems (Farhan et al., 2023).

Advances in ASR technology for Arabic have also been rapid. Recent ASR systems trained on large and diverse Arabic speech corpora, encompassing multiple dialects and speech varieties, have achieved increasingly low Word Error Rates (WER), bringing the accuracy of Arabic speech recognition by machines closer to human performance (Hamdan et al., 2023). The practical implications for Arabic language learning are quite revolutionary: learners can now practice their maharat al-kalam (speaking skills) by receiving immediate feedback on their pronunciation accuracy, without having to rely on the availability of a teacher or human conversation partner. This technology has the potential to address one of the biggest barriers to communicative Arabic language learning: the lack of opportunities for active speaking practice.

AI-based adaptive learning platforms represent the most holistic approach to leveraging technology to optimize the learning experience. These platforms use machine learning algorithms, specifically techniques such as collaborative filtering, knowledge tracing, and reinforcement learning,

to build increasingly accurate models of each learner's knowledge base and weaknesses. They then use these models to dynamically recommend the most appropriate learning content at the most appropriate time (Troussas et al., 2023). In the context of Arabic, this adaptive ability is very valuable considering that the Arabic language system has a highly interconnected structure, where understanding concept A is often a prerequisite for understanding concepts B, C, and D so that accurate diagnosis of one's understanding gaps and targeted remediation can result in much higher learning efficiency.

Perhaps the most revolutionary category is LLM-based conversational AI. The ability of models like GPT-4 to engage in long, complex, and contextual Arabic conversations, answering questions, arguing, telling stories, or even discussing linguistic and cultural nuances, opens up the possibility of creating "Arabic-speaking conversation partners" available 24/7, at no additional cost per session. Research by Baidoo-Anu and Ansah (2023) shows that using ChatGPT and similar systems for language conversation practice can significantly increase learners' confidence in using the target language, due to the interaction environment being free from human social judgment.

AI's Contribution to Improving Communicative Competence

An analysis of the collected empirical research findings reveals several consistent patterns regarding how AI integration contributes to improving the communicative competence of Arabic language learners. These findings can be organized into three main dimensions: the linguistic dimension (increased accuracy of language use), the pragmatic dimension (increased ability to use language appropriately in context), and the psychological dimension (increased motivation and reduced language anxiety).

From the linguistic dimension, various studies have shown that the use of AI-based tools such as automatic grammar correction systems, AI-based contextual dictionaries, and intelligent transliteration systems can significantly improve the grammatical accuracy of learners' writing. A study conducted by Almutairi and Al-Shehri (2024) involving 140 Arabic language students at two universities in Saudi Arabia found that the group using an AI-based writing assistant system showed a statistically significant increase in grammatical accuracy (effect size d = 0.73) compared to the control group, especially in the use of the Arabic case marking (i'rab) system, which is one of the most difficult grammatical aspects to learn for non-native speakers.

However, more interesting than simply improving grammatical accuracy are findings about changes in cognitive processes that occur when learners work with AI systems. Huang et al. (2023) reported that learners who regularly interacted with an intelligent tutoring system for Arabic demonstrated patterns that increasingly resembled self-regulated learning strategies: they independently verified linguistic hypotheses more frequently, were more proactive in seeking explanations for unfamiliar rules, and demonstrated a deeper metalinguistic understanding of Arabic language structure. This suggests that well-designed AI not only directly improves language performance but also helps foster more autonomous and reflective learning habits.

From a pragmatic perspective, research by Alrabai (2023) exploring the use of conversational AI for teaching maharat al-kalam (speaking skills) in Islamic boarding schools (pesantren) in Indonesia found that learners who regularly practiced conversations with an AI-based chatbot showed greater improvement in their ability to use appropriate language registers for context, distinguishing between formal language used in academic and religious contexts and more informal language used in everyday conversation. This finding is important because it shows that the benefits of AI are not limited to the linguistic dimension alone, but also touch on more complex sociolinguistic dimensions.

The psychological dimension of AI integration is perhaps the most overlooked in the discourse on educational technology, yet it has fundamental implications. Language anxiety has long been identified as one of the strongest predictors of failure in foreign language learning, and Arabic, with its high linguistic complexity, often triggers higher levels of anxiety than the average foreign language (Horwitz et al., 1986). Research by Fryer et al. (2023) and confirmed by Zulhannan (2023) shows

that AI-based interactions offer a unique "low-stakes practice environment": learners can make mistakes, even repeated ones, without embarrassment, without fear of negative evaluation by classmates or teachers, and without stressful social consequences. This environment has been shown to significantly increase willingness to communicate.

