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Abstract: *Empowering language learners across the globe, we are LingoAce. Our team believes in the power of collective intelligence and collaboration. "None of us are as smart as all of us together." We strive to create an environment where learning is not just about individual growth, but also about growing together as a community. Our goal is to make language learning an engaging and rewarding experience.*

Key words: *"LingoAce", Quizlet platform, Insufficient communication, cognitive skills.*

Everyday life requires effective communication in native and foreign languages. To communicate effectively means the ability to listen, write, understand, and speak, but important is to listen actively, listen to the others, show participation, show interest in communication between people.

Insufficient communication and lack of acceptance can negatively influence the cognitive skills in all developmental periods of a human being existence and performance. (Ruřckova´ & Sedal´ik, 2018, p. 94)[10] Learning a foreign language in the modern world is one of the important components in the life of a modern, successful person. Knowledge of a foreign language is not just desirable, it is necessary.

An ambitious person must speak several foreign languages, constantly polish and improve them, because learning foreign languages is not a boring process at all. This is a creative, exciting activity that develops a worldview, allows you to improve logical thinking, the ability to express your thoughts briefly and clearly. This is the reason why developing new methods for teaching foreign languages is receiving a lot of attention these days. The teacher cannot accomplish his objectives and ensure that the learning process is meaningful and of the highest caliber without the use of specific methods and approaches. The game approach is an engaging and successful way to teach foreign languages to elementary and secondary school students. Motivation lies at the heart of it. This topic is pertinent since games are frequently used to boost students' enthusiasm for learning foreign languages. The game is available to even the most underprivileged pupils and treats everyone equally. Children are able to overcome their shyness and nervousness, which hinders them from freely utilizing a foreign language in conversation. These factors, along with an atmosphere of enthusiasm and excitement and a sense of the feasibility of tasks, all have a positive impact on learning results. The use of computer games as a

potential source of an authentic language environment has become ingrained in the daily lives of the students of the current generation; nevertheless, this has not been extensively acknowledged in the pedagogical literature.

Serious gaming is regarded as a particularly active, problem-solving, situated and social form of learning with rapid and differentiated feedback that also promotes the enjoyment of learning (Garris, Ahlers & Driskell, 2002; Kirriemuir & McFarlane, 2004; Petko, 2008; Tobias, Fletcher, Dai & Wind, 2011). [3, 6, 11, 12]

With the development of technology, the Internet, and the software tools evolving and become acceptable for the majority of the people around the world, even to the third-world countries. The need in learning foreign languages is growing, and the demand for the tools that can help to learn languages is growing as well. The Quizlet platform is one of the most popular platforms for learning purposes, and it can be used for learning languages.

1.1 The prominence of technology and games in language learning within the digital realm from 2016 to 2024.

From 2016 to 2024, there has been a substantial increase in the utilization of technology and games for the purpose of language acquisition. These tools have grown more advanced and easily available, providing learners with captivating and efficient methods to learn new languages. Presented below are two notable illustrations: The Emergence and Growth of Mobile Language Learning Applications: The popularity of mobile applications such as Duolingo, Babbel, and Memrise has experienced a significant surge since 2016. These applications provide gamified educational experiences that incorporate concise teachings, interactive exercises, and incentive structures. Smartphones are utilized to exploit the convenience and accessibility they offer, enabling learners to engage in practice sessions at any given time and location. According to a study conducted in 2020 by the University of South Carolina, utilizing Duolingo for a mere 34 hours can yield results comparable to those of a semester-long language course offered by a university (Loewen et al., 2019). [7] This exemplifies the efficacy of mobile language learning applications, specifically in terms of acquiring vocabulary and fundamental grammar. The progress made in the field of immersive technology. In recent years, there have been notable advancements in Virtual Reality (VR) and Augmented Reality (AR) technology, which have provided language learners with more immersive learning experiences. Virtual reality (VR) systems such as MondlyVR and Immerse provide learners the opportunity to engage with native speakers and enhance their language proficiency through immersive virtual environments that replicate real-life situations. Augmented reality (AR) applications, such as the quick camera translation capability offered by Google Translate, enable users to perceive real-time translations of their surroundings. According to a study conducted in 2023 by the University of Cambridge, the utilization of virtual reality (VR) in language learning has been found to yield noteworthy enhancements in both speaking fluency and pronunciation (Freina & Ott, 2015). [2] These examples demonstrate the transformative

impact of technology and games on language acquisition, enhancing its accessibility, engagement, and effectiveness. With the ongoing evolution of these technologies, it is anticipated that there will be a proliferation of new and immersive language learning experiences in the foreseeable future.

1.2 Our Application

The purpose of this project is to create a platform for learning languages (uzbek, russian, english, spanish and italian) by using Wordnets. Our application is called LingoAce. This software system will use Wordnet for learning languages. It will have a Database of words (in PostgreSQL) where will be the definiton of words, words, and synonyms. The learning method will be by cards, understanding international word and trying to learn it from words and finding synonyms and understand their definition.

In addition, LingoAce will provide interactive quizzes and games to reinforce language learning. Users can track their progress and revisit difficult words or phrases. The system will also offer a feature for users to practice pronunciation and receive instant feedback.

