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**PEDAGOGY AND TEACHING METHODS**  
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## АБАЙ ШЫҒАРМАЛАРЫН КОГНИТИВТІ-КОНЦЕПТУАЛДЫ ОҚЫТУ ӘДІС-ТӘСІЛДЕРІ

**Андатпа.** Бұл мақалада Абай шығармаларын когнитивті-концептуалды негізде оқытудың теориялық-практикалық тиімділігі қарастырылады. Абай мәтіндерінің көпқабатты танымдық құрылымы, күрделі ұғымдық жүйесі, символдық және семантикалық өрісінің байлығы білімгерден гносеологиялық дайындықты, терең ойлау мен интерпретация дағдыларын талап ететіні анық. Ізденіс барысында Абай шығармаларын дәстүрлі және когнитивтік тәсілдер арқылы талдаудың нәтижелері салыстырылады. Дәстүрлі оқу барысында студенттер «Жігіттер, ойын арзан, күлкі қымбат» өлеңінің мазмұнын жалпы тақырыптық деңгейде ғана меңгерсе, когнитивтік әдіс мәтіндегі тірек сөздерді айқындау, семантикалық өріс құру, модельдеу арқылы мәтіннің ішкі құрылымына терең бойлауға мүмкіндік беретіні көрінеді. Абай шығармаларындағы «жан», «тән», «қызыл» тәрізді концептілердің көпқабатты мәнін түсіну барысында студенттер мәтіндік әлемді реконструкциялап, философиялық және этикалық астарды терең қабылдайды. Мақала нәтижелері когнитивті-концептуалды әдістердің Абай поэзиясының мәнін ашуда, студенттердің аналитикалық, концептуалдық және метатанымдық қабілеттерін дамытуда ерекше тиімді екенін дәлелдейді.

**Түйін сөздер:** когнитивтік талдау, концептуалды оқыту, семантикалық өріс, мәтіннің микроструктурасы, философиялық концепт, әдеби-когнитивтік модель, интерпретация, концептуалды карта.

### Кіріспе

Абай шығармаларын мектепте, тіпті жоғары мектепте оқыту неліктен күрделі? Оның бірнеше себебі бар. Алдымен Абай шығармаларындағы таным көп қабатты, құрылым күрделі. Абай шығармаларына үлкен «дайындықпен» танымдық (гносеологиялық) негізбен келмесе, мәніне жету қиындайды. Абай шығармаларындағы дүниені тану, адам болмысының мәнін түсіну, ақиқатқа ұмтылу мәселелері оқырманнан сөзтаным, абстрактілі ойлау қабілетін талап етеді. Мәселен, «Қызыл да, қызықшыл да әуре жан гой» немесе «көп жүрмек жеңсікқойлық әлі-ақ тозар» қолданыстарын ұлттық, әлеуметтік танымнан тысқары түсіну де түсіндіру де қиын. Қазақта «әсіре қызыл тез оңар» дейтін мәтел бар. «Қызыл» сөзінің лексикалық мағынасынан бөлек концептілік мәні танылады. Абай бірнеше шығармасында осы мәндес ой тарқатады: «Қырмызы, қызыл жібек бозбалалар, Оңғақ пұлдай былғайды, бір дым тисе», «Жыртаң-тыртаң қызылдан шығады ерек». Яғни Абай шығармасындағы бір сөздің өзі түрлі мағына-мәнде қолданылады екен. Сондықтан Абай шығармаларын когнитивтік негізде танып, түсінудің маңызы зор. Абай тілінің құрылымы, логикалық байланыстары, ұғымдық категориялары күрделі. Ол ойды көпқабатты символдармен, метафоралық бейнелермен, концептуалды өрісте береді. Сол себепті Абай сөзінің мәнін ашуда білімгердің когнитивтік салыстыру, талдау, жалпылау, интерпретация жасай алу сияқты дағдыларын дамыту маңызды. Ол мәтінді меңгеруде шешуші рөл атқарады. Абай мәтіндері – таңбалар, символдар, мәдени кодтар жүйесі. Астарлы ой, тұспал, ишара, ұлттық дүниетаным, психология, болмыс философиясының элементтері (аңшылық, аттың сыны, қараңғылық, жарық, надандық, мақтан, ұят, күлкі, т.т. құмарлық) когнитивті-семиотикалық талдауды талап етеді.

Мәселен «Жүректе қайрат болмаса» өлеңінде ақын:

... Тән сүйгенін бермесе,  
Жан шыдамас жаны ашып.  
Бере берсе бер десе,

Үміт етер таласып, – дейді. Осы өлеңдегі тұтас ойды түсіну үшін «жан» мен «тән» сөзінің лексикалық мағынасын ғана емес, философиялық категория ретіндегі танымды да бағдарлау керек болады. Түсіну мен түйсінуді ұластырмай, мағына тану қиынға соғады. Сондықтан көркем шығарманы талдаудың әдебиеттану бағытынан өзге де мүмкіндіктерін қарастырамыз. Абай шығармаларын когнитивті талдап тану әдебиеттану саласына да жат емес, оны бір бағыт ретінде қарап, оқу-таным үдерісін талдаудың осы арнасына бұрамыз.

### Әдістер мен материалдар

Жалпы көркем шығарманы когнитивтік тұрғыдан қарастыру әдеби талдау теориясы ретінде сипатталмайды. Дегенмен әдебиеттанушылар (Ю. Тынянов, М. Бахтин, Д. Лихачёв, Ю. Лотман) әдеби талдауды лингвистикалық талдаумен ұштастырып жүргізген, өйткені олар екі ғылымның да әдістерін кіріктіре жүргізу көркем мәтінді терең танымға әкелетінін түсінген. Бұл ғалымдар психолінгвистика, когнитивтік психология, когнитивтік семиотика, сөйлеу әрекеті теориясы, сөйлеу жады теориясы, ассоциативтік лингвистика, лингвомәдениеттану сияқты пәнаралық әдістердің тиімділігін аңғарды.

Бұл туралы Николай Гей: «Әр сөз басқалармен көзге көрінбейтін желілер арқылы тығыз байланысты. Сөздердің «валенттілігінен» бастап, эстетикалық өрісі сөздердің барған сайын күрделене түсетін жүйеге қосылуымен кеңейе түседі. Ал мұндай көркемдік немесе синтетикалық форма бізге жеке ұғымдар туралы емес, тұтас құрылым жайлы кеңірек қозғауға мүмкіндік береді» [1, 129 б.] деп жазады. Когнитивтік лингвистиканың негізін салушылардың бірі Рональд Лангакер когнитивті әдісті әдеби мәтінді талдауда қолдануға болатынын мойындайды, бірақ оның шекаралары болуы тиіс екенін ескерткен. Мәселе мәтін мен әдеби шығарма арасындағы айырмашылыққа келіп тіреледі. Әдеби шығарма – көркем-образдық модель. Әдеби шығарма әлеуеті тұрғысынан шексіз, ол әртекті элементтер мен образдардың күрделі, көпқабатты бірлігі саналады. Сондай-ақ когнитивтік лингвистиканың көптеген ұғымдары әдеби талдаудың аясын кеңейте түсті.

Когнитивтік зерттеулерде жиі қолданылатын «когнитивтік база», «когнитивтік кеңістік», «концептосфера» ұғымдары философиядағы «дүниенің картинасы», «әлемнің образы» сияқты категориялармен астасып, көркем мәтінді түсіндіруде маңызды теориялық құралға айналған.

Когнитивизм әдістерінің әдебиеттануда қолданылуын негіздеген ғалымдар қатарында нарратив талдаудың когнитивтік моделін жасаған Т.А.ван Дейк[2], семиотикалық және интерпретативтік тәсілдерді дамытқан У.Эко[3], концептуалды метафора теориясы арқылы көркем ойлау механизмін түсіндірген Дж. Лакофф[4], фрейм семантикасын қалыптастырған Ч.Филлмор[5], тілдік және мәдени концептологияны дамытқан Е.С.Кубрякова, И. А. Стернин[6], С.Г.Воркачев[7], Е.В Лозинская [8], Третьяков В. [9] сияқты зерттеушілер бар. Олардың еңбектері когнитивтік әдістердің тілтану мен әдебиеттануды біріктіріп, көркем мәтінді интерпретациялаудың жаңа межесін көрсетті.

Олай болса Абай шығармаларын танудың икемді моделі ретінде когнитивті талдау мен оқыту жүйесін қалыптастыру орынды болмақ. Әдебиеттану ғылымында Абай шығармаларын талдаған әдебиеттанушылардың еңбектері біршама (М.Әуезов, М.Мырзахметов, Қ.Мұхаметханов, Қ.Өмірәлиев, Ғ.Есім, Т.Жұртпай т.т.), лингвистика саласында да Абай зерттеу нысанын түскен жоқ (Қ.Жұбанов, Р.Сыздық, т.т.), ал әдебиетті оқыту әдістеме саласында Абай шығармаларын оқыту әлі де репродуктивті-түсіндірмелі әдістен ұзап кеткен жоқ. Когнитивті талдап тану туралы бұған дейінгі әдістемелік мақалада көрсеткеніміздей бұл жыраулап поэзиясын тануда тиімді болғаны анық [10].

### Нәтижелер және оларды талдау

Тәжірибемізде филолог мамандарға «Абайтану» пәнінен өтілген сабақ барысында мәтінді түсінудің тиімді жолын айқындауға мүмкіндік туды. Таңдалған мәтін – «Жігіттер ойын арзан, күлкі қымбат» өлеңі.

Алдымен өлеңді студенттердің өздері іштей оқып мәтінді түсініктері бойынша интерпретациялады. «Жігіттер, ойын арзан, күлкі қымбат» өлеңін дәстүрлі оқыту әдістері негізінде талдау (өлеңді іштей және мәнерлеп оқу, құрылысын талдау, автор ойын анықтау) барысында филология мамандығы студенттері мәтіннің мазмұнын негізінен жалпы тақырыптық деңгейде ғана қамтыды. Атап айтқанда, олар шығарманың идеялық өзегін «жігіттерге бағытталған ақыл-кеңес», «достық мәселесі», «жар таңдау жөніндегі толғаныстар» сияқты кең пайымдалатын мазмұндық желілермен шектеп түсіндірді. Мұндай нәтижелер студенттердің өлеңнің терең философиялық, этикалық және поэтикалық астарын, Абайдың адамгершілік идеалына қатысты концептуалдық тұжырымдарын толық ашып көрсете алмағанын байқатады.

Ендігі кезекте мәтінді қайта зерттеу жұмысы ұйымдастырылды. Ол үшін алғашқы тапсырма әр шумақ бойынша мағынаны айқындайтын *тірек сөздерді белгілеу* болды да, оқу-таным жұмысы *мағынаны тану арқылы мазмұнды түсіну, мәтіндегі семантикалық өрісті анықтау, сөз– бейне – концепт– идея схемасында кластер құру, құрылымдық модельдеу* қадамдарымен жүргізілді.

Когнитивті тәсілге негізделіп берілген оқу қадамы әр шумақтың ішкі құрылымына жүйелі үңіліп, мәтіннің микроструктурасын (шумақ ішіндегі семантикалық бірліктер мен олардың байланысын) анықтау арқылы концептуалды ядроны бөліп алуға жұмылдыру. Студенттердің шумақтардан «тірек-сөздер» (мысалы: сыр, сымбат, шын күлерлік, ер табылса, шын көңілмен сүю, сұхбат қылу, «қырмызы, қызыл жібек бозбала», «оңғақ пұлдай былғау, дым тию және т.б.) белгілеуі оқытудың алғашқы когнитивті баспалдағы: бұл қадам мәтіндік ақпаратты алдын ала өздерінде бар білім-схемаларымен байланыстыруға, мағынаны фрагменттерге бөлшектеп өңдеуге және кейінгі интерпретация үшін семантикалық маркерлерді қалыптастыруға бағытталған.

Техникалық тұрғыдан мұндай тәсіл мынадай когнитивті әрекеттер арқылы жүзеге асады:

Алдымен, сөздерге лексикалық аннотация жасау, яғни шумақ ішіндегі семантикалық «тіректерді» таңбалау, олардың жалпылама және мәнмәтіндік мағынасын жіктеу;

Екіншіден, семантикалық өрістерді құру, таңдаған сөздер бойынша ұқсас мағыналық форма (мысалы, «сымбат – сыртқы форма», «сыр – ішкі мазмұн», «қырмызы, қызыл жібек – мата (пұл), «қырмызы, қызыл жібек бозбала – кінәратсыз, таза қалыпты», «оңғақ пұлдай былғайды бір дым тисе – тез оңу, өзгеру, (әсіре қызыл тез оңар), «ер табылса – нағыз лайық, мазмұнды, азамат» т.т. қалыптастыру.