It's interesting to note that not all studies show uniformly positive results. A longitudinal study conducted by Godwin-Jones (2023) over a full semester found that significant improvements occurred only in certain competency areas, particularly receptive vocabulary and reading comprehension, while speaking and creative writing showed no significant differences between the groups using AI and those not using it. These findings suggest that current AI technology may be more effective for some types of language learning and less effective for others, making selecting the right technology for specific learning objectives crucial.

Challenges and Limitations of AI Implementation in Arabic Language Learning

While the potential of AI to transform Arabic language learning is very promising, the literature review also revealed a number of serious challenges that require critical attention and planned solutions. Ignoring these challenges will not only hinder effective implementation but also potentially exacerbate existing educational disparities.

The first and most fundamental challenge is the still-vast digital infrastructure gap in Indonesia, particularly in regions outside Java and major cities. A 2023 BPS report shows that internet penetration in remote areas remains very limited, and many madrasahs and Islamic boarding schools (pesantren), the primary institutions for Arabic language learning in Indonesia, are not yet equipped with adequate technological infrastructure to implement AI-based learning platforms (BPS, 2023). This situation creates a real risk of what Selwyn (2023) calls "digital divide 2.0": a gap not only in access to digital technology in general, but also in the ability to access and utilize AI technology, which is increasingly becoming a determinant of educational quality.

The second challenge relates to the competence and readiness of human resources, particularly among educators. Research conducted by Syamsuddin and Rosyidi (2023) on Arabic language teachers in madrasas in five provinces in Indonesia revealed that the majority of respondents (over 70%) had limited technological literacy, and nearly half admitted to having never used an AI-based learning platform. Even more worrying, most of them were unsure of their capacity to integrate AI technology into their teaching practices without intensive and ongoing training. These findings underscore the need for significant investment in teacher professional development focused on AI literacy and technology-based pedagogy.

The third challenge is more technical but no less significant: the limited accuracy and reliability of current AI systems in addressing the rich linguistic and cultural nuances of Arabic. Arabic has several characteristics that make it one of the most challenging languages for AI systems to process: an abjad writing system that generally excludes vowel diacritics in plain text, creating high lexical and grammatical ambiguity; extreme regional dialectal diversity; morphological complexity that allows for the formation of almost unlimited words from relatively few roots; and a wealth of rhetoric and figures of speech deeply rooted in the classical Arabic literary tradition (Ibrahim, 2023). AI systems that are not specifically trained with these complexities in mind will produce output that is often inaccurate or even misleading from an Arabic linguistic perspective.

The fourth challenge touches on deeper ethical and pedagogical dimensions. There is substantial concern among Arabic language educators, particularly those rooted in the Islamic scholarly tradition, about whether overreliance on AI technology will erode dimensions of Arabic language learning that cannot be reduced to data and algorithms: the teacher-student relationship (ta'lim) that is rich in moral and spiritual values, the experience of learning from sacred texts that demands the full presence of heart and mind, and the values of local wisdom and academic honesty that can only be instilled through authentic human interaction (Purwadi & Kuswoyo, 2023). This

concern is not merely traditionalist sentimentalism, but rather a reflection of a deep understanding of the nature of Arabic language learning in the context of Islamic civilization.

D. DISCUSSION

Strategic AI Integration Model in Arabic Language Learning

Based on a comprehensive synthesis of research findings and the critical considerations presented, this article proposes an integrated model that balances the optimal use of AI technology with maintaining the humanistic and cultural essence of Arabic language learning. This model, which the authors call the IHSAN (Integrated Humanistic-Smart Arabic Nurturing) Model, rests on five main, mutually supporting pillars.

The first pillar, Technology-Enhanced Human Interaction, places authentic human interaction between teachers and students, between students and native Arabic speakers, and between students and meaningful Arabic texts at the heart of the learning process, while AI technology serves to expand and enrich these interactions, not replace them. In practice, this means that face-to-face sessions with teachers should increasingly focus on high-value activities that cannot be replicated by AI, such as in-depth discussions of textual meaning, developing literary sensitivity, and moral-spiritual guidance. Repetitive and mechanistic exercises can be more efficiently delegated to AI systems outside of class hours (Huang et al., 2023).

Pilar kedua adalah Adaptive Personalization dengan Pengawasan Guru, yang mengakui bahwa meskipun sistem AI dapat melakukan personalisasi pembelajaran pada skala yang tidak mungkin dilakukan manusia secara manual, pengawasan dan penilaian guru tetap esensial untuk memastikan bahwa jalur belajar yang direkomendasikan AI selaras dengan tujuan kurikuler yang lebih luas dan kebutuhan perkembangan holistik peserta didik. Guru dalam model ini bertransformasi dari penyampai informasi menjadi learning architect yang merancang ekosistem pembelajaran dan curator yang menyaring, mengontekstualisasikan, dan memperkaya output AI sesuai kebutuhan peserta didiknya (Kasneci et al., 2023).