2Product Perspective and Related Work Kalecky, 2016[5] - study summary

The thesis's "Research Methodology" segment cautiously describes the tactics and frame-

work used to study how properly Quizlet is carried out in terms of enhancing language and gaining knowledge of results when compared to conventional vocabulary notebooks. This huge method is based on 3 primary research questions that analyze how Quizlet affects college students' studying results, how they view the virtual tool, and the way it can be incorporated into teaching strategies.

Research Context and Participants:

The have looked at targeting two groups: the experimental agencies the usage Quizlet and the management agencies using traditional vocabulary notebooks. It was done in a technical and vocational secondary college in U'st'i nad Labem. The participants had been

college students who had studied English for five to 8 years inside the beyond. A few of them had to study difficulties like ADHD, which affected their ability to consciousness and spell. Pseudonyms inclusive of 1IVQ (first year, abnormal verbs, Quizlet) have been used to hold anonymity. The instructions were named after their year, vocabulary attention (sports or irregular verbs), and method (Quizlet or pocketbook).

	Strongly agree	Agree	Not sure	Disagree	Strongly disagree
I enjoy using Quizlet at school	42 %	58 %	0 %	0 %	0 %
I enjoy using Quizlet at home	4 %	38 %	21 %	38 %	0 %
The app is better than Quizlet online in a browser	4 %	13 %	58 %	21 %	4 %
The pictures are helpful to remember new words	17 %	54 %	21 %	8 %	0 %
I prefer creating the sets on my own	4 %	4 %	38 %	46 %	8 %
There are sets, created by other users, that I find useful	17 %	63 %	17 %	4 %	0 %
I will use Quizlet to study English more in the future	17 %	54 %	29 %	0 %	0 %
I will use Quizlet to study for other subjects	4 %	21 %	54 %	21 %	0 %
	Strongly agree	Agree	Not sure	Disagree	Strongly disagree
Quizlet is easy to use	27 %	71 %	2 %	0 %	0 %
It is fun to study with Quizlet	4 %	73 %	19 %	2 %	2 %
I can study with Q more often than with a notebook	15 %	31 %	33 %	17 %	4 %
It is easier to learn with Quizlet than with a notebook	29 %	35 %	31 %	4 %	2 %
Quizlet is useful for storing vocabulary	33 %	63 %	4 %	0 %	0 %
Quizlet is effective for studying vocabulary	25 %	71 %	4 %	0 %	0 %
Quizlet helps me to remember the words longer	4 %	50 %	42 %	4 %	0 %

Figure 1: Results of the survey in the experimental group (using Quizlet)[5] Materials and Vocabulary Selection:

In accordance with the curriculum, the vocabulary change into taken from Pearson Education Limited's "Real Life pre-intermediate" textbook (2010). In order to gain 30 to forty vocabulary items over the route of the examination session, the selection technique aimed to introduce kind of 10 new terms in keeping with the lesson. To guarantee a nicely rounded and efficient learning enjoy, the method placed a strong emphasis on classifying phrases consistent with their degree of problem and significance.

Data Collection Instruments:

They have a look at made use of some of data amassing equipment to get information on player perspectives and gain knowledge of outcomes. Surveys, vocabulary exams, posttest questionnaires, and information from Quizlet research have been among them. From the quantitative success in vocabulary retention to the qualitative feedback on the studying technique and device usability, every instrument changed created to seize an awesome aspect of mastering enjoy.

Learning Strategies:

The methodology gave specific commands on how to research for both the notebook and Quizlet groups. The technique featured a sequence of physical games for Quizlet users, ranging from video games to flashcards, with an emphasis on retrieval techniques and spaced repetition. To improve retention and recollect, notebook users were counseled to use techniques including verbal repetition and conceal-and-retrieve. These approaches were designed to support students' mastering autonomy while concurrently encouraging the acquisition of new language.

Research Process:

The look method changed into intricately planned, starting with an introductory elegance wherein students learned about the features of Quizlet and the framework of keeping a vocabulary pocketbook. A pre-take a look at became used to gauge baseline expertise, accompanied by a coaching segment where terminology becomes taught in context, durations of unbiased revision, and a battery of tests to gauge retention and progress. This methodical methodology made certain that the mastering equipment has been thoroughly assessed over a protracted period, giving analysts a solid dataset.

	Pre-test	Test 1 - translation	Test 1 - gapfill	Progress	Test 2 - longterm	Long-term forgetting	Time spent studying at home	Number of study sessions	Quizlet activities
Student 1	30 %	98 %	75 %	68 %	78 %	20 %	60 min	2	finished Learn
Student 2	39 %	95 %	56 %	56 %	85 %	10 %	50 min	2	finished Learn, ✕
Student 3	44 %	94 %	75 %	50 %	76 %	18 %	30 min	1	Gravity
Student 4	52 %	98 %	90 %	46 %	98 %	0 %	35 min	1	Learn, Scatter, ✕
Student 5	35 %	73 %	50 %	38 %	76 %	-3 %	100 min	2	All, ✕
Student 6	56 %	93 %	75 %	37 %	81 %	12 %	40 min	1	Learn, Speller, Scatter
Student 7	43 %	78 %	70 %	35 %	91 %	-13 %	40 min	1	Speller, Scatter, Learn, ✕
Student 8	46 %	76 %	70 %	30 %	83 %	-7 %	40 min	1	Flashcards, Learn, Speller
Student 9	40 %	68 %	65 %	28 %	69 %	-1 %	30 min	1	Learn, Test
Student 10	53 %	79 %	75 %	26 %	73 %	6 %	35 min	1	Flashcards, Learn
AVERAGE	44 %	85 %	70 %	41 %	81 %	4 %	46 min	1,3	