Үшіншіден, тірек-сөздерден мәтіннің имплицитті идеясын (авторлық ұстаным, этикалық бағалау, эстетикалық критерий) шығару, концептуалдау. Сондай-ақ, студенттер өздері белгілеген сөздердің неге маңызды екендігін түсіндіреді, негіздеп, талдау түрлерін бағалайды, қандай негізгі таным-түсініктер қандай интерпретацияға әкелгенін айқындайды.

Сонымен берілген когнитивті жаттығу мәтіннің макро-және микроструктураларын ажырата алуға, семантикалық талдау қабілетін дамытуға септігін тигізді. Шумақтар бойынша лексикалық «тірек-сөздерді» таңбалау - бұл білімгерлердің мәтіннің концептуалды ядросын белгілеуіне, имплицитті мағыналарды тануына және авторлық ұстанымды бағамдауға бағытталған когнитивті танымдық тәсілдер жиынтығын құрайды. Әдіс оқытушы үшін әрі бағалау элементі саналады: таңбалау дәлдігі мен одан туындаған интерпретациялар студенттің мәтінге дендеп ене алғандығын айқындайды.

Осылайша, белсенді когнитивті белгілер арқылы жүргізілген талдау тек сөздік деңгейдегі жаттығу емес, ол студенттердің мәтіндік құрылымды тану, имплицитті мағыналарды шығару және авторлық этикалық-эстетикалық ұстанымды жүйелеу қабілеттерін қалыптастыратын оқу үдерісінің бастапқы, бірақ шешуші кезеңі болып саналады.

Сонымен, Абай шығармасын меңгерту барысында қолданылған екі түрлі әдістің нәтижелері білім алушылардың мәтінді қабылдау, интерпретациялау және

концептуализациялау деңгейлерінің айқын айырмашылығын көрсетті. Дәстүрлі оқыту бойынша талдау көбіне *макротақырыптық* деңгейде жүргізді. Өлең мазмұнынан ақыл-кеңес, достық мәселесі, жар таңдау сияқты жалпы тақырыптар аясында түсіндірумен шектелді. Бұл нәтиже мәтінді «тақырып – идея – негізгі ой» сұлбасы бойынша қабылданғанын көрсетеді. Ал когнитивті тәсіл бойынша студенттер әр шумақ ішінде семантикалық бірліктерді, концептуалды тірек сөздерді ажырату арқылы мәтінге *микродеңгейде* үңілді.

Салыстырмалы кестеде сипаттайтын болсақ, айырмашылық мынадай:

**Кесте 1.** Салыстырмалы кесте

	Өлшемдер	Дәстүрлі оқыту нәтижесі	Когнитивті оқыту нәтижесі
1	Мәтін түсіну деңгейі	Жалпы мазмұндық тақырыптармен шектелді.	Әр шумақтың ішкі семантикасы ашылды; концептуалды мән анықталды.
2	Мағына қалыптастыру механизмі	Мағынаны дайын күйінде қабылдау; репродуктивті ойлау басым.	Мағынаны тірек-сөздер арқылы құрастыру; конструктивті ойлау іске қосылды.
3	Концептуалды сөздермен жұмыс	Тілдік бірліктер ажыратылмады.	Жекелеген ұғымдар мен сөздер концептуалды маркер ретінде таңбаланды.
4	Эстетикалық-философиялық астарды ашу	Автордың этикалық үндеуі ғана байқалды.	Поэтикалық оппозициялар (шын – жалған, ішкі мән – сыртқы сән) анықталды.
5	Талдау тереңдігі	Жалпы интерпретация; мазмұнды қайта айту басым.	Семантикалық өріс құру, концептуализация, мәтін ішіндегі жасырын мәндерді ашу жүзеге асты.
6	Ойлау дағдысы	Төменгі деңгейлі ойлау (білу, түсіну).	Жоғары деңгейлі ойлау (талдау, синтез, бағалау, модельдеу).
7	Авторлық позицияны анықтау	Жалпы идея ғана көрінді.	Абайдың адамгершілік-эстетикалық идеалы тереңірек ашылды.
8	Жалпы қорытынды нәтиже	Өлең мазмұны үстірт игерілді.	Өлеңді терең меңгеру, поэтикалық, семантикалық әрі концептуалды деңгейде түсіну қалыптасты.

### Қорытынды

Тұжырып айтқанда, жүргізілген салыстырмалы талдау когнитивті оқыту әдіс-тәсілдерінің мәтінді терең меңгертуге, студенттердің аналитикалық және концептуалдық ойлауын дамытуға едәуір ықпал ететінін көрсетті. Дәстүрлі әдіс мазмұнды тақырыптық деңгейде ғана игеруге мүмкіндік берсе, когнитивті әдіс мәтінді құрылымдық, семантикалық және философиялық қырынан кешенді түрде түсінуге бағдар берді. Когнитивті тәсілдің нәтижесінде студенттерде бірнеше оқу-таным әрекеті жүзеге асады, сол арқылы білімгердің танымдық күзіреті артады деуге болады. Олар:

- ✓ мәтіндік тірек-сөздерді бөліп көрсете алу;
- ✓ тілдік бірліктердің лексикалық мағынасынан бастап, поэтикалық, концептуалдық өрісін түсіне алу;
- ✓ семантикалық өріс құру;
- ✓ жасырын мағыналарды аша алу;

✓ авторлық дүниетанымды модельдеуді меңгеру.

Осылайша, когнитивті әдіс дәстүрлі тәсілге қарағанда өлеңнің поэтикалық табиғатын жан-жақты тануға және терең концептуалды пайым жасауға мүмкіндік береді деген қорытындыға келеміз.

### Қаржыландыру

Мақала АР26103915 «Мектеп оқушыларының эмоционалдық интеллектін (EQ) дамыту мақсатында әдебиет пәнінің мазмұнын өнермен біріктірудің ғылыми және әдістемелік негіздері» атты гранттық қаржыландыру жобасы аясында дайындалды.

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10. The Role and Place of Zhyrau Poetry in the World Literature <https://doi.org/10.1590/2176-4573e65434>

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## КОГНИТИВНО-КОНЦЕПТУАЛЬНЫЕ МЕТОДЫ ПРЕПОДАВАНИЯ ПРОИЗВЕДЕНИЙ АБАЯ

**Аннотация.** В статье рассматриваются теоретические основы и практическая эффективность когнитивно-концептуального подхода к изучению творчества Абая. Многоуровневая когнитивная структура его текстов, сложность концептуальной системы и богатство символично-семантических полей требуют от учащихся эпистемологической подготовленности, глубокой рефлексии и развитых интерпретационных навыков. Исследование сопоставляет результаты анализа произведений Абая в рамках традиционных и когнитивных методов. Если при традиционном обучении студенты воспринимали стихотворение «Жигиттер, ойын арзан, күлкі қымбат» лишь на общетематическом уровне, то когнитивный подход позволил выявить ключевые лексические маркеры, выстроить семантические поля и смоделировать структурные связи, обеспечив более глубокое понимание внутренней организации текста. При анализе многослойных концептов «душа», «тело», «красное» студенты реконструировали текстовый мир и смогли яснее осмыслить его философско-этические аспекты. Результаты показывают, что когнитивно-концептуальные методы особенно эффективны для раскрытия сущности поэзии Абая и развития аналитических, концептуальных и метакогнитивных умений обучающихся.

**Ключевые слова:** когнитивный анализ, концептуальное обучение, семантическое поле, микроструктура текста, философский концепт, литературно-когнитивная модель, интерпретация.

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## COGNITIVE-CONCEPTUAL METHODS FOR TEACHING ABAI'S WORKS

**Abstract.** This article examines the theoretical foundations and practical effectiveness of teaching Abai's works through a cognitive-conceptual approach. The multilayered cognitive structure of Abai's texts, the complexity of their conceptual system, and the richness of their symbolic and semantic fields clearly require learners to possess epistemological preparedness, deep reflective thinking, and advanced interpretive skills. The study compares the outcomes of analyzing Abai's works using traditional and cognitive methods. While, under traditional instruction, students grasped the poem "Zhigitter, oyun arzan, külki kymbat" only at a general thematic level, the cognitive approach enabled them to identify key lexical markers, construct semantic fields, and model structural relations, thereby gaining deeper insight into the text's internal organization.

In exploring multilayered concepts such as "soul," "body," and "red," students reconstructed the textual world and developed a more profound understanding of its philosophical and ethical

dimensions. The findings demonstrate that cognitive-conceptual methods are particularly effective in revealing the essence of Abai's poetry and in enhancing students' analytical, conceptual, and metacognitive abilities.

**Keywords:** cognitive analysis, conceptual teaching, semantic field, microstructure of the text, philosophical concept, literary-cognitive model, interpretation, conceptual mapping.

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## PRE-SERVICE TEACHERS' AWARENESS AND UTILIZATION OF ARTIFICIAL INTELLIGENCE FOR LEARNING IN UNIVERSITIES IN KWARA STATE, NIGERIA

**Abstract.** Pre-service teachers' familiarity and proficiency with AI tools are crucial for effectively integrating these innovations into future classrooms. Yet, limited research exists on AI awareness and utilization among pre-service teachers in Nigerian universities, particularly in Kwara State. This study, therefore, explored the state of AI awareness and utilisation among pre-service teachers in universities in Kwara State. A descriptive research approach of survey type was employed. The population for the study was all pre-service teachers in universities in Kwara State, Nigeria. Two hundred (200) pre-service teachers were sampled for the study using stratified sampling technique. A researchers' self-developed questionnaire was used for data collection while the data collected for this study were analysed using mean and percentage to answer the two research questions while independent t-test was used to test the hypotheses postulated for this study at 0.05 level of significance. The findings indicate that the level of awareness of Artificial Intelligence for learning was high among pre-service teachers in universities in Kwara State. It was also revealed that the level of utilisation of Artificial Intelligence for learning was low among pre-service teachers in universities in Kwara State. Statistical analysis using independent t-tests revealed no significant differences in AI awareness and utilization based on gender of the respondents. It was however recommended that training on usability of AI should be organised for pre-service teachers so as to ensure effective use of AI.

**Keywords:** Artificial intelligence, pre-service teachers, teacher education, awareness, utilisation, learning.

### Introduction

Artificial Intelligence (AI) is a phenomenon that has transformed and improved the teaching and learning process in this digital age. It has developed at a very fast rate that it has transformed several sectors such as the education. Although AI is already being used in the educational environment of all continents, not much is known about the perception and the use of AI among Nigerian undergraduates, especially those enrolled in the teacher preparation programmes. Through this research, the scholars aimed to seal the gap in knowledge regarding the awareness and the use of AI tools by these students in real life. The value of the investigation is that it would reveal the core factors that influence the consciousness and usage of AI, which can then inform the future of enhancing educational outcomes.

The inequality in the use of technology in learning institutions has emerged to be witnessed as a consequence of the cultural shift to using digital learning aids. Issues of whether students in universities in Kwara State are adequately prepared and motivated to integrate AI in their learning are increasingly becoming common. The researcher is driven by the need to address this social problem that has been triggered by the varying levels of digital literacy and lack of a uniform access to technology resources

among students. In discussing these issues, the research aims to make a contribution to more balanced and productive application of AI in education, specifically, teaching education.

The need to conduct the study is analyzed by acknowledging the possibility that AI will bring to the educational setting. AI has the ability to customize education, offer smart tutoring, and enable access to a plethora of data and resources and as a result enhance research of teacher education (UNESCO, 2021). Nonetheless, such benefits are possible when students know and utilize such technologies (Ally, 2022). This research is needed to comprehend how much students in the Universities in Kwara State are ready to utilize AI in their studies and also to determine any impediment that can hinder the process. Therefore, the main purpose of the study was to assess the pre-service teachers' awareness and utilisation of Artificial intelligence for learning in Universities in Kwara State, Nigeria. Specifically, the study examined:

1. The level of awareness of Artificial Intelligence for learning among pre-service teachers in Universities in Kwara State
2. The level of utilisation of Artificial Intelligence for learning among pre-service teachers in Universities in Kwara State
3. The difference in the awareness of Artificial Intelligence for learning among pre-service teachers in Universities in Kwara State based on their gender and school type
4. The difference in the utilisation of Artificial Intelligence for learning among pre-service teachers in Universities in Kwara State based on their gender and school type

Artificial Intelligence (AI) could be traced to the works of John McCarthy in 1955, which was based on the assumption that all facets of learning and other types of intelligences could be provoked by the machine (Wang, 2018). The concept of Artificial Intelligence was defined by different scholars and Benhamou and Janin (2018) described Artificial Intelligence as a set of technologies that allow machines to behave at a very high level of intelligence as humans do. AI is able to scan the learning patterns and preferences of an individual student and modify the educational content and pace (Benhamou & Janin, 2018). This will enable the students to learn at their pace and fashion and will address their weaknesses and strengths. The adaptive learning platforms have many that rely on AI algorithms to keep the difficulty and content of the lessons adaptable as the student makes progress and have a more personalized learning experience (Bruce, 2019).

