



MIRZO ULUG'BEK NOMIDAGI
O'ZBEKISTON MILLIY UNIVERSITETINING
JIZZAX FILIALI

**ZAMONAVIY INNOVATSION
TADQIQOTLARNING
DOLZARB MUAMMOLARI
VA RIVOJLANISH
TENDENSIYALARI:
YECHIMLAR VA ISTIQBOLLAR
RESPUBLIKA ILMIY-TEXNIK
ANJUMAN MATERIALLARI
TO'PLAMI**



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**O‘ZBEKISTON RESPUBLIKASI OLIY TA’LIM, FAN VA
INNOVATSIYALAR VAZIRLIGI**

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3. Hasanboyev J., To'raqulov X., Haydarov M., Hasanboyeva O., *Pedagogika fanidan izohli lug'at.* – Toshkent: «Fan va texnologiya» nashriyoti, 2008. – 480 b.
 4. Hughes, S. *The webbing way: Integrating the curriculum through writing.* Winnipeg, Canada: Peguis Publishers. 1994
 5. Jacobs H. *Interdisciplinary curriculum: design and implementation.* Alexandria, VA: ASCD. 1998
 6. Kayumova N.A. *Elektron ta'lim muhitida bo'lajak informatika o'qituvchilarini integrativ yondashuv asosida tayyorlash metodikasini takomillashtirish.* *Pedagogika fanlari doktori (DSc) ilmiy darajasini olish uchun yozilgan dissertatsiya.* Toshkent – 2022. 306 b.
 7. Le Trung Hieu, Nguyen Danh Nam. *The teacher's competence of integrated teaching at primary school science.* *International Annual Meeting on STEM Education (I AM STEM) 2018.* IOP Publishing. IOP Conf. Series: Journal of Physics: Conf. Series 1340 (2019) 012023. doi:10.1088/1742-6596/1340/1/012023
 8. Загуменных, К.Э. *Педагогические условия формирования основ профессионализма учителя безопасности жизнедеятельности: дис.... канд. пед. наук: 13.00.08 / Загуменных Кирилл Эрнстович.* - Курск, 2007. - 227 с.
 9. Зимняя, И.А. *Ключевые компетентности как результативно-целевая основа компетентного подхода в образовании [Текст]: материалы к 1 -му заседанию метод, семинара 20 мая 2004 г. / И.А. Зимняя.* – Моек Исследовательский центр проблем качества подготовки специалистов-2004 с.
 10. Макаренкова, Т.Ю. *Педагогическая мастерская как фактор совершенствования профессионализма учителя: дисс.... канд. пед. наук: 13.00.08 / Макаренкова Татьяна Юрьевна.* - М., 2009. - 208 с.
 11. Ожегов С. И., Шведова Н. Ю. *Толковый словарь русского языка/ Российская академия наук. Институт русского языка имени В. В.Виноградова.* - 4-е изд., доп. —М.: Азбуковник, 1997. -С. 3-5. -944 с. <https://ru.wikipedia>.
 12. Самсиков С. А. *Интегративный подход к подготовке учителей начальных классов. Диссертация на соискание ученой степени кандидата педагогических наук.* Рязань: 2000 г. 215 с.
 13. Судариков, Д.В. *Управление становлением профессионализма учителя в условиях модернизации образования: автореф. дис. ... канд. пед. наук: 13.00.08 / Судариков Денис Валентинович.* - Томск, 2010. - 24 с.
- Чуватова, Н.Е. *Педагогические ценности как основа профессионализма личности учителя: дисс. ... канд. пед. наук: 13.00.01 / Чуватова Надежда Евгеньевна.* - Саранск,

**THE ROLE OF ARTIFICIAL INTELLIGENCE TOOLS IN THE
MODULAR STRUCTURE OF A FOREIGN LANGUAGE TEACHING
PLATFORM BASED ON COGNITIVE AND CONSTRUCTIVIST
APPROACHES (GENERATIVE AI, NLP)**