Figure 2: Scores in the second year Quizlet group (2SQ) in the three successive tests and the ways of studying the sports vocabulary. Ordered by progress.[5]

Nguyen, Long Quoc and Le, 2022 - study summary

The "Methodology" section of the exam titled "Quizlet as a Learning Tool for Enhancing L2 Learners' Lexical Retention"[9] delineates the strategies and techniques employed to scrutinize the efficacy of Quizlet in fostering lexical retention amongst English as a Foreign Language (EFL) green folks. The appearance's layout relies on a quasi-experimental frame work, encompassing a pre-test and a put-up-test to gauge the impacts of Quizlet utilization in evaluation to standard studying techniques.

The player cohort comprised 89 college students, initially, determined on from three EFL classes at a non-public university in Vietnam. The university college students had been

allocated into three awesome agencies: a manipulated institution, an in-elegance Quizlet institution, and an at-home Quizlet organization. The manipulated organization, consisting of 28 college students, adhered to conventional vocabulary analyzing techniques without Quizlet's involvement. In comparison, the in-magnificence organization, with 31 students, engaged in vocabulary review classes using Quizlet inside the study room environment. The at-domestic group blanketed 30 college students who applied Quizlet for vocabulary gaining knowledge of independently outside of sophistication.

A vocabulary pre-check is administered to all members on the look-out's inception to set up a baseline for every student's lexical expertise. Over the subsequent four weeks, the in-class and at-home organizations engaged with Quizlet, exploring its numerous skills which encompass flashcards, getting-to-recognize modes, and video games, which may be designed to decorate vocabulary acquisition via attractive and interactive strategies. The manage institution, in the meantime, persevered with traditional vocabulary physical games and did not engage with Quizlet.

Upon the examination's end, all contributors undertook a submit-take a look at same in structure to the pre-check to evaluate vocabulary retention and acquisition. The post-test ratings, juxtaposed with the pre-check results, had been intended to show the differential influences of Quizlet utilization on vocabulary analyzing a number of the corporations.

In addition to the quantitative records gleaned from pre-assessments and publish-tests, they have got a have a look at incorporating qualitative research component. Semi-primarily based interviews have been carried out with a subset of members from the in-elegance and at-domestic agencies. These interviews aimed to extract nuanced insights into the students' reports, perceptions, and attitudes closer to the use of Quizlet as a language-analyzing device. This qualitative records furnished intensity and context to the quantitative findings, supplying holistic statistics on Quizlet's effectiveness in language acquisition.

The studies' statistical assessment used the Generalized Linear Mixed Model (GLMM), a strong technique able to dealing with non-generally disbursed statistics and accounting for male or girl variances among individuals. This statistical technique ensured a rigorous and complete analysis of the exam's results, taking into account nuanced conclusions about Quizlet's impact on vocabulary retention and reading.

The have a study's technique became meticulously crafted to make certain the reliability and validity of its findings. The quasi-experimental design, combined with the methodological rigor of the statistical assessment and the inclusion of qualitative insights, provided an entire framework for comparing Quizlet's effectiveness as a language learning device.

This sure methodological technique underpins the observer's contribution to the sector of language mastering technology. By analyzing the results of Quizlet on vocabulary retention and mastering via a methodologically sound and entire framework, the have an

examine offers precious insights into the capability blessings and programs of digital equipment in language schooling.

Lubis, Arif Husein and Johan, 2022 - study summary

The look at "Quizlet as an Electronic Flashcard to Assist Foreign Language Vocabulary Learning"[8] systematically critiques literature to explore the usage of Quizlet in improving vocabulary mastering in foreign languages. The studies centered on reading articles from 2016 to 2021, aiming to identify trends, advantages, and demanding situations related to Quizlet's software in language learning contexts.

METHODOLOGY:

The methodology employed a qualitative approach through a systematic assessment, adhering to the PRISMA diagram for article selection. The overview targeted articles from Google Scholar, the use of a set of keywords in English and Indonesian to make certain a comprehensive search. The choice procedure brought about the final inclusion of 20 articles after filtering based totally on relevance and comprehensiveness.

Findings and Discussion:

The findings discovered numerous developments in Quizlet-associated studies. The majority of research occurred in Indonesia, observed by way of different Southeast Asian countries, and targeted often English language learning. The instructional ranges of the individuals vary, with a large number of studies concerning secondary and tertiary college students. Methodologically, most studies utilized a quantitative approach, aiming to evaluate Quizlet's effectiveness in vocabulary acquisition.