AI includes expert system, fuzzy logic, artificial neural network, evolutionary algorithms, case-based reasoning, image processing, natural language processing, speech recognition and robotic. According to Tredinnick (2017), AI can be described as a group of technologies, and different methods of computing science can be employed to create flexible decisions regarding what rational choices should be made in the unpredictable environment. Nevertheless, one can attribute this trend to the process automation, Internet of things, data processing, tangible robotic, conversational interactions and decision support.

Woods and Evans (2018) unveiled that the usage of Artificial Intelligence is cross-cutting in different fields of human activities that may include speech recognition, machine translation, and acting as robots instead of humans. It can be concluded that Artificial Intelligence use in the educational process will be more effective. Artificial Intelligence can transform learning operations in three major ways. They are smart automation, innovation, and increased productivity of learners (Woods & Evans, 2018).

Among the most favorable views of AI in learning, there is the power of AI to offer personalized educational opportunities (Woods & Evans, 2018). The AI is able to study the personal learning styles and preferences and adjust the content and speed of learning to the needs of individual

students. Such personalisation has the potential to bring about better learning (Bruce, 2019). AI-based solutions can also automatize administrative processes to liberate educators to teach. Furthermore, AI is capable of covering the disparities in the access to good education by delivering resources to poor or remote locations.

Bhagat et al. (2021) classify artificial intelligence into two, weak artificial intelligence and strong artificial intelligence. A computer is said to have weak artificial intelligence when it is simply a tool used to study the cognitive processes. This implies that the computer simulates intelligence. Strong artificial intelligence on the other hand is the manner in which computers are intelligent, self-learning systems. This brings to the surface the idea that a computer has the capability of performing tasks as a man does because it has all the innate human capabilities. The researchers proceed to group the numerous economic applications of AI into five, which are autonomous driving, dematerialization, robotization, and deep learning.

The understanding of AI requires knowing the way it works. AI relies on the development of computer programs that are developed by humans. This program consists of algorithms which are supposed to perform certain tasks. Once that is done, humans have to directly and indirectly teach the algorithm to understand how its purpose is required to be and what errors and remedies it may have. This requires the capacity to read huge amounts of information.

Artificial intelligence (AI) usage in libraries and other organizations has resulted in the steep increase of inequality and an overall feeling of panic about being deprived of a job due to the trend of technological change (International Labor Organization, 2018). Korinek and Stiglitz (2017) report that the use of AI technologies can cause jobs to disappear or to be polarized. Bowles (2017) puts in a submission that the adoption of AI can cause a substantial rise in inequality due to automation. As well, Frey and Osborne (2017) state that within the next 20 years, AI will take the place of approximately 35 percent of employees in the UK and 47 percent of employees in the US. The World Bank (2016) argues that the underdeveloped countries might be less willing to use AI because it can lead to a high unemployment rate. By the analysis, employment losses will be 69 percent in India, 72 percent in Thailand, 77 percent in China, and 85 percent in Ethiopia due to the AI adoption. All of these studies point to the possibility of gross loss of jobs due to AI.

Bernard (2018) points out that AI can resolve the problems related to gender. For instance, detecting and preventing online bullying, enhancing access to healthcare by both genders, advancing gender equality in the workplace and so on. Gender discrimination and bias patterns can be extracted and assessed with the help of AI-driven tools and shed light on the areas, where interventions are necessary. Another aspect that was highlighted by Bernard (2018) is that if AI is not developed and supervised closely, AI systems may support the existing gender stereotypes. As an illustration, voice assistants whose voice is mostly of a female type and with subservient feedback may reinforce gender conventions. There is an attempt to make sure that the AI systems are constructed in such a way that they do not reinforce destructive stereotypes.

According to Treharne (2017), AI is a system that varies depending on the collected data, the analysis of the data used, and other observations gathered without being coded. It means that AI is a set of technologies making machines perform functions to a greater extent of intelligence and imitate human abilities in terms of perception, understanding, and taking some actions. The available literature has pointed out that artificial intelligence has two forms; weak artificial intelligence and strong artificial intelligence.

This study has taken into account several variables such as the degree of awareness and the use of Artificial Intelligence to study among school students. The study by Roberts (2021) suggested that the adoption of artificial intelligence (AI) as an aid in learning by students in higher institutions of learning is turning out to be a game-changer since it provides learners with personalized and adaptive learning experiences. Intelligent tutoring systems and machine learning algorithms are examples of AI

technology that help to personalize learning material to the unique needs of the students, give them specific feedback, and allow a student to learn at his/her own pace. Such tools do not only complement the conventional teaching techniques but present new ways of encouraging critical thinking, problem solving, and conceptual learning. Educational tools based on AI can be used to analyze educational data in large quantities to individualize the learning process, predict student achievements and refine teaching methods and make learning more interesting and effective in higher education (Roberts, 2021).

Concerning the awareness of Artificial Intelligence, Rothan (2019) highlighted how the awareness of artificial intelligence (AI) by students to learn in universities is growing and is helpful. Learners are using AI applications and websites to improve their learning process by utilizing numerous resources and applications. Such tools are AI-powered virtual assistants, intelligent study platforms, and language processing applications that are useful in research, organization and information retrieval. The adaptive learning systems based on AI can provide students with the opportunity to customize their learning experience and enjoy the possibility to learn at their own pace and with the style of learning that suits them best. Also, AI applications facilitate group learning, where students can learn together remotely, exchange materials, and have peer-to-peer learning experiences. In general, the use of AI among undergraduates in higher education institutions is enhancing students to have more control over their education experience, which facilitates autonomy, efficiency, and a better comprehension of their studies (Rothan, 2019).

The main goal in training the new generation to face the changing world of technology is to raise awareness of artificial intelligence (AI) in students. With AI slowly taking over different aspects of the society, it is important to prepare students with an initial familiarity with the principles and how AI can be applied (John, 2019). Students can be made aware of the ethical implications, possible implications on the society, and employment opportunities that AI offers through awareness programmes. With the interactive approach toward AI, students are likely to gain critical thinking, digital literacy, and curiosity-driven mentality that will make them better placed to negotiate and participate productively in the AI future (Andersen & Brown, 2022). Besides, a literate student population will be in a better position to embrace the revolutionary potential of AI in a responsible manner and see to it that new technologies can meet the demands and values of the society.

Besides the above variables, the study will also take into consideration the effect of the other moderating variables, including gender and the type of school on the awareness and use of artificial intelligence in learning at schools. The role of gender in the process of adopting and using artificial intelligence in learning is varying, yet they are involved. A study conducted by Bernard (2018) revealed that there are gender differences in the adoption of technology as males are more likely to express interest and confidence in the use of AI tools than females. There is however an attempt to close this divide with the help of inclusive AI educational programs such that both sexes are motivated and brought forward to use AI as a learning tool. Besides, specific AI apps that cater to various ways of learning and liking are vital in achieving gender equity in the use of technology in educational places.

## **Research Questions**

The following research questions have been raised to guide the study

1. What is the level of awareness of Artificial Intelligence for learning among pre-service teachers in Universities in Kwara State?
2. What is the level of utilisation of Artificial Intelligence for learning among pre-service teachers in Universities in Kwara State?

## Research Hypotheses

The following hypotheses were postulated for this study:

**H1:** There is no significant difference in the awareness of Artificial Intelligence for learning among pre-service teachers in Universities in Kwara State based on their gender

**H2:** There is no significant difference in the awareness of Artificial Intelligence for learning among pre-service teachers in Universities in Kwara State based on school type

**H3:** There is no significant difference in the utilisation of Artificial Intelligence for learning among pre-service teachers in Universities in Kwara State based on their gender

**H4:** There is no significant difference in the utilisation of Artificial Intelligence for learning among pre-service teachers in Universities in Kwara State based on school type

## Methods and materials

This study adopted the descriptive research of the survey type. The population of this study included all pre-service teachers in Universities in Kwara State, Nigeria. The target population included the pre-service teachers in University of Ilorin (public) and Al-Hikma University, Ilorin (private). Stratified random sampling was used to select 120 and 80 pre-service teachers across all levels in Faculties of Education of University of Ilorin and Al-Hikma University, Ilorin respectively. Stratified random sampling was adopted in order to ensure that students across all levels are captured. The total number of respondents for this study is 200.

A researchers' designed questionnaire tagged "Questionnaire on Pre-service Teachers' Awareness and Utilization of Artificial Intelligence for Learning in Universities in Kwara State (QPTAUAILU)" was used to obtain data from the respondents. The items in the questionnaire contain both demographic data and items focusing on pre-service teachers' awareness and utilisation of Artificial intelligence for learning. In order to ascertain the reliability of the instrument, the test-retest method was carried out on the groups who were not part of the sample. Then the data collected was subjected to Cronbach Alpha and the reliability coefficient of 0.71 was obtained for the instrument. Data collected was analysed using descriptive and inferential statistics. The mean and percentage was used to analyse the research questions while t-test was used to test the formulated hypotheses with the aid of statistical package for social science at 0.05 level of significance.

## Results

The analyses and results of the data collected for this study were hereby presented.

**Question One:** *What is the level of awareness of Artificial Intelligence for learning among pre-service teachers in Universities in Kwara State?*

Given that there are 10 items on the awareness structured in a four-response-type, the minimum, maximum and range score were 10, 40 and 30 respectively. The range score was therefore divided by 3-level ( $30/3=10$ ). Students whose score fell within score range of 10 – 20; 21 – 30 and 31 – 40 were categorized as low, moderate and high level of awareness respectively. The analysis of response to research question 1 were summarized and presented in Table 1.

**Table 1.** Level of Students' Awareness of Artificial Intelligence for Learning among Pre-service Teachers in Universities in Kwara State

Level of Awareness	Score Range	Frequency	Percentage
High	31 – 40	117	57.5

Moderate	21 – 30	41	20.5
Low	11 – 20	32	16.0
<b>Total</b>		<b>200</b>	<b>100.0</b>

Table 2 revealed that 117 (57.5%) of the students were highly aware of Artificial Intelligence for learning; 41 (20.5) were of moderate level of awareness while 32 (16.0%) had low level of awareness of Artificial Intelligence for learning. Thus, the level of awareness of Artificial Intelligence for learning was high among pre-service teachers in universities in Kwara State.

**Question Two:** *What is the level of utilisation of Artificial Intelligence for learning among pre-service teachers in universities in Kwara State?*

Given that there are 15 items on the utilisation structured in a four-response-type, the minimum, maximum and range score were 10, 40 and 30 respectively. The range score was therefore divided by 3-level ( $30/3=10$ ). students whose score fell within score range of 10 – 20; 21 – 30 and 21 – 40 were categorised as low, moderate and high level of utilisation respectively. The analysis of response to research question 2 were summarized and presented in Table 2.

**Table 2.** Level of Students' Utilisation of Artificial Intelligence for learning Among Pre-service Teachers in Universities in Kwara State

Level of Utilisation	Score Range	Frequency	Percentage
High	31 – 40	38	19.0
Moderate	21 – 30	68	34.0
Low	11 – 20	94	47.0
<b>Total</b>		<b>200</b>	<b>100.0</b>

Table 4 revealed that 38 (19.0%) of the students were of high utilisation of Artificial Intelligence for learning; 68 (34.0%) were of moderate level of utilization while 94 (31.0) had low level of acceptance of Artificial Intelligence for learning. Thus, the level of utilisation of Artificial Intelligence for learning was low among pre-service teachers in universities in Kwara State.

### Hypotheses Testing

Inferential statistics of independent t-test was used to test the hypotheses postulated for this study at 0.05 alpha level.

**H1:** *There is no significant difference in the awareness of Artificial Intelligence for learning among pre-service teachers in Universities in Kwara State based on their gender*

**Table 3.** t-test Statistics showing the difference in the awareness of Artificial Intelligence for learning among pre-service teachers' universities in Kwara State based on their gender

Gender	No	Mean	S. D.	Df	t-value	Sig	Remark
Male	88	33.426	3.125	198	1.417	0.091	<b>Not Rejected</b>
Female	112	32.183	3.422				

*\*Insignificance at  $p > 0.05$*

Table 3 shows that the t-value 1.417 is obtained with a p-value of 0.091 when computed at 0.05 alpha level. Since the p-value of 0.091 is greater than 0.05 level of significance, the null hypothesis one is not rejected. Therefore, there was no statistically significant difference in the awareness of Artificial Intelligence for learning among pre-service teachers in universities in Kwara State based on their gender ( $t_{198} = 1.417, p > 0.05$ ).