**Turakulov Olim Xolbutayevich, p.f.d., (DS), O'zMU Jizzax filiali, Kompyuter
ilmlari va dasturlashtirish kafedراس professori**

olimxolbotaevich@gmail.com

Abdumalikov Akmaljon Abduxoliq o'g'li, t.f.f.d., (PhD), O'zMU Jizzax filiali, Kompyuter ilmlari va dasturlashtirish kafedrası professori

akmalabdumalikov6@gmail.com

Kayumov Oybek Achilovich, p.f.f.d., (PhD), O'zMU Jizzax filiali, Kompyuter ilmlari va dasturlashtirish kafedrası dotsenti

oybekuzonlined3@gmail.com

Aliyeva Raykhona Makhmud qizi, O'zMU Jizzax filiali, Kompyuter ilmlari va dasturlash texnologiyalari yo'nalishi talabasi

rayxonaaliyeva202@gmail.com

Madina Yo'ldosheva Salim qizi, O'zMU Jizzax filiali, Kompyuter ilmlari va dasturlash texnologiyalari yo'nalishi talabasi

madina0620yuldosheva@gmail.com

Abstract. This article develops a modular architecture of a foreign language teaching platform based on cognitive and constructivist approaches. The proposed model consists of basic and auxiliary modules. The functional role of generative artificial intelligence and natural language processing tools is analyzed.

Keywords: cognitive language learning, constructivism, modular platform, generative AI, NLP, adaptive teaching.

Introduction

The development of modern information technologies has led to the widespread adoption of digital platforms for foreign language teaching, including Duolingo, Babel, Memrise, and Busuu. These platforms provide users with convenient interfaces, gamification elements, and automated exercises. However, numerous studies [1, 2] indicate that most of these platforms are based on behaviorist principles – the stimulus-response-reinforcement scheme – and remain distant from robust pedagogical theories.

Contemporary research in language learning emphasizes the importance of cognitive and constructivist approaches. The cognitive approach focuses on working memory, schemata, and automation mechanisms [3]. The constructivist approach places active knowledge construction, context, and social interaction at the center of the learning process [4, 5]. At the same time, recent advances in generative artificial intelligence (GPT, LLaMA) and natural language processing (BERT, mT5, Whisper) have created new opportunities for language instruction.

Literature review and methods

According to cognitive language learning theory [3, 6], language acquisition relies on working memory, schemata, automation, and metacognition. The constructivist approach [4, 5] interprets language learning as an active and contextual process. Vygotsky's concept of the zone of proximal development (ZPD) [4] explains the role of assistance in learner development.

Table 1 presents a comparative analysis of the two approaches in terms of platform requirements.

Table 1 – Platform requirements of cognitive and constructivist approaches

Approach	Main mechanisms	Platform requirement
Cognitive	Working memory, schemata, spaced repetition	One module active at a time, timed error repetition
Constructivist	Active construction, context, ZPD, social interaction	Authentic tasks, AI dialogue, reflection

Current AI-based language teaching models mainly include NLP analysis models, generative models, and multimodal speech models. Although research demonstrates their effectiveness, their systematic pedagogical integration remains insufficiently developed.

Methodology

This study employs the following methods: system analysis to examine the functional capabilities of existing language platforms and AI models; modeling to develop the modular architecture and algorithmic stages; and design-based research to ensure the theoretical grounding of the proposed model. The platform model includes six modules (three basic, three auxiliary), four AI tools (BERT, spaCy, Whisper, GPT), and a six-stage algorithm.

Results

Modular Architecture of the Platform. The proposed platform consists of six modules divided into two groups. Basic modules (core competencies): The lexical module focuses on acquiring words and phrases within a semantic network using word embeddings and FastText. The grammar module addresses the recognition and application of rules in context using BERT for grammar checking. The phonology module deals with pronunciation and intonation using Whisper for automatic speech recognition.

Auxiliary modules (higher-order skills):

The dialogue and pragmatics module enables appropriate responses in real situations using GPT for dialogue generation and intent recognition. The analysis and reflection module supports error awareness and self-assessment using GPT for metacognitive prompting. The contextual project module handles real-world tasks using GPT for scenario generation.

Table 2 presents the AI tools and pedagogical functions for each module.