Advantages of Using Quizlet:

Improved Learning Outcomes: Quizlet has been located to facilitate better vocabulary retention and engagement amongst college students. The interactive features and variety of learning modes offered through Quizlet contribute to an extra dynamic mastering enjoyment, main to tremendous enhancements in vocabulary mastery as evidenced via pre-test and publish-take look at comparisons.

Increased Student Participation: The research reviewed indicated that Quizlet encourages lively participation and will increase college students' willingness to interact in the mastering process. The app's recreation-like environment and interactive features foster significantly greater engaging and motivating getting-to-know surroundings.

Accessibility and Flexibility: Quizlet's cell and web-primarily based structures offer an easy right of entry to gaining knowledge of materials each time and everywhere. This flexibility supports independent studying outside the lecture room, providing college students with additional possibilities to practice and giving a boost to their vocabulary abilities.

Support for Various Learning Styles: Quizlet contains one of a kind gaining knowledge of choices, consisting of visual, auditory, and kinesthetic newbies. The app's multimedia talents allow for a richer getting-to-know experience, catering to a broader range of student desires.

Challenges of Using Quizlet:

Dependency on Internet Access: One of the primary demanding situations highlighted is the need for an Internet connection to get admission to Quizlet, which may restrict its usability in areas with negative connectivity.

Learning Curve and Motivation: While Quizlet is generally person-pleasant, a few fresh- men might also discover it challenging to navigate or may not be encouraged to apply it continuously. Ensuring that students are effectively trained and motivated to use the app is important for its powerful integration into the mastering method.

Quality of Content: Ensuring the accuracy and excellent content on Quizlet is critical. Teachers want to reveal and guide the advent of flashcards to avoid incorrect information and maximize the instructional value of the device.

Ho, Thi Thu Huong and Kawaguchi, 2021 - study summary

The "Methodology" phase of the study titled "The Effectiveness of Quizlet in Improving EFL Learners' Receptive Vocabulary Acquisition"[4] presents an in-depth account of the experimental design, player selection, substances used, and processes accompanied to assess the impact of Quizlet compared to traditional paper flashcards (PFs) on the receptive vocabulary acquisition of excessive college students in Vietnam.

Study Design and Participants: The study employed a pretest-posttest quasi-experimental layout with 39 high college students in Vietnam, who were divided into groups. Group A to begin with used Quizlet, and even Group B used paper flashcards for the primary two weeks, and then they swapped gear for the following weeks.

Materials and Learning Tools: The knowledge of materials consisted of four studying texts from grade eleven English textbooks in Vietnam, with 121 target vocabulary gadgets. Quizlet digital flashcards (DFs) and physical paper flashcards (PFs) had been created to include those vocabulary gadgets, with additional context and visual aids furnished at the flashcards.

Intervention Procedure: The intervention spanned four weeks, during which each business used its assigned knowledge of gear to examine the goal vocabulary. This became supplemented by way of lecture room coaching, character study, and group activities. The examination aimed to create balanced linguistic surroundings, in which both visual and auditory learning channels have been engaged, particularly with Quizlet, which offered audio pronunciations—a characteristic not available with PFs.

Data Collection and Analysis: Data have been accrued through pre-checks, instantaneous put-up-checks, delayed submit-exams, questionnaires, and audio-visual recordings of decided-on individuals' observed classes. The exams assessed students' word form and word - which means profits. Questionnaires have been used to accumulate members' perceptions of the mastering gear, and recordings helped examine the multimodal linguistic environments created by PFs and Quizlet.

Findings: The study found that each Quizlet and PF has been effective in improving vocabulary studying. However, Quizlet showed an extra considerable effect on college

students' vocabulary gains, attributed to its multimodal getting-to-know surroundings, which aligns with the Cognitive-Affective Theory of Learning with Media (CATLM). The students' perceptions additionally preferred Quizlet, indicating a choice for its interactive and tasty nature.

This precise methodology highlights the rigorous method taken to assess the comparative effectiveness of Quizlet and PFs in vocabulary acquisition, imparting precious insights into the potential blessings of integrating digital equipment into language learning curriculums.

Chaikovska, Olha and Zbaravska, Lesia, 2020 - study summary

The book titled "The Efficiency of Quizlet-Based EFL Vocabulary Learning in Preparing Undergraduates for State English Exam"[1] with the aid of Olha Chaikovska and Lesia Zbaravska explores the implementation of Quizlet, a Mobile-Assisted Language Learning (MALL) device, to decorate the vocabulary acquisition of English as a Foreign Language (EFL) learners. This research turned into conducted inside the context of the State Agrarian and Engineering University in Podillia, Ukraine, which specializes in undergraduate college students, predominantly from rural regions, aiming to put together them for the country English exam.

METHODOLOGY:

The studies concerned two organizations of A2 degree EFL freshmen: an experimental institution (n=25) and a control institution (n=25), comprising 0.33-12 months' college students from various disciplines. Ethical considerations which include voluntary participation, knowledgeable consent, anonymity, and confidentiality had been upheld all through the look at.

Both companies engaged in the same extracurricular intensive EFL direction, spanning 72

hours across the semester, designed to equip students for the kingdom English examination. This examination is segmented into "Reading" and "Use of English" parts, necessitating a vocabulary expertise of about 2,500 words across various topics and a complete grasp of grammar.