**H2:** *There is no significant difference in the awareness of Artificial Intelligence for learning among pre-service teachers in universities in Kwara State based on school type*

**Table 4.** t-test Statistics showing the difference in the awareness of Artificial Intelligence for learning among pre-service teachers in universities in Kwara State based on school type

School Type	No	Mean	S. D.	df	t-value	Sig	Remark
Private	80	32.192	3.361	198	1.103	0.138	<b>Not Rejected</b>
Public	120	32.227	3.272				

*\*Insignificance at  $p > 0.05$*

Table 4 shows that the t-value 1.103 is obtained with a p-value of 0.138 when computed at 0.05 alpha level. Since the p-value of 0.138 is greater than 0.05 level of significance, the null hypothesis two is not rejected. Therefore, there was no statistically significant difference in the awareness of Artificial Intelligence for learning among pre-service teachers in universities in Kwara State based on school type ( $t_{198} = 1.103, p > 0.05$ ).

**H3:** *There is no significant difference in the utilisation of Artificial Intelligence for learning among pre-service teachers in universities in Kwara State based on their gender*

**Table 5.** t-test Statistics showing the difference in the utilisation of Artificial Intelligence for learning among pre-service teachers in universities in Kwara State based on their gender

Gender	No	Mean	S. D.	df	t-value	Sig	Remark
Male	88	33.048	3.593	198	1.382	0.174	<b>Not Rejected</b>
Female	112	33.161	3.722				

*\*Insignificance at  $p > 0.05$*

Table 5 shows that the t-value 1.382 is obtained with a p-value of 0.174 when computed at 0.05 alpha level. Since the p-value of 0.174 is greater than 0.05 level of significance, the null hypothesis five is not rejected. Therefore, there was no statistically significant difference in the utilisation of Artificial Intelligence for learning among pre-service teachers in universities in Kwara State based on gender ( $t_{198} = 1.174, p > 0.05$ ).

**H4:** *There is no significant difference in the utilisation of Artificial Intelligence for learning among pre-service teachers in Universities in Kwara State based on school type*

**Table 4.** t-test Statistics showing the difference in the utilisation of Artificial Intelligence for learning among pre-service teachers in universities in Kwara State based on school type

School Type	No	Mean	S. D.	df	t-value	Sig	Remark
Private	80	32.188	3.357	198	1.105	0.141	<b>Not Rejected</b>
Public	120	32.229	3.276				

*\*Insignificance at  $p > 0.05$*

Table 4 shows that the t-value 1.105 is obtained with a p-value of 0.141 when computed at 0.05 alpha level. Since the p-value of 0.141 is greater than 0.05 level of significance, the null hypothesis two is not rejected. Therefore, there was no statistically significant difference in the utilisation of Artificial Intelligence for learning among pre-service teachers in universities in Kwara State based on school type ( $t_{198} = 1.105, p > 0.05$ ).

## Discussion

Findings from this study revealed that the level of awareness of Artificial Intelligence for learning was high among pre-service teachers in universities in Kwara State. This implies that pre-service teachers in universities in Kwara State were aware of Artificial Intelligent for learning. This finding corroborates with Kucukkeles, et al. (2019) whose study revealed that the awareness and use of AI have improved user engagement in many developing countries in the world. Access to timely information can only occur in a situation where AI is being used to guide and support, and at the same time user-friendly, particularly in information search. For instance, a friendly AI technology will help users search for information with ease, help retrieve information across various collections, and help with users' queries.

In addition, findings of this study revealed that the level of utilisation of Artificial Intelligence for learning was low among pre-service teachers in universities in Kwara State. This shows that pre-service teachers in universities in Kwara State rarely use AI for academic activities. This finding is in line with Fernandez (2016) whose study showed that using AI in academic libraries by students was low. However, using AI will help in the analysing big data, create metadata, and improve search translation. This means that using AI in academic libraries will make library materials more accessible and available.

Furthermore, findings of this study revealed that there was no statistically significant difference in the awareness of Artificial Intelligence for learning among pre-service teachers in universities in Kwara State based on gender. These findings substantiate Agrawal, et al. (2018) whose study showed no discrepancy in the awareness of Artificial Intelligence for learning History between male and female students regardless of their academic levels. More so, findings of this study revealed that there was no statistically significant difference in the awareness of Artificial Intelligence for learning among pre-service teachers in universities in Kwara State based on school type. This implies that no significant difference exist among pre-service teachers in public and private universities in Kwara State.

It was found that there was no statistically significant difference in the utilisation of Artificial Intelligence for learning among pre-service teachers in universities in Kwara State based on gender. Findings also revealed that there was no statistically significant difference in the utilisation of Artificial Intelligence for learning among pre-service teachers in universities in Kwara State based on school type. These results are in line with Huang, et al. (2019) whose study showed no discrepancy existing in the utilization of AI for learning.

## Conclusion

This study explored the level of awareness and utilization of AI among the pre-service teachers' awareness and utilization of AI for learning in universities in Kwara State. The findings reveal a mixed picture, with majority of pre-service teachers demonstrating awareness of AI while few displayed

utilization of AI tools for learning. By implication, the future teachers know the "what" but haven't mastered the "how." This disconnect has profound pedagogical implications for the future of education in Kwara State, Nigeria. Without active utilization, pre-service teachers may enter the workforce capable of talking about AI but unable to use it to differentiate instruction, automate grading, or create personalized learning pathways for their future students. If teachers-in-training aren't using AI during their formative university years, they will likely fall into pedagogical lag, teaching using 20<sup>th</sup> century methods in a 21<sup>st</sup> century classroom. In the light of this development, conferences, workshops and training programmes including hand-on session for pre-service teachers on AI tools and integration of AI literacy into teacher education curricula was recommended by the researchers. It is further suggested for the future researchers that longitudinal studies to track changes in AI utilization over time or comparative studies across different states or countries be conducted.

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## **НИГЕРИЯНЫҢ КВАРА ШТАТЫНДАҒЫ УНИВЕРСИТЕТТЕРДЕ БІЛІМ АЛЫП ЖАТҚАН БОЛАШАҚ МҰҒАЛІМДЕРДІҢ ЖАСАНДЫ ИНТЕЛЛЕКТ ТУРАЛЫ ХАБАРДАРЛЫҒЫ МЕН ОНЫ ОҚУ ҮДЕРІСІНДЕ ҚОЛДАНУЫ**

**Аңдатпа.** Болашақ мұғалімдердің жасанды интеллект (ЖИ) құралдарымен таныстығы мен оларды қолдану дағдылары осы инновацияларды болашақтағы оқу үдерісіне тиімді енгізу үшін маңызды. Дегенмен, Нигерия университеттеріндегі, әсіресе Квара штатындағы болашақ мұғалімдердің жасанды интеллект туралы хабардарлығы мен оны пайдалану деңгейі жөнінде зерттеулер жеткіліксіз. Осыған байланысты бұл зерттеу Квара штатындағы университеттерде білім алып жатқан болашақ мұғалімдердің ЖИ туралы хабардарлығы мен оны қолдану жағдайын зерттеуге бағытталды. Зерттеуде сауалнама түріндегі сипаттамалық зерттеу әдісі қолданылды. Зерттеудің жалпы жиынтығын Квара штатындағы университеттерде білім алып жатқан барлық болашақ мұғалімдер құрады. Стратификацияланған іріктеу әдісі арқылы зерттеуге 200 болашақ мұғалім таңдалды. Деректерді жинау үшін зерттеушілер әзірлеген сауалнама пайдаланылды. Жиналған деректер екі зерттеу сұрағына жауап беру үшін орташа мән мен пайыздық көрсеткіштер арқылы талданды, ал зерттеу барысында ұсынылған гипотезаларды тексеру үшін 0,05 маңыздылық деңгейінде тәуелсіз t-тест қолданылды. Зерттеу нәтижелері Квара штатындағы университеттерде білім алып жатқан болашақ мұғалімдердің оқу мақсатында жасанды интеллект туралы хабардарлық деңгейі жоғары екенін көрсетті. Сонымен қатар, олардың оқу үдерісінде жасанды интеллектті қолдану деңгейі төмен екені анықталды. Тәуелсіз t-тест нәтижелері респонденттердің жынысына байланысты жасанды интеллект туралы хабардарлық пен оны пайдалану деңгейінде айтарлықтай айырмашылық жоқ екенін көрсетті. Осыған байланысты болашақ мұғалімдердің жасанды интеллектті тиімді пайдалануын қамтамасыз ету үшін арнайы оқыту және тренингтер ұйымдастыру ұсынылады.

**Түйін сөздер:** Жасанды интеллект, болашақ мұғалімдер, мұғалімдерді даярлау, хабардарлық, қолдану, оқу үдерісі.

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## ОСВЕДОМЛЁННОСТЬ БУДУЩИХ УЧИТЕЛЕЙ ОБ ИСКУССТВЕННОМ ИНТЕЛЛЕКТЕ И ЕГО ИСПОЛЬЗОВАНИЕ В ОБУЧЕНИИ В УНИВЕРСИТЕТАХ ШТАТА КВАРА, НИГЕРИЯ

**Аннотация.** Осведомлённость будущих учителей об инструментах искусственного интеллекта (ИИ) и их умение использовать их являются важными для эффективной интеграции этих инноваций в будущий образовательный процесс. Однако существует ограниченное количество исследований, посвящённых осведомлённости и использованию ИИ среди будущих учителей в университетах Нигерии, особенно в штате Квара. Поэтому данное исследование направлено на изучение уровня осведомлённости и использования искусственного интеллекта среди будущих учителей университетов штата Квара. В исследовании использовался описательный метод исследования типа опроса. Генеральную совокупность исследования составили все будущие учителя университетов штата Квара, Нигерия. Для исследования с использованием стратифицированной выборки было отобрано 200 будущих учителей. Для сбора данных применялась анкета, разработанная исследователями. Полученные данные анализировались с использованием среднего значения и процентных показателей для ответа на два исследовательских вопроса, а также независимого t-теста для проверки выдвинутых гипотез на уровне значимости 0,05. Результаты исследования показали, что уровень осведомлённости об использовании искусственного интеллекта для обучения среди будущих учителей университетов штата Квара является высоким. Однако было выявлено, что уровень использования искусственного интеллекта для обучения среди них остаётся низким. Статистический анализ с использованием независимого t-теста показал отсутствие значимых различий в уровне осведомлённости и использования ИИ в зависимости от пола респондентов. В связи с этим рекомендуется организовывать специальные тренинги по использованию ИИ для будущих учителей с целью обеспечения его эффективного применения в обучении.

**Ключевые слова:** Искусственный интеллект, будущие учителя, педагогическое образование, осведомлённость, использование, обучение.

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## SECONDARY SCHOOL EFL TEACHERS' PERCEPTIONS OF THEIR DIGITAL COMPETENCES

**Abstract.** Given the rapid development of Information and Communication technologies (ICT) and their integration into all spheres of human activity, digital competence of teachers has become one of the crucial skills to acquire. Current educational context requires teachers to be digitally competent in order to achieve greater results in the teaching process. The aim of the article is to identify and analyze the perceptions of secondary school English as a foreign language (EFL) teachers regarding their digital competence. Using a qualitative approach, semi-structured interviews with secondary school EFL teachers were conducted to investigate their views, experiences, challenges, and needs connected with digital technology use in teaching English. The results revealed basic levels of EFL teachers' digital competence, the challenges related to a lack of digital equipment at state schools, and the need of enrolling in particular professional development courses and institution's supportive function. The study ends with some suggestions for how to enhance EFL teachers' digital competence development.

**Keywords:** EFL teachers, ICT, digital competence, teaching, digital technology, secondary school.

### Introduction

Teachers now have to reconsider their strategies and obtain new skills as digital technology is transforming language instruction. Many secondary schools have English as a foreign language (EFL) teachers running against a mix of unanticipated challenges trying to bring digital resources into their classrooms. The influence of Information Communication Technology (ICT) on language learning and teaching today increased the scholars' interest in understanding how teachers are comfortable with digital tools and what challenges they encounter while implementing them into teaching (Kassymova et al., 2023). Digital competence is commonly described as the capability to use digital tools critically and confidently to assist oneself to work, learn, and socialize (Ferrari, 2012; Redecker, 2017). In education, particularly language teaching, it also means the knowledge of both the technical skills and the pedagogical aspects that will lead to better outcomes of the learners. Through the European Framework of Digital Competence of Educators (DigCompEdu) (Redecker, 2017) and Technological Pedagogical Content Knowledge (TPACK) (Mishra & Koehler, 2006), the understanding of what digital competence is for educators has been greatly achieved. DigCompEdu identifies three major areas of competence, which include Educators' professional competences, Educators' pedagogic competences and Learner competences while TPACK stresses technological, pedagogical, and content aspects of digital competence.

Generally speaking, today's classrooms blur the lines between traditional instruction and technology-backed learning. This research, hopefully, adds to our growing pool of knowledge on digital literacy by flagging the critical issues that secondary school teachers face – issues that might call for more thoughtful professional development. Thus, this study aims at exploring the secondary school EFL teachers' perceptions towards their own digital skills, the difficulties they encountered, and the needs they have developed as they used digital tools in the teaching process. To reach the aim, the paper digs into a few pointed research questions:

- 1) What do secondary school English teachers say about their digital competence?
- 2) What difficulties crop up when they try to integrate digital tools into their lessons?
- 3) What types of support and ongoing training do they feel are needed to boost these skills?

These questions, together with the educators' varied perspectives, form the backbone of the investigation, pointing to potential strategies for progress.

### **Theoretical framework**

Two distinct theories mentioned earlier, namely, European Framework of Digital Competence of Educators (DigCompEdu) (Redecker, 2017) and Technological Pedagogical Content Knowledge (TPACK) (Mishra & Koehler, 2006) are considered to be suitable to guide the current research. Both frameworks have vital components that help to explain complexities of integrating digital technologies into educational process. Although they seem to have variations in terminology and offer different perspectives, generally both focus on the necessity of developing teachers' digital competences. TPACK framework highlights the significance of teacher professional development (PD) in educational technology, but argues "against teaching technology in isolation" (Mishra & Koehler, 2006, p. 29) pointing to the necessity to integrate technology with pedagogical and content knowledge. The framework shows how the PD should be designed to become an efficient program. TPACK is important in understanding how teachers should integrate digital technology across disciplines. For example, the way, technology is used by Math teacher and language teacher may significantly vary.

DigCompEdu further expands our understanding of components needed for the development of teachers' digital competences since it suggests a broader set of skills and competences. Six competences areas that this framework includes are: professional engagement, digital resources, teaching and learning, assessment, empowering learners, facilitating learners' digital competence. DigCompEdu stresses the necessity to equip educators with all six areas and 22 subsidiary competences (see more in Redecker, 2017) to use digital technology effectively, critically, and ethically for personal and professional purposes.

### **Digital Competence of EFL Teachers: Regional and Local Trends**

There has been an increasing worldwide concern on the topic of enhancing the EFL teachers' digital competences, especially after the shift to online teaching during the COVID-19 pandemic. Research conducted in the regions such as East Asia (Wong & Moorhouse, 2021), Europe (Kopinska, 2020), North Africa (Kamal et al., 2021) shows that EFL teachers still remain at the realization stage where most are familiar with basic digital tools but lack confidence in using them in their pedagogical practices. In fact, most teachers claim to be able to handle general digital tasks (e.g. emailing, creating documents) rather than integrating technology into lesson planning or student-centered learning activities. Similarly, research in Kazakhstan consistently demonstrates a low capacity of educators in utilizing digital tools in teaching (Kassymova et al., 2023). The results showed that although masters' students working at secondary schools have sufficient levels of digital competence for studying the program, they are not proficient enough in integrating educational technology in EFL classrooms. Recent study found that secondary school teachers demonstrate high levels of interest and readiness for PD in raising digital competence (Aimicheva et al., 2025). This large-scale study, involving 916 teachers identified the low and average levels of their digital competences before the intervention and the effectiveness of well-designed PD programs. Niyazova et al. (2022) in their study across Turkestan region also established rather low activity of teachers in implementation of methods on the basis of digital technologies and suggested improving the methodological training of teachers, increasing their knowledge in the field of ethical use of ICT, as well as in obtaining and utilizing internet resources for education. Collectively, previous local studies call for the urgency of raising the awareness and developing digital competences of secondary school teachers.

### **Barriers to Technology Integration in EFL Classrooms**

Several researches reported about a myriad of substantial issues of a technological nature as well as other obstacles that prevent the exploitation of technology. These obstacles include infrastructural, personal, psychological, and institutional ones. Infrastructural barriers, for example, include such drawbacks as lack of appropriate hardware and software, unreliable internet, and a shortage of technical support. As a result, teachers frequently express feeling of frustration due to poor infrastructure at a particular school that negatively affects the learners' outcomes and lesson efficiency (Guillén-Gámez et al., 2019). Such challenges have been also classified as "first-order, external barriers" influenced by technological constraints and institutional support (Ertmer, 1999; Hew & Brush, 2007).

Personal barriers are the digital competence levels, mindset, willingness and confidence of the educators themselves referred to as "second-order, internal barriers" by Ertmer (1999). Many teachers are reluctant to use digital tools due to the negative experiences they had at the initial stages of implementation, when required to integrate ICT into teaching without proper training and professional development. Educators who are about to try extended platforms, on the other hand, can experience loss of motivation when faced the idea of changing their teaching approach (Chabert, 2021).

Institutional barriers may be recognized as the lack of administrative support, non-existence of clear ICT policies, and little or no encouragement for innovation (Zhao et al., 2022). In the regimes of examination, teachers may feel technology is not complying, and this would consume more time than the teacher's available time to waste. They might also feel they cannot because, in addition to the lack of time, the colleagues or the professionals with whom they interact may not have successful strategies to share, or the professional learning communities may not exist at all.

The teachers of resource-rich environments might get better training and infrastructure, yet when it comes to the digital integration process, they still encounter challenges as they are not equipped with the necessary pedagogical training. When we talk about the developing regions, infrastructural obstacles, for instance, the absence of proper internet, the lack of equipment are indeed the concerns that even worsen the situation. The study conducted by Zhao et al. (2022) in China has pinpointed that the accessibility and the attitude of the teacher, rather than the age or the experience, are the main determinants of one's digital competence. Hence, it is more likely that the motivation and the backing from the school will dominate the demographic features as sources of teachers' skill development.

### **Importance of Professional Development and Support**

The conclusion of the researchers is that the debates all center around the same idea, that targeted and ongoing PD is a key factor in shaping the digital skills of teachers. Synthesis of international research on teacher PD positions teachers' digital competence as a pedagogical rather than technical construct (Tondeur et al., 2016), complying with the TPACK and Digcompedu theories. The need for sustained and complex PD is also stressed by Darling-Hammond et al. (2017), who point that teacher training should first of all positively affect learners' outcomes. Moreover, collaboration and informal peer support are crucial in efficacy of such PD programs (Wenger, 1998).

According to Guillén-Gámez et al. (2019), the existence of many tech-no-geek teachers should not come as a surprise to anyone as a major percentage of teachers are yet to be trained in using ICT. It has been a waste of time to deliver only short-term or one-off workshops, as research has shown that providing teachers with sustained and hands-on PD experiences will be the best way in the future.

Kopinska (2020) and Redecker (2017) highlight the point that a number of institutional initiatives, such as the provision of not only regular ICT training, but also peer mentoring and access to helpdesk, can really make a difference regarding teachers' digital readiness. At the same time, the existence of a supportive school culture, which is characterized by the acceptance and promotion of technology experimentation, is also very important. In addition, schools that are capable of creating an environment in which teachers can interact with each other and learn from one another might witness a high level of technology adoption. Moreover, the research also indicates that PD, which is aligned with teachers' instruction goals, for example, teaching grammar interactively or using video for pronunciation, is more likely to have a greater impact. Therefore, we should be practicing learner-

centered professional learning, where teachers make practice and have clear connections with their daily classroom needs.

### **Teachers' Perspectives and Experiences**

A teacher's personal views of their capabilities and experiences in the digital world through a qualitative channel of communication offer a clear picture of the human factor, which is crucial for digital transformation in the field of language education. Many teachers acknowledge the duality of their digital competence, thus feeling at a loss even if they are very competent in certain areas. This self-assessment is the result of both the internal (confidence, self-efficacy) and the external (feedback, institutional expectations) elements.

The study by Wong and Moorhouse (2021), focusing on teachers from Hong Kong, proves that teachers were not ready for the online classes but changed their mind saying that the experience is life-changing and helpful to them. In a similar vein, a few teachers suggest that it is important for such teacher-student connections to be established when the digital tools are used—as in, the so-called interactive quizzes or collaborative writing platforms. If designed for the effective use of digital technology, tasks in the classroom can also result in students' active participation and learning.

Nevertheless, when the negative incidents, such as technical problems or even the student's disinterest, continue, the readiness of teachers to adopt innovative practices is negatively affected. Despite the importance of tools' palatability, refresher courses, and network support to be at the forefront, many teachers make the point that these are not the only factors for the successful use of digital resources. The results of the research show that teachers find it necessary to be involved in selecting the content of the digital policy and planning of workshops from which they will benefit the most (Aimicheva et al., 2025). A collaboration aspect from the teachers' side, by means of being participants who organize the workshops or give feedback on tools, may bring about positive changes in the implementation of technology.

On top of that, it is revealed in some papers that teachers feel their voice is important in the formation of digital policies and in the training exercises. Practices, such as the participation of educators in the development of PD programs or of digital tools, have proved that this could not only increase the worth and the continuity of the efforts taken to integrate technology but also improve their effectiveness.

## **Methods and Materials**

### **Research Design and Approach**

The study primarily utilized qualitative methods to gain insights into how secondary school English teachers perceive their digital competence in teaching. The data was gathered via semi-structured interviews, which were the tools to investigate teachers' digital competence, their challenges of technology integration, and their needs in integrating ICT into educational process. For the qualitative analysis of the data, the thematic analysis by Braun and Clarke (2006) was adopted to uncover the patterns in the data.

### **Participants: sampling**

The study employed a non-probability purposeful sampling, recruiting four secondary school EFL teachers from two schools of Almaty who volunteered to participate. The criteria for recruiting them were the following: being able to use ICT for various purposes; working as a secondary school EFL teacher. The selection of the sample was represented by the variety of age groups and experience levels. It ranged from recent graduates in their 20s to senior teachers in their late 30s. The levels of teaching experience were stretched from one to 20 years, thus there was a diversity of freshmen and veterans. In order not to disclose their original identities, they were coded as Teacher A, Teacher B, etc. when the researcher reported about them. The focus of their teaching activities was basically teaching English language at the level of lower secondary and higher secondary education. All participants were non-native speakers of English who were teaching English as a Foreign Language in a non-English speaking environment which is quite common in the region.

**Table 1.** *Participants' demographics*

Codes	Age	Gender	Type of school	Experience	What digital tools or platform are you regularly applying in your teaching practice?
A	Teacher Mid-20s (23-24)	Female	State	2 years	Kahoot PowerPoint
B	Teacher Mid-30s (34-35)	Female	State	5 years	PowerPoint
C	Teacher Mid-20s (23-24)	Female	State	3 years	PowerPoint Canva Bilimland Wordwall
D	Teacher Late-30s (37-38)	Female	State	7-8 years	PowerPoint, Google form

In addition, the participants were required to give information about the digital tools they regularly use in their teaching practice. According to responses, all interviewees can use basic digital instruments.

### **Data Collection Tools**

Data were collected through interviews. As for the interviews, they were of a semi-structured type and conducted with the teachers, only in interviewee's preferred language, which was either Kazakh, Russian or English. The interviews in Kazakh and Russian were then translated into English at the data processing stage. The individual interviews were conducted for 30-35 minutes, the total number of interviews was 4 and they consisted of open-ended questions. These open-ended questions were related to the areas of teachers' self-assessed digital competence, teachers' examples of digital tool use in their teaching, the difficulties when employing technology, and the opinions on what support or training would be most beneficial to their development of digital skills. The questions were designed in such a way as to elicit from the interviewees detailed and illustrative examples and personal experiences of implementation. The questions are presented below:

#### **Interview questions**

##### **Background and Context**

- Can you explain your current teaching role and the educational setting (e.g., grade level, subject, school type)?
- What would be your description of the digital infrastructure in your school (e.g., devices, software, internet access)?

##### **Experiences with Digital Competencies**

- What digital tools or platforms are you regularly applying in your teaching practices?
- Could you guide me through an example of a class where digital tools played a major part? What went right and what went wrong (if any)?

##### **Skill Development**

- How have you gained your digital skills so far (e.g., formal / self-taught / collaborated with peers)?
- Can you describe situations when you were not confident with a specific digital tool?

What was your reaction?

##### **Student Engagement**

- Would you tell me how digital tools affect students' participation and learning outcomes in your class?
- Can you provide an instance when the students found it a bit challenging to use the digital tools, and tell me how you supported?

#### Attitudes and Perceptions

- To what extent do you consider digital skills to be necessary for the teachers today?

#### Why?

- Do you find your school's leadership to be supportive of the development of digital competency among the staff? In which ways is that shown in the policies or the work of the school?

#### Confidence and Comfort

- On a scale from 1 to 10, to what extent are you confident in the use of new digital tools? What are the reasons for the grade you have given?
- Are there some areas of digital competence (e.g., data privacy, AI tools, multimedia creation) where you just feel you are not that confident?

#### Challenges and Barriers

- What are the key barriers that hinder you to effectively integrate digital tools into your teaching (e.g., technical, pedagogical, or institutional)?
- How do you prioritize the use of digital tools given all teaching commitments?

#### Support and Resources

- What assistance (e.g. training, technical support, peer collaboration) are you receiving to help you develop digital competences?
- What are the other resources or support that you wish you have?

#### Professional Development and Future Outlook

- If you were allowed to create a teacher professional development program on digital competences, what topics would you include?
- What improvements would you like to be done at your school or district to help digital readiness better?

All of the recordings have been transcribed word for word. The transcription of Russian interviews was translated into English.

### **Data Analysis**

Thematic analysis method was utilized to carefully unveil the qualitative data, in line with the well-known six phase process created by Braun and Clarke (2006). The approach was mainly data driven, which basically meant that the themes were taken out of the data content itself rather than from theories that existed previously, however the research questions did provide the general frame. First, familiarization involved the raw data transcription and translation into English when necessary, then the initial codes were generated, and emerging themes were searched. After the reviewing the themes, they were defined and named. The participants' quotes that are representative of all other answers were included in writing up the results.

### **Ethical Considerations**

Consistent with SDU protocols for human subject research, ethical rules were meticulously followed throughout this investigation. The participants' informed consent was sought before the initiation of data collection. Additionally, teachers were made aware of the study's purpose, the voluntary nature of participation and their right to withdraw without any impact. The participants assured that by agreeing to be audio-recorded for the interviews and that the anonymous quotes, if used, would not be affected in publications.

The issue of the confidentiality and anonymity of the participants was handled with the utmost care. Data related to the identification of any (e.g., specific school names, etc.) information is omitted in order to ensure the privacy of the participants. All the digital files, both the recordings and the

transcripts, were kept very securely in password-protected devices, and only the researcher could reach them.

## **Results and Discussion**

Three main themes were realized: Low Digital Competence and Confidence, Barriers to Digital Integration, and the Support Needs.

### **Theme 1: Low Digital Competence and Confidence**

The skill level of teachers as per their own ratings ranged from basic to intermediate. The younger of them were self-assured, while the more experienced teachers claimed to be not competent enough for technology changes. Most of the tools were acquired through online self-training.

Teacher A: “I frequently use Kahoot and Power Point, no problem with basic features, but I'm a bit uncomfortable with advanced tools.”

Teacher B: “The technology I mastered is only creating Power Point presentations that I use sometimes. My students are often more knowledgeable than I am.”

Teacher C: “I think I can use quite many tools and my colleagues often ask for my help. And it would be great to learn more because the efficiency of the lesson raises. There are so many new technologies now that we should use, but can't.”

Teacher D: “My colleague taught me how to create Google forms. Also, I can do Power Point presentations when I need. Unfortunately, I am not confident in using other, more recent digital technologies.”

### **Theme 2: Barriers to Digital Integration**

Infrastructure Issues: Teachers commonly faced problems such as the poor internet and lack of proper equipment. They also did not have technical support and the malfunctions they faced were frequent.

Teacher D: “The lesson gets disrupted many times due to the poor internet connection. This is really irritating.”

Teacher A: “We don't have the basic equipment to use digital technologies in the classroom. For example, there is only one projector and we can use it very seldom.”

Learning Curve: Several teachers felt really stressed because they simply couldn't keep up with such fast changes in technology.

Teacher C: “There's definitely a new instrument each time. I'm completely lost when it comes to what I should do first.”

Time management: Teachers reported a lack of time because of overloaded classes and assignments. So, they cannot raise their digital competence on their own.

Teacher B: “We want to learn more about information technologies, but we don't have time.”

Institutional Attitudes: As a result of the limited administrative encouragement and the main concentration on traditional methods, the teachers were discouraged from trying out different methods.

Teacher C: “Without support, teachers won’t develop. We are loaded with many responsibilities besides teaching and as a result, teach traditionally.”

### **The third theme: The Need for Digital training**

The need for the practical, on-site training with tools that are real and proper was one of the teachers’ requests.

Teacher A: “Only practice, no theory, can make us competent with tech. We need training in this aspect so that to use ICT in the classroom.”

Alongside, they preferred the idea of peer-to-peer mentoring and tech-sharing groups.

Teacher B: “Perhaps the departments should have someone to guide us with the digital technologies.”

They also indicated the importance of engaging leaders, updating infrastructure, and providing tools.

Teacher D: “Only a good network and support can help in this. The administration should first provide with professional development. Also, the state schools need more financial support to buy appropriate digital equipment.”

Teachers were very optimistic about the unity of regulation together with the integration of digital competencies into official curricula.

Teacher A: “If the modules have the tech component, school administration will be there to support it.”

The study indicates that besides experience, teachers of English as a foreign language are also shaped through digital competences by the personal and external systems of support. The technology intention of the respondents, clearly seen from the positive attitudes towards its use, was subject to the effect of individual levels of confidence and infrastructure challenges that persisted. Corroborating these results is Ertmer’s (1999) contrast between external and internal barriers to the application of the technology.

Concerning the digital tools, it was found that the younger educators were more outspoken when it comes to their competence in using technological solutions. In contrast, the professionals with longer experience describe themselves as being more conservative and taking it slowly. Still, technological perception was not merely a function of age, as some experienced teachers expressed their desire to learn, in agreement with Tondeur et al. ’s (2012) results, who argued that along with age, self-efficacy and accessibility of supportive systems matter more.

First and foremost, the lack of infrastructure, such as unreliable internet, a shortage of devices, and the absence of technical support, has always been the cause of the challenges. These results support what was deduced by Hew and Brush (2007) in a former study that environmental factors can hinder the best intentions to try out the technology. Thus, teachers had very little time to try out new tools and due to many school responsibilities, they had to still use old-fashioned methods.

The third finding was the requirement for effective and purposeful continuous teacher education. Teachers complained the professional development sessions were not provided in their schools. This is also observed in Darling-Hammond et al. (2017) who recommend continuous and collaborative training models. The results are also in line with Aimicheva et al. (2025) that secondary school teachers are ready to embrace digital technology in case the holistic PD is provided. Following the components of TPACK and Digcompedu frameworks, such a program would benefit greatly not only teachers but also students in diving into complexities of digitalization.

Another factor of peer outreach that was the most influential in resolving the daily digital obstacles, turning such a situation around for the better, and consequently, to a community of practice of Wenger (1998) was the informal peer support.

Finally, the participants demanded the unification of the policy at the national level. The teachers were of the opinion that the consistency of school-based undertakings would be elusive unless the digital skills are given the topmost priority in the national curricula and assessments. This points to what is required in terms of system redesign for the purpose of being able to sustain continuous digital integration into the educational system.

### **Limitations**

Though this study does cast light on the perceptions of the digital competencies from the perspectives of EFL teachers in secondary schools, the findings are subject to certain restrictions that ought to be recognized. The first limitation is that only four teachers were available and agreed to be interviewed voluntarily at the time of the research, which means that the generalization of the findings is limited. Although qualitative investigations are supposed to be concentrated rather than extensive, a larger and more diversified sample drawn from various types of schools or different regions could present a more complete picture of the issues under investigation.

Furthermore, the study was confined to the experiences of the secondary EFL teachers in Kazakhstan with respect to the digital competences, so it did not encompass teachers of primary level, teachers in various subjects, or teachers in private schools with different technological and educational infrastructures.

Finally, the study was intended to explore the current situation, so the chance to study changes in digital competences or attitudes over a longer time was not possible. Conducting a longitudinal study would be useful to reflect the changing picture of teachers' development in relation to the undergoing training or policy currents.

### **Conclusion**

This study is focused on the way that four secondary school EFL teachers understand and are using digital technologies in their professional practice. The teachers, approached for the interview, had different technical skills, but, however, all share similar worries about the lack of suitable infrastructure, time shortage, and insufficient training. Nevertheless, they exhibited high interest in professional growth and were willing to work hard to have their students engaged through technology.

From the findings, it follows that the provision of support to teachers should be done through the following means: the combination of technical infrastructure, experiential methodologies for training and the development of a collaborative environment that complies with the TPACK and Digcompedu frameworks. Additionally, management and educational policymakers should take the responsibility to make the curriculum and assessment regulations match the modern-day digital content expectations.

The research takes the first-hand teaching experience as a starting point and, thus, it gives a perspective on the efficient development of teaching staff and policy elaboration in EFL contexts. It could be beneficial for further research if more respondents are considered or when the researchers track the process of developing digital competences.

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## ОРТА МЕКТЕПТІҢ АҒЫЛШЫН ТІЛІ МҰҒАЛІМДЕРІНІҢ ӨЗДЕРІНІҢ ЦИФРЛЫҚ ҚҰЗЫРЕТТІЛІКТЕРІ ТУРАЛЫ КӨЗҚАРАСТАРЫ

**Аңдатпа.** Ақпараттық-коммуникациялық технологиялардың (АКТ) қарқынды дамуы және олардың адам қызметінің барлық салаларына интеграциялануын ескере отырып, мұғалімдердің цифрлық құзыреттілігі игерілуі тиіс маңызды дағдылардың біріне айналды. Қазіргі білім беру контексті оқыту процесінде үлкен нәтижелерге қол жеткізу үшін мұғалімдерден цифрлық сауаттылықты талап етеді. Мақаланың мақсаты - орта мектеп шет тілі ретіндегі ағылшын тілін мұғалімдерінің цифрлық дағдыларына қатысты түсініктерін анықтау және талдау. Сапалы тәсілді қолдана отырып, орта мектепте ағылшын тілін оқытуда цифрлық технологияларды қолданумен байланысты көзқарастарын, тәжірибелерін, қиындықтарын және қажеттіліктерін зерттеу үшін орта мектептің ағылшын тілі мұғалімдерімен жартылай құрылымдалған сұхбаттар жүргізілді. Нәтижелер ағылшын тілін оқыту мұғалімдерінің цифрлық сауаттылығының негізгі деңгейлерін, мемлекеттік мектептерде цифрлық жабдықтардың жетіспеушілігімен байланысты қиындықтарды және белгілі бір кәсіби курстарға жазылу қажеттілігін және мекеменің қолдау функциясын анықтады. Зерттеу мұғалімдерінің цифрлық дағдыларын дамытуды қалай жақсартуға болатыны туралы кейбір ұсыныстармен аяқталады.

**Түйін сөздер:** Ағылшын тілі мұғалімдері, АКТ, цифрлық сауаттылық, оқыту, көзқарастар, орта мектеп.

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## ВОСПРИЯТИЕ УЧИТЕЛЯМИ АНГЛИЙСКОГО ЯЗЫКА В СРЕДНИХ ШКОЛАХ СВОИХ ЦИФРОВЫХ КОМПЕТЕНЦИЙ

**Аннотация.** Учитывая стремительное развитие информационно-коммуникационных технологий (ИКТ) и их интеграцию во все сферы человеческой деятельности, цифровая компетентность учителей стала одним из важнейших навыков. Современный образовательный контекст требует от учителей цифровой грамотности для достижения лучших результатов в процессе обучения. Цель статьи — выявить и проанализировать представления учителей английского языка как иностранного в средних школах об их цифровых навыках. С помощью качественного подхода были проведены полуструктурированные интервью с учителями английского языка в средних школах для изучения их взглядов, опыта, проблем и потребностей, связанных с использованием цифровых технологий в преподавании английского языка. Результаты выявили базовый уровень цифровой грамотности учителей, проблемы, связанные с нехваткой цифрового оборудования в государственных школах, и необходимость прохождения специальных профессиональных курсов и получения поддержки со стороны учреждения. Исследование завершается некоторыми предложениями по повышению уровня развития цифровых навыков учителей средних школ.

**Ключевые слова:** учителя английского языка как иностранного, ИКТ, цифровая грамотность, преподавание, восприятия, средняя школа.

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## A CONCEPTUAL FRAMEWORK OF AI TOOLS AS A COGNITIVE TOOL IN HIGHER EDUCATION

**Abstract.** The rapid adoption of artificial intelligence (AI) technologies in higher education has attracted growing academic interest. At the same time, it has raised concerns among teachers. While existing research largely emphasizes technological efficiency or academic integrity risks, fewer studies address how AI can be pedagogically integrated to support learning without undermining students' cognitive engagement. The study synthesizes peer-reviewed literature in the areas of AI-supported learning, educational technology, and higher education using an analytical and theoretical research design. This study develops a pedagogical framework that conceptualizes AI as a cognitive tool rather than a substitute for human thinking. The proposed framework conceptualises the AI tool as a cognitive tool operating through three connected functions in pedagogy: scaffolding, cognitive support, and reflection. These roles are integrated into a logical framework based on constructivist and sociocultural learning theories. By providing a logical and practically useful model for ethical AI integration in higher education, the study enhances AI-enhanced teaching.

**Keywords:** AI in Education, AI-driven tools, Cognitive Tool, Pedagogical Scaffolding, Critical Thinking, cognitive tool

### Introduction

Kasneji et al., (2023) and Zawacki-Richter et al., (2019) systematic investigations show that the emergence and active implementation of large language models (LLMs) have led to a noticeable increase in the role of artificial intelligence in the higher education system. Generative artificial intelligence (GenAI) can create new content - including text, images, video, audio, and software code - by learning patterns from existing data. In this study, the discussion primarily refers to generative AI systems based on LLM, such as ChatGPT and similar tools, generally used by students for explanation, feedback, and problem exploration in a learning context.

Its fast popularity has generated a lot of conversation about academic integrity, assessment, and teaching in the future. The arrival of AI tools has noticeably changed, for instance, students can now quickly get brief explanations, alternative views of understanding phenomena in nature. Sometimes AI tools help with step-by-step problem walkthroughs, which make independent learning easier (Bearman et al., 2022). Many instructors worry that AI could promote superficial learning or erode pupils' capacity for independent thinking (Rudolph, 2023).

Meanwhile, past technological innovations in education were often viewed with concerns, yet over time, tools such as computers, calculators, and internet resources became recognised as valuable cognitive aids and, when thoughtfully integrated into teaching practices (Adom & Ferdinand James, 2019; Pakdaman-Savoji et al., 2019).

From this point of view, the key issue is not the presence of AI tools in education, but the way it is pedagogically integrated into learning activities. Against this background, this study suggests that AI can make a positive contribution to learning when it is deliberately used as a cognitive tool that supports, rather than replaces, students' thinking.

Recent studies on artificial intelligence in education emphasize the importance of aligning AI use with established learning theories (Wang et al., 2024). Aspects of AI-supported learning that have

been discussed in earlier studies of Yan et al. (2025) and this study bring these perspectives together by presenting a unified pedagogical framework that conceptualizes AI as a cognitive tool supporting different phases of the learning process.

This paper develops a conceptual framework that explains how artificial intelligence can function as a cognitive tool to support learning in higher education. It synthesizes relevant literature and presents three key pedagogical functions of AI-scaffolding, cognitive support, and reflection- by an analytical discussion of their implications for teaching and learning. These functions provide a structured lens for understanding how AI can support cognitive engagement while maintaining students' active role in the learning process.

This study is significant as it contributes to the growing body of research on AI in the HE role. It provides a theoretically grounded framework that conceptualizes AI as a cognitive tool supporting student thinking, rather than replacing it. The proposed model offers practical value for educators by outlining how AI can be meaningfully integrated into learning processes to enhance cognitive engagement, reflection, and independent learning.

The subsequent section presents the analytical findings and the proposed conceptual framework. Finally, the paper concludes with a discussion of the implications for teaching and learning in HE.

## Literature Review

### AI in Higher Education

AI is gradually moving beyond the scope of an assistive technology and is beginning to play a role as a structural element of the educational environment, influencing the ways in which we think and learn. Also appears concerns of academic dishonesty, which means HE is still negotiating its relationship with AI.

Crompton & Burke (2023) suggested that the conversation movement is moving from “Can we use AI?” toward “How should we use AI in a way that preserves authentic and meaningful learning?” In recent years, there has been a significant increase in AI research in higher education. AI is making huge inroads into higher education institutions, modifying how students learn and how instructors teach. Zawacki-Richter et al. (2019) demonstrate that much of this material focuses on technical applications, automations, and efficiency benefits. Kasneci et al. (2023) recent research suggests opportunities such as personalized assistance and adaptive learning with worries relating to reliance and academic dishonesty. A common weakness of his body of research is the lack of an explicit educational framework. Existing studies primarily focus on defining AI competencies and technical applications, while offering limited insight into how learning can be structured around AI to promote meaningful cognitive engagement (Zawacki-Richter et al., 2019; Kasneci et al., 2023; Wang et al., 2024).

There is a need to design educational frameworks with learning theory alignment, models, and scaffolding. A systematic review of 69 empirical studies found that personalized adaptive learning, which tailors the learning experience to the level and needs of each student and provides timely feedback, is most often associated with improved academic performance (41 studies out of 69,  $\approx 59\%$ ) and increased student engagement (25 studies out of 69,  $\approx 36\%$ ) (Du Plooy et al., 2024). Even though results vary by context, successful implementation remains an important challenge despite broad student recognition. The correlation of students' performance with test scores, course completion, conceptual understanding, and short-term and long-term learning goals (Kwak, 2025).

AI can help students learn English more effectively than traditional techniques (Rukiati et al., 2023). AI tools make learning more adaptable and interesting by adapting to each student's level and needs, providing immediate guidance, and allowing students to learn in their own adaptive manner. Some studies show that AI language models encourage students to experiment and explore new studies more effectively than traditional methods. For instance, in English learning, because the learners are different, it means giving more detailed information regarding their own abilities.

Wang et al.'s (2024) research indicates that AI considerably increases English language learning when applied properly and sensibly. Although the integration of AI in higher education has great potential, its pedagogical execution and applications are still restrictive. Ismail et al. (2024) research,

about educator development, and AI literacy encouragement are required to fully realize the potential of AI in education in delivering appropriate educational experiences for learners. AI can be applied as a learning subject to foster active participation, critical analysis and innovation while being academically honest. When implemented correctly, AI improves rather than being self-sufficient in thinking. (Slade et al., 2025). According to a quantitative quasi-experimental study of engineering and computer science students, AI-based adaptive learning technologies substantially enhance student engagement and comprehension, consequently positively influencing academic performance in undergraduate and STEM courses. (Fakhrudin et al., 2025).

### **AI as a Cognitive Tool**

Cognitive technologies are characterized as methods that are helpful in the development of learners' intellectual skills rather than replacing human cognition. Within this framework, AI can be viewed as a tool for reasoning, problem-solving, and reflection. According to Holmes et al. (2021) and Shaples (2022), AI has the ability to operate as a learning scaffold or provide cognitive guidance when embedded in structured tasks. However, the literature lacks integrative frameworks for transforming these concepts of theory into pedagogically applicable and interactive models. Yavich (2025) explains that AI tools support teaching strategies that promote autonomous and reflective thinking. Similarly, Stuchlikova and Weis (2024) highlight that AI can enhance learning in HE by personalized support and adaptive learning. However, careful integration is required to avoid overdependence and maintain students' critical and independent thinking. Gerlich (2025) concludes that the link between frequent AI tool application and lower critical thinking is affected by cognitive withdrawal. It is explained by learners' disengagement from active cognitive processing. These findings imply that unstructured AI use may have a greater impact on students with lower educational achievement, emphasizing the importance of pedagogical practices that encourage reflective and responsible AI interaction.

From a constructivist perspective, AI tools support individualized and flexible learning experiences, but ethical considerations are necessary to ensure that AI integration does not undermine core educational principles (Marphala & Ajani, 2019). The analysis demonstrates that there is a trend in literature to imagine AI as a united and human-like entity. Nevertheless, such a wide paradigm ignores the diversity of AI technologies and their many functional and cognitive implications. They are useful for policy advancement, complicating proper analysis, and pedagogical application (Dumouchel, 2023). The relevance of cognitive framing of AI acceptance, according to Li (2025) the cognitive processing methods and contextual circumstances affect people's perceptions of AI more than technological attributes. In addition, their impact is generally confined to improving comprehension of individual texts and the identification of significant concepts of different subjects, with limits in cross-study comparison between tasks and higher-level conceptual clear analysis. Polin & Levine, (2025) findings suggest that a hybrid model approach is essential. In subject matter integration and complicated interpretation, AI supports all analytical stages. AI is conceptualized as a cognitive tool that supports learning through guidance, problem-solving, and reflection rather than replacing human thinking. Its effectiveness depends on structured pedagogical use, as unregulated use may reduce cognitive engagement.

### **Theoretical Foundations**

In this study, analytical, sociocultural, and cognitive perspectives are used to interpret how AI supports different aspects of learning, including reasoning processes, interaction, and reflection. This perspective builds on sociocultural approaches to learning, which view learning as an active process shaped through interaction with tools, environments, and others (Vygotsky, 1978). From this point of view, learning is not passive, but involves active engagement, with AI serving as a tool that can support thinking and learning.

Additionally, for the two concepts, constructivist and sociocultural perspectives, this study offers the cognitive tool theory. This tool is designed to get involved in processes such as interpretation, reflection, and analysis. From this point of view, AI systems function as mediational means that

scaffold reasoning and make thinking processes explicit. The results are also informed by the theory of distributed cognition, which posits that cognitive processes are not confined to the individual but are distributed across tools, representations, and social interactions.

Overall, this perspective aligns with the view that AI can function as an external cognitive resource that supports reasoning and problem-solving without replacing the learner's cognitive agency (Cukurova, 2024).

## **Methods and Materials**

The analytical perspective was used to examine how AI supports reasoning and problem-solving, the sociocultural perspective to understand interaction between learners and tools, and the cognitive perspective to explore reflection and self-regulation processes.

The literature published from 2019 to 2025 indicates that research on AI in HE is commonly framed around three dominant perspectives: AI as a tool for efficiency and productivity, AI as a source of pedagogical and ethical concerns, and AI as a cognitive tool supporting learning processes.

It does not collect primary data or reviews; it integrates peer-reviewed results. The results are based on examination of published articles about using AI tools in HE for various purposes between 2019 and 2025. The goal addressed the conceptual gap in AI-enhanced pedagogy. This offered framework concludes a review of the literature with theoretical interpretation and analytical synthesis.

Peer-reviewed articles and scholarly reports from established journals in higher education and educational technology were selected, with a focus on published studies that investigate pedagogical design, cognitive engagement, assessment practices, and the use of AI as a cognitive tool in learning contexts. These studies were analyzed using analytical, sociocultural, and cognitive learning perspectives to discover pedagogically relevant patterns of AI use. Throughout the evaluated literature, recurring studies were found and integrated into a set of higher-level instructional roles of AI, which influenced the creation of the suggested framework.

Based on this methodological framework, the study investigates the pedagogical interpretation and integration of AI as a cognitive tool in higher education, with a focus on enhancing learning while sustaining students' independent and autonomous thinking.

## **Results**

This section presents the main findings and the proposed conceptual framework. This study pays particular attention to the use of AI in physics education as a representative domain for analyzing cognitive processes in learning.

### **Analytical Overview of the Literature**

This section presents an analytical overview of the literature. Castilio-Martinez (2024) argues that the existing research mostly views AI mainly as an instrument of productivity and improving efficiency. The results indicate that automating some administrative tasks optimizes processes, workflow enhancement, improving features and performance characteristics. Other researchers investigate AI as a source of pedagogical and ethical concerns. The concerns about academic integrity and honesty, students' reliance and decreasing cognitive engagement, possible weakening of independent self-studying, characterizing AI as a destructive factor, assessment redesign, and more explicit institutional guidelines. (Zhai C et al., 2024). In contrast, a relatively smaller but conceptually significant body of work examines AI as a cognitive and pedagogical tool integrated into the learning experience. Studies in this stream examine how AI can scaffold reasoning, facilitate cognitive reflection, and encourage learners' independence, and they more explicitly draw on established learning theories like constructivism, sociocultural learning, and self-regulated learning to frame AI as a mediator of cognitive activity rather than a substitute for human thinking. (Tsakeni et al., 2025; Fan et al., 2025)

Overall, the analytical overview highlights a clear imbalance in the literature: while AI is widely addressed in terms of efficiency, ethics, and institutional governance, its pedagogical role remains under-theorized. A small number of studies directly link AI integration in educational theory, which

highlight the need for conceptually informed frameworks that explain how AI can enhance cognitive engagement and significant learning in HE. (Garzon et al., 2025).

The next section presents the key pedagogical functions of AI identified in the analyses.

### Identified Pedagogical Functions of AI

In the review studies, three consistent pedagogical functions of AI were noted. First, AI can serve as scaffolding by providing structured guidance that supports students' progress. Secondly, AI can function as a cognitive aid, assisting learners in analyzing information, organizing ideas, and exploring alternative solutions. Third, AI serves as a reflective tool by prompting learners to justify their reasoning, assess their comprehension, and engage in self-reflection. These findings are organised around three key pedagogical functions: scaffolding, cognitive support, and reflection. The summary of these findings is presented in Table 1.

**Table 1.** Analytical findings across studies on AI use in Higher education

Analytical Dimension	Dominant Patterns in the Literature	Pedagogical Interpretation	Contribution of This Study
Framing of AI	AI viewed as automation or risk	Technology-centered framing limits learning potential	Reframes AI as a cognitive tool
Instructional Design	Unstructured use linked to surface learning	Learning quality depends on task design	Emphasizes pedagogical structuring
Cognitive Engagement	Higher engagement with guided AI use	AI mediates thinking when scaffolded	Identifies scaffolding as a core function
Student Dependency	Dependency emerges without constraints	Dependency is a design issue	Proposes gradual release of support
Reflection	Rarely emphasized	Cognition is essential for deep learning	Positions AI as reflective tool
Assessment	Traditional assessment loses validity	Process-oriented assessment needed	Provides theoretical basis for redesign

Three consistent ways that AI facilitates pedagogical studies. Results show how AI enhances learning in a variety of subjects, program outcomes, and educational contexts by supporting students' thinking. They are:

- AI helps learners by delivering a comprehensive framework that facilitates the handling of challenging problems. Advice, guided questions, suggestions, or detailed instructions can be considered as an example. It decreases challenge and boosts self-confidence. The degree of support can be gradually decreased as students grasp subject matter better, enabling them to work more effectively and independently. In this way, AI advances students' learning without taking away their independence; rather, it progressively strengthens it.

- AI also serves as a mirror, allowing students to see how they think. By formulating queries, offering criticism, or making comparisons between different strategies, it gently leads them. This encourages students to reflect on how they approach learning tasks, assess their progress in studies, and provide more detailed explanations of the reasoning processes. Helping with a particular task is only one aspect of this type of reflection. It aids in the development of a crucial skill, such as becoming conscious of one's own ideas, assessing the efficacy of one's learning techniques, and eventually identifying strategies that are suitable for them.

- AI helps learners to think more methodologically and clearly by acting as a “mental training simulation”, which promotes the crucial phases of information processing, such as data organization and structuring, breaking down complex scientific problems by dividing them into parts, and investigating different strategies and potential solutions. AI does not provide only simple, ready-made answers. Mainly, it encourages students to study subject matter completely and actively. This method is regarded as a cognitive tool that is particularly useful in tasks that require analysis, comparison, and evaluation processes. They are components of critical thinking.

These perspectives provide the theoretical basis for identifying key pedagogical functions of AI, including scaffolding, cognitive support, and reflection. This framework illustrates that AI support in HE takes into account all the described 3 roles, playing the role of an assistant. But not considering it as an all-knowing authority. AI has different and various functions in a wide range of subjects, from literature to physics-related subjects. One of the important things is using AI widely, which means that technologies - the capacity for independent thought - will promote development, engagement, and introspection. Finally, empowering the students is more important than just giving an answer. AI can be a dependable assistant in Physics education at every level of problem-solving. Instead of offering pre-made solutions, it guides learners in breaking down complex problems on their own, identifying significant laws and phenomena, and formulating a plan of action. Considering AI as an assistant, it makes it easier to organize equations, compare various approaches to solving them, and find logical components between physical concepts. Moreover, it promotes intersection by posing queries that compel students to think about their presumptions, the true significance of the findings, and how the solution could differ in different circumstances.

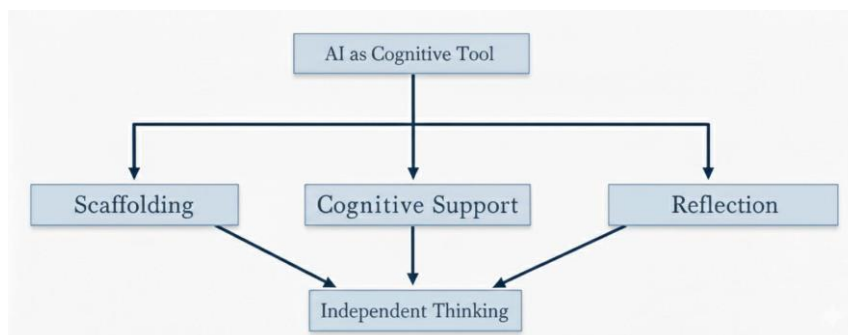
All of these desires are towards one thing: improving students' comprehension of physics and their ability to solve problems without taking the place of the most crucial component - their own independent thought. AI remains in the background as the process of thinking at the core of the educational process.

## **Discussion**

The findings are discussed in relation to the proposed conceptual framework and existing literature. The study fills the gap by providing a view of AI as a cognitive tool that does not replace nor automates students' thinking but supports their intellectual processes. This shift means the discussion from technological capabilities to pedagogical capabilities to pedagogical goals and connects the use of AI with proven learning theories. This research analysis reveals that most of the current researchers consider AI as either an aid to increase productivity or as some kind of threat to pedagogy. But very few researchers have presented AI as some kind of facilitator in the learning process. It helps shape the learning process itself.

These findings are consistent with previous studies highlighting the role of AI as a cognitive support tool in learning (Holmes et al., 2021; Kasneci et al., 2023).

The role of AI as an intelligent assistant also discloses fully how it contributes to the development of complex forms of thinking. After using correctly and adequately, it can be considered such as analytical activities, comparing alternatives, and refining arguments. These findings challenge the notion that AI inevitably leads to superficial learning and demonstrate that its real educational impact is determined primarily by pedagogical impact. The next idea is about AI, considering AI as a learning support, as a tool for Pedagogical functions. In this part we consider three functions. They are scaffolding, cognitive assistance, and reflection. These functions facilitate students in moving ahead with complex problems through a carefully designed structure that allows them to use in various areas and the model is described in Figure 1.



**Figure 1.** Conceptual model of AI as a cognitive tool in physics education

Another finding, considering AI instruments such as scaffolding, is also described in terms of dependency and design. One issue that was raised in relation to studies carried out on students is that of dependence on AI. Conversely, the problem is not using AI technology, but concerns about its uncontrolled use. Therefore, the research question is a pedagogical design of using AI tools, but is not about capabilities.

One of the main concepts described in this study is the engagement of AI tools as a cognitive tool. According to the relevance of this study, previous studies have paid little attention to the reflective use of AI instruments. Instead, these results illustrate reflection in interaction with technology. While students address the results of AI-created material, explain the basis for assessment, and articulate the rationale for that determination, it confirms the capability of artificial intelligence to enhance cognition and promote self-regulation of learning. This study also describes the implications of Assessment Practices. The results are shown in Table 1, describing a growing disconnect between traditional methods and AI-enabled learning environments. Such tools undermine the efficiency of assessment practices that concentrate on the end outcome. Our results support the need for a shift in emphasis towards process, with a focus on the ability to justify, argue, and critically reflect. In recognizing the potential of AI as a cognitive tool, the research provides a theoretical foundation for a paradigm shift in assessment approach. While capturing the value of technological potential. It ensures the integrity of the learning institution environment.

Finally, according to pedagogical contributions and pedagogical contributions, this results in a debate with both pedagogically sustained models, which position AI as a facilitator within the learning process in HE. Opposing these approaches focus solely on technological capabilities or potential risks. It means that the AI promotes intellectual engagement, assists in learning, stimulates reflections - but only meaningfully integrated into HE.

This aligns with concerns raised in recent research about over-reliance on AI and its impact on critical thinking (Gerlich, 2025). This finding is consistent with previous studies that highlight the role of AI in supporting cognitive processes (Holmes et al., 2021; Kasneci et al., 2023). Despite the diversity of positions in the literature, a comprehensive analysis reflects that the conflicting research results are not related to AI technology itself, but to the specifics of its pedagogical integration. Positive educational effects are consistently evident in conditions of structured support, guiding questions, and reflective activities. At the same time, unsupervised or unstructured use of AI is associated with the risk of cognitive unloading and reduced depth of information processing. Thus, the decisive factor is the instructional design, not the presence of AI in general.

The proposed model imagines a structured integration of AI into the physics learning process. The use of AI should be integrated into the stages of solving physics problems such as analyzing the conditions, identifying key laws and concepts, choosing a solution strategy, testing hypotheses, and then reflecting on them. In this context, AI acts not as a source of ready-made answers, but as a means of supporting reasoning. AI support should be gradually reduced as students develop skills in independent analysis and application of physical principles. Assessment practices should focus on the solution process, the rationale for choosing laws, and the interpretation of the results obtained, rather than solely on the correctness of the numerical answer. This approach allows AI to be used as a tool for developing conceptual understanding and critical thinking in physics. The proposed

framework extends previous work by integrating cognitive, sociocultural, and metacognitive perspectives (Shaples, 2022; Yavich, 2025).

An analysis of peer-reviewed studies (2019–2024) revealed a consistent pattern: conflicting results in the literature are related not to the AI technology itself, but to the nature of its pedagogical integration. Positive effects are observed with structured use of AI (support, guiding questions, reflection), while unstructured use is associated with the risk of cognitive unloading. Thus, instructional design is the decisive factor.

Based on the identified patterns, a model for the structured integration of AI into physics instruction is proposed. It is advisable to include AI in the problem-solving stages (condition analysis, strategy selection, hypothesis testing, reflection), gradually reducing the amount of support and shifting the assessment to the reasoning process. This approach promotes the development of conceptual understanding and critical thinking.

## Conclusion

The obtained results indicate that the educational impact of AI is determined by the nature of its pedagogical integration. When incorporated into structured learning tasks, AI promotes the development of analytical thinking, reflection, and student independence. Unstructured use increases the risk of superficial learning. Therefore, the decisive factor is not the technology itself, but the logic of its pedagogical design. The proposed model sets guidelines for the methodologically sound use of AI in higher education.

Future research may focus on empirical validation of the proposed framework and its application in specific disciplinary contexts, including physics education.

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## **ЖОҒАРЫ БІЛІМ БЕРУДЕГІ ЖИ ҚҰРАЛДАРЫНЫҢ ТҰЖЫРЫМДАМАЛЫҚ НЕГІЗІ КОГНИТИВТІК ҚҰРАЛ РЕТІНДЕ ҚАРАСТЫРУ**

**Аңдатпа.** Жоғары білім беру саласында жасанды интеллект (ЖИ) технологияларының қарқынды енгізілуі ғылыми қызығушылықтың артуына алып келді. Сонымен қатар, бұл оқытушылар арасында алаңдаушылық туғызды. Қолданыстағы зерттеулер негізінен технологиялық тиімділікке немесе академиялық адалдыққа төнетін қауіптерге назар аударса, ЖИ-ді студенттердің когнитивтік белсенділігін төмендетпей, оқытуды қолдау үшін педагогикалық тұрғыда қалай тиімді біріктіруге болатынын қарастыратын зерттеулер аз.

Бұл зерттеуде ЖИ-ге негізделген оқыту, білім беру технологиялары және жоғары білім салаларындағы рецензияланған ғылыми еңбектер аналитикалық және теориялық тәсіл арқылы жүйеленді. Жұмыста ЖИ-ді адам ойлауын алмастыратын құрал емес, когнитивтік құрал ретінде қарастыратын педагогикалық модель ұсынылады.

Ұсынылған модель ЖИ-ді педагогикада өзара байланысты үш негізгі функция арқылы әрекет ететін когнитивтік құрал ретінде сипаттайды: скэффолдинг, когнитивтік қолдау және рефлексия. Бұл функциялар конструктивтік және әлеуметтік-мәдени оқыту теорияларына негізделген логикалық құрылымға біріктірілген. Жоғары білім беруде ЖИ-ді этикалық тұрғыда енгізуге арналған логикалық және практикалық тұрғыдан тиімді модель ұсына отырып, зерттеу ЖИ-ге негізделген оқыту тәжірибесін дамытуға үлес қосады.

**Түйін сөздер:** Білім берудегі жасанды интеллект, жасанды интеллектпен басқарылатын құралдар, когнитивті құрал, педагогикалық қолдау, сыни ойлау, когнитивті құрал

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## **КОНЦЕПТУАЛЬНАЯ ОСНОВА ИСПОЛЬЗОВАНИЯ ИИ ИНСТРУМЕНТОВ КАК КОГНИТИВНОГО ИНСТРУМЕНТА В ВЫСШЕМ ОБРАЗОВАНИИ**

**Аннотация.** Быстрое внедрение технологий ИИ в высшее образование вызвало растущий научный интерес. В то же время это вызвало опасения среди преподавателей. В то время как существующие исследования в основном акцентируют внимание на технологической эффективности или рисках академической честности, меньше исследований посвящено тому, как ИИ может быть педагогически интегрирован для поддержки обучения без подрыва когнитивной вовлеченности студентов.

В данном исследовании осуществляется синтез рецензируемой литературы в области обучения с использованием ИИ, образовательных технологий и высшего образования на основе аналитического и теоретического подхода. В работе предлагается педагогическая модель, в которой ИИ рассматривается как когнитивный инструмент, а не как замена человеческого мышления.

Предложенная модель описывает ИИ как когнитивный инструмент, функционирующий через три взаимосвязанные педагогические функции: скэффолдинг, когнитивную поддержку и рефлексию. Эти функции интегрированы в логическую структуру, основанную на конструктивистских и социокультурных теориях обучения. Предлагая логически обоснованную и практически применимую модель этичной интеграции ИИ в высшем образовании, исследование вносит вклад в развитие педагогических подходов с использованием ИИ.

**Ключевые слова:** ИИ в образовании, инструменты на основе ИИ, когнитивный инструмент, педагогическая поддержка, критическое мышление, когнитивный инструмент

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