Table 2 – Modules, AI tools, and pedagogical functions

Module	AI tool	Cognitive function	Constructivist function
Lexical	Word2Vec, FastText	Semantic network	Creating personal word maps
Grammar	BERT	Systematic error identification	Discovering rules in context

Phonology	Whisper	Pronunciation memory	Real speech experience
Dialogue	GPT	Pragmatic adaptation	Knowledge construction through AI conversation
Reflection	GPT	Metacognition	Error analysis and awareness
Project	GPT	Schema application	Testing knowledge in real tasks

Algorithm

The proposed algorithm consists of six stages.

Stage 1 – Reception and initial analysis: The student's response (text or speech) is received. If the input is speech, it is converted to text using Whisper.

Stage 2 – Deep NLP analysis: Grammatical and semantic analysis is performed using the BERT model. Error types (grammatical, lexical, pragmatic) and proficiency levels are identified.

Stage 3 – Cognitive classification: The cognitive cause of the error is determined, including working memory load, missing schema, low automation, or metacognitive weakness.

Stage 4 – Generative response: Explanations and metacognitive questions are generated using the GPT model.

Stage 5 – Module activation: Relevant modules (grammar, dialogue, reflection) are activated based on the error type.

Stage 6 – Platform reconfiguration: Spaced repetition intervals and module activity levels are adjusted according to the student's error profile and proficiency level.

Discussion

The results demonstrate that generative AI and NLP tools complement cognitive and constructivist approaches in language learning. NLP models such as BERT reduce cognitive load through automatic error identification, while GPT-generated questions encourage active knowledge construction. Whisper-based multimodal tools also support authentic pronunciation practice.

Comparative Analysis with Existing Platforms. Table 3 presents a comparative analysis of the proposed model with existing platforms.

Table 3 – Comparative analysis of platforms

Feature	Duolingo	Babbel	Proposed Model
Cognitive approach	Partial	Partial	Full
Constructivist approach	No	Partial	Full
NLP analysis	No	No	BERT, spaCy

Generative AI	No	No	GPT
Metacognitive questions	No	No	Yes
Modular adaptivity	Partial	Partial	Full

The comparison shows that existing platforms only partially implement cognitive and constructivist principles, while the proposed model integrates NLP and generative AI more systematically.

Limitations and Future Research Directions. The proposed model has several limitations, including GPT hallucination risks, lower NLP performance for low-resource languages such as Uzbek, and high computational requirements. Future studies may focus on emotion AI, multimodal learning models, and specialized Uzbek NLP systems.

Conclusion

This article developed a modular structure for a foreign language teaching platform based on cognitive and constructivist approaches. The following main conclusions were reached.

First, the proposed model consists of six modules – lexical, grammatical, phonological, dialogue, reflection, and project – which serve to implement both pedagogical approaches.

Second, specific functional roles for generative AI (GPT) and NLP tools (BERT, spaCy, Whisper) are defined for each module. NLP tools are responsible for error analysis and classification, while generative AI is responsible for generating explanations, dialogues, and metacognitive questions.

Third, the six-stage algorithm comprising reception, NLP analysis, cognitive classification, generative response, module activation, and platform reconfiguration ensures adaptive changes to the platform based on the student's individual error profile.

Fourth, AI can function not merely as a technical tool but as a pedagogical agent that manages cognitive load, forms schemata, and stimulates constructivist knowledge construction.

References

1. Almelhes, S. A. (2021). Integrating technology acceptance models into language learning technologies. *Education and Information Technologies*, 26(6), 7157–7174.
2. Kohnke, L., Moorhouse, B. L., & Zou, D. (2023). ChatGPT for language teaching and learning. *RELC Journal*, 54(2), 537–550.
3. Paas, F., & van Merriënboer, J. J. G. (2020). Cognitive-load theory: Methods to manage working memory load in the learning process. *Educational Psychologist*, 55(1), 1–14.
4. Zhang, Y., & Zou, D. (2022). Technology-enhanced collaborative language learning: A review of recent practices and research. *Computer Assisted Language Learning*, 35(8), 1795–1823.
5. Huang, X., Zou, D., Cheng, G., & Xie, H. (2021). A systematic review of AR and VR enhanced language learning. *Sustainability*, 13(9), 4639.