Implementation of Quizlet:

The experimental group changed into informed to apply Quizlet for vocabulary getting to know. The researcher tailor-made Quizlet getting to know units to align with the route's grammar and vocabulary segments, emphasizing root phrases, suffixes, prefixes, synonyms, antonyms, and word collocations to expedite vocabulary acquisition.

Quizlet activities in the study room blanketed diverse interactive sporting activities like translation identification, photo-based questions, spelling, and matching games, with extra collaborative and tasty duties assigned for home a look at.

Data Collection and Analysis:

They have a look at hiring a pre-experimental questionnaire to gauge students' prior experience with technology and their preliminary language talent level. Diagnostic tests

were administered to check the scholars' English language competence. A pre-check and a submit-check, mirroring the kingdom English examination format, were performed to degree the vocabulary acquisition ranges before and after the intervention.

RESULTS:

The up-experimental information revealed that the experimental group, which applied Quizlet, confirmed a greater development in vocabulary acquisition as compared to the control organization, which used conventional strategies. Specifically, the experimental organization confirmed a 7

The publish-experimental questionnaire meditated on students' effective reception towards the usage of Quizlet, highlighting its ease of use, time efficiency, and the role of visuals in assisting in mastering. However, some college students felt that Quizlet no longer substantially beautified their creativity.

CONCLUSION:

The observation concluded that integrating Quizlet into EFL vocabulary getting to know, in particular, while aligned with spaced repetition and the principles of the Ebbinghaus forgetting curve, can notably enhance vocabulary acquisition. This research underscores the capability of Quizlet as a valuable device in getting ready college students for language proficiency exams and recommends its broader utility in language schooling, in particular in settings wherein traditional instructional resources are restricted.

3Data Specification and Sources

Here are presented the most important data entities and their relationships:

1. PERSONS - ARE - EITHER STUDENTS OR TEACHERS
2. TEACHERS - MUST CREATE - COURSE
3. EACH COURSE - HAVE - LEVEL
4. TEACHERS - MUST DESIGN - EXAMS
5. TEACHERS - GIVE - CERTIFICATES OF COMPLETION FOR STUDENTS
6. STUDENTS - CAN REGISTER TO - COURSE
7. STUDENTS - MUST TAKE - EXAMS
8. STUDENTS - CAN RECEIVE - CERTIFICATES
9. STUDENTS - CAN RATE - COURSES
10. STUDENTS - PLAY WITH - STUDENTS
11. COURSE - CONTAIN - AT LEAST 10 FLASHCARDS BUT NO MORE THAN 20
12. COURSE - INCLUDE - ONE AND ONLY ONE EXAM
13. FLASHCARDS - ARE PASSED TO - WORDNET
14. GAMING - IS BASED ON - WORDNET
15. CERTIFICATES - ARE CONNECTED TO - EXAMS

Now, these sentences are the described with the help of Entity Specialization Tables and Relationship Specialization Tables

Identificator	Entity	Explanation	Identity	Attributes	Note	Sample values	Relationship with
1	Person	Storing data of all people who enter the system	strong	Name	composite		
				Firstname	(string)	Michael	
				Lastname	(string)	Jordan	
				ID	simple, primary	12345	
				email	(string)	blabla@gmail.com	
				Created at	timestamp	2024-04-14T09:52:52+00:00	
				Updated at	timestamp	2024-04-14T09:52:52+00:00	
				Use_language	(string)	French	
2	Teacher	Storing data of teachers	strong	Name	composite		
				Firstname	(string)	Michael	
				Lastname	(string)	Jordan	
				ID	simple, primary	12345	
				email	(string)	blabla@gmail.com	
				Created at	timestamp	2024-04-14T09:52:52+00:00	
				Updated at	timestamp	2024-04-14T09:52:52+00:00	
				Teaching language	(string)	French	
3	Student	Storing data of students	strong	Name	composite		
				Firstname	(string)	Idel	
				Lastname	(string)	lbragimov	
				ID	simple, primary	12345	
				email	(string)	blabla@gmail.com	
				Created at	timestamp	2024-04-14T09:52:52+00:00	
				Updated at	timestamp	2024-04-14T09:52:52+00:00	
				Points	number	0, 10, 100	
Studying language	(string)	English					
4	Course	Storing data about courses	strong	Name	(string)	English	
				ID	simple, primary	1234	
				Description	(text)	This course is about English	
				Teacher_id	simple, foreign	12345	Teacher
				Level	number	1	
				Minimal points	number	70	
				Created at	timestamp	2024-04-14T09:52:52+00:00	
				Updated at	timestamp	2024-04-14T09:52:52+00:00	
5	Flashcard	Storing flashcards of course materials	Weak	course_id	(simple, foreign)	12345	Course
				Word	(string, partial)	Father	
				Translation	string	Ota	
				Description	(text)	A male parent of a child	
				Created at	timestamp	2024-04-14T09:52:52+00:00	
				Updated at	timestamp	2024-04-14T09:52:52+00:00	

6	Exams	Storing data about exam results of students who take course	Strong	ID	simple, primary	12345	
				Score	number	80	
				Course_id	simple, foreign	12345	Course
				Student_id	simple, foreign	12345	Student
				Teacher_id	simple, foreign	12345	Teacher
				Created at	timestamp	2024-04-14T09:52:52+00:00	
				Updated at	timestamp	2024-04-14T09:52:52+00:00	
7	Certificate	Storing data about students who completed the course	Strong	URL	string, primary	https://link to certificate	Course
				Exam_id	simple, foreign	12345	Exam
				Student_id	simple, foreign	12345	Student
				Teacher_id	simple, foreign	12345	
				Created at	timestamp	2024-04-14T09:52:52+00:00	
				Updated at	timestamp	2024-04-14T09:52:52+00:00	
8	Wordnet	Storing data of all words to be used in gaming	Strong	Word	string	Ota	
				Translation	string	Father	
				Description	string	A male parent of a child	
				Level	number	1	
				Lang_from	string	Uzbek	
				Lang_to	string	English	

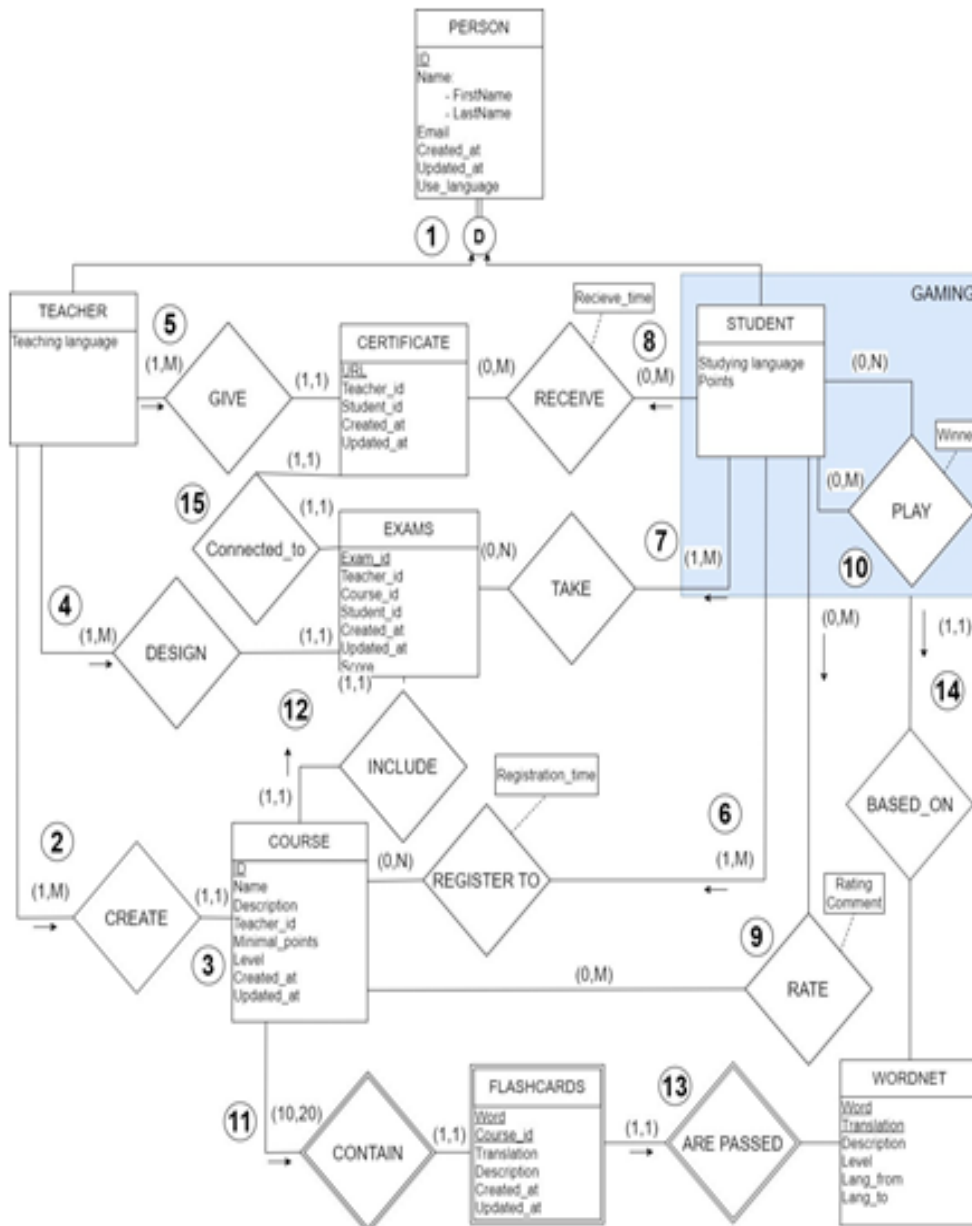
No	Relationship	Design Characteristics	Design values	Note	Sample values
1	Create	Meaning	Teacher creates material		
Type					
Parent entity set and participation		Teacher(1,*)			
Child entity set and participation		Course (1,1)			
		Descriptive attributes			
2	Design	Meaning	Teacher design exams		
Type					
Parent entity set and participation		Teacher (1,M)			
Child entity set and participation		Exam (1,1)			
		Descriptive attributes			
3	Give	Meaning	Teacher gives certificate		
Type					
Parent entity set and participation		Teacher(1, *)			
Child entity set and participation		Certificate(1,1)			
		Descriptive attributes	Registration_time	When student registered	2024-04-14T09:52:52+00:00
4	Register	Meaning	Students register to course		
Type					
Parent entity set and participation		Student(1,*)			
Child entity set and participation		Course(0,*)			
		Descriptive attributes			
5	Take	Meaning	Students take exams		
Type					
Parent entity set and participation		Student(1,*)			
Child entity set and participation		Exam (0,*)			
		Descriptive attributes			
6	Receive	Meaning	Students receive certificate		
Type					
Parent entity set and participation		Student(0,*)			
Child entity set and participation		Certificate(0,*)			
		Descriptive attributes	Receive_time	When student got certificate	2024-04-14T09:52:52+00:00
7	Contain	Meaning	Course must have flashcards		
Type					
Parent entity set and participation		Course(10,20)			
Child entity set and participation		Flashcard(1,1)			
		Descriptive attributes			
8	Play	Meaning	Student plays with student		
Type					
Parent entity set and participation		Student(0,*)			
Child entity set and participation		Student(0,*)			
		Descriptive attributes	Winner	Student id of winner	12345

9	Rate	Meaning	Student rates course		
Type					
Parent entity set and participation		Student(0,*)			
Child entity set and participation		Course(0,*)			
		Descriptive attributes			
10	Are_Passed	Meaning	Flashcards are passed to wordnet		
Type					
Parent entity set and participation		Flashcard(1,1)			
Child entity set and participation		Wordnet()			
		Descriptive attributes			
11	Based_on	Meaning	Gamings is based on wordnet		
Type					
Parent entity set and participation		Gaming(1,1)			
Child entity set and participation		Wordnet()			
		Descriptive attributes			
12	Are connected	Meaning	Certificate is connected to exam		
Type					
Parent entity set and participation		Certificate(1,1)			
Child entity set and participation		Exam(1,1)			
		Descriptive attributes			

Figure 4: Relationship Set

4 Data Design

4.1 Conceptual Data Design



In this subsection, we represent our E-R diagram, based on the Data Specification and Sources section. This diagram was done with the help of draw.io¹ site.

Figure 5: E-R diagram

A wordnet entity is a collection of words with their definitions and

translations, which will be used for activity called "Gaming", represented by aggregation. In the gaming, two people will be playing against each other who faster can solve the task. The winner of a game is recorded, and points, which represent the student's ranking, will be incremented.

¹<https://app.diagrams.net/>

4.2 Logical Data Design

In this subsection, the E-R diagram from previous subsection was transformed to the Codd model diagram. ¹

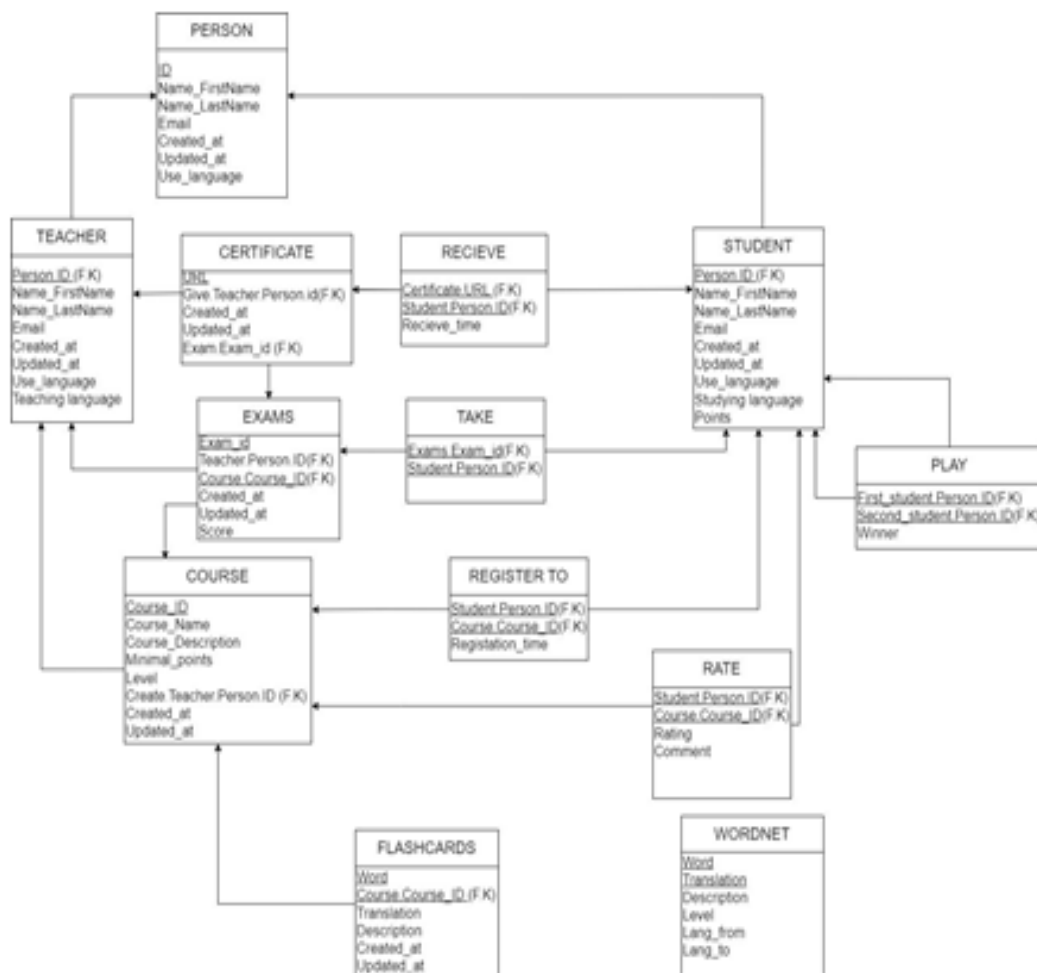


Figure 6: Codd model

As you may see, Wordnet is not connected to any other entity, but it is actively used in recording the words and gaming process.

4.3 Physical Data Design by ER-Win

In this subsection, there is shown a logical and physical design elements written in ER-Win, included all constraints necessary to model participation and cardinality mapping as defined in E-R diagram

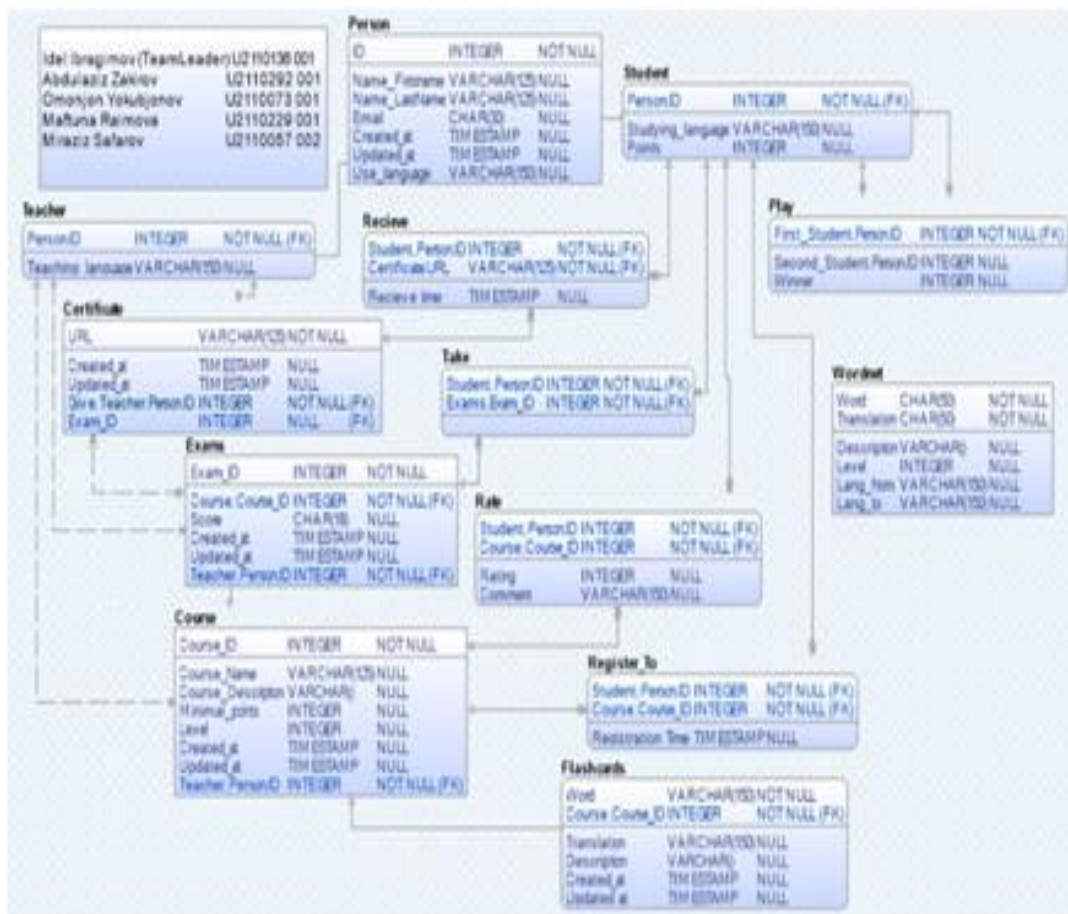


Figure 8: ER-Win Physical Model

CONCLUSIONS

In conclusion, in this project, we demonstrated the design, implementation, and optimization of a database system and application to help people in learning foreign language.

Key features of our project:

1. Entity-Relationship modelling: Through careful analysis, we have developed detailed EER model that accurately shows relationships and attributes of different entities. This ensured that our database structure matches real-world requirements.

2. Transforming EER model into Codd's Diagram: By using different methodologies, we transformed our EER model into a structured model with key constraints.

3. Physical Design modelling by using ERWIN: With the help of ERWIN tool, we added some necessary constraints to ensure efficient and reliable system, reducing the risk of anomalies and maintaining consistency.

4. Normalization