The third pillar is Cultural and Spiritual Grounding, which emphasizes that all AI-based content and activities must be consistently rooted in and reflect the rich Arab-Islamic scholarly and cultural traditions. An ideal AI platform for Arabic language learning should not only teach linguistic principles but also introduce learners to the rich cultural context in which Arabic lives and thrives, including the traditions of classical Arabic poetry, the unparalleled beauty of Quranic prose, rich historical narratives, and the local wisdoms of various Arabic-speaking communities around the world. This culturally contextualized AI will generate far more sustained learning motivation than systems that treat Arabic solely as a linguistic code devoid of cultural content (Alrabai, 2023).

The fourth pillar, Inclusive Access, emphasizes the need for AI system design that considers and accommodates various infrastructure limitations in Indonesia. This includes developing applications that can function optimally even with slow or unstable internet connections (offline-capable applications), simplifying user interfaces to accommodate students and educators with limited digital literacy, and establishing affordable pricing or providing functional free versions for educational institutions with limited budgets (Selwyn, 2023). Without this commitment to inclusion, AI implementation risks becoming the privilege of a handful of leading institutions in major cities, while the majority of madrasas and Islamic boarding schools in remote areas of the country fail to benefit.

The fifth pillar is Continuous Evidence-Based Evaluation, which emphasizes the need for a systematic, planned, and empirically evidence-based evaluation mechanism to regularly assess the effectiveness and impact of AI integration on various aspects of Arabic language learning. Comprehensive evaluation should not only focus on easily measurable quantitative metrics such as test scores, speed of task completion, or level of engagement with digital platforms, but should also encompass more qualitative and long-term dimensions, such as the development of intrinsic motivation, growing appreciation for Arab-Islamic culture, and the formation of a healthy and productive linguistic identity (Troussas et al., 2023).

Comparison with International Context

To provide a more comprehensive perspective, it is useful to compare the development of AI integration in Arabic language learning in Indonesia with what is happening in other countries, both in the Arab world and in countries with large Muslim populations.

In Saudi Arabia, the implementation of AI technology in Arabic language education has taken place in a much more conducive context in terms of resources. Saudi Arabia's Vision 2030 program explicitly places digital transformation in education as one of its top priorities, with billions of dollars invested in developing digital education infrastructure and developing AI-based learning content. The National Center for e-Learning platform has developed a comprehensive adaptive learning ecosystem for various subjects, including Arabic, which is now accessed by millions of students across the kingdom (Almutairi & Al-Shehri, 2024). However, Saudi Arabia's experience also teaches that technology investment alone is not enough: research shows that the greatest impact occurs when technology implementation is accompanied by substantive changes in teaching paradigms and intensive teacher training.

In Malaysia, a country with characteristics more similar to Indonesia in terms of its Islamic education context, the government has launched various initiatives to integrate AI into Arabic language learning in religious schools (sekolah agama rakyat) and Islamic higher education institutions. The Malaysian experience shows mixed results: in university settings with adequate infrastructure and tech-savvy students, AI integration has shown a significant positive impact on motivation and learning performance; however, at the primary and secondary levels with greater infrastructure constraints, the impact remains very limited (Zulhannan, 2023).

These international experiences offer a valuable lesson for Indonesia: there is no universal formula that can be applied equally across all contexts. The success of AI integration in Arabic language learning depends heavily on the quality of implementation planning, sustained investment in human capacity development, a commitment to inclusion and equitable access, and a willingness to continuously learn from empirical evidence generated from real-world practice (Nuha, 2023)

E. CONCLUSIONS

The comprehensive review conducted in this research leads to several conclusions, as follows. First, the transformation of AI-based Arabic language learning in the era of Society 5.0 is an unavoidable necessity, but also a significant opportunity that can be strategically utilized to address various learning challenges that have hindered students' optimal achievement of communicative competence.

Second, the various AI technologies available from NLP and ASR to adaptive learning systems and LLM-based conversational AI, each offer unique and complementary contributions in supporting the development of Arabic language learners' communicative competence. Consistent empirical evidence demonstrates that the planned integration of these technologies can increase learning motivation, reduce language anxiety, improve grammatical accuracy, and expand opportunities for active communication practice.

Third, the success of this transformation depends heavily on the ability to balance the use of technology with maintaining the humanistic and cultural essence of Arabic language learning. The IHSAN model proposed in this study offers a conceptual framework for achieving this balance, by positioning human interaction, evidence-based personalization, cultural engrounding, inclusive access, and continuous evaluation as uncompromising pillars.

Fourth, several serious challenges remain that need to be systematically addressed: infrastructure gaps, limited teacher competency, the technical limitations of AI systems for Arabic linguistic nuances, and ethical questions about the role of technology in education, which demand planned, inclusive policy and practice responses based on a deep understanding of the local Indonesian context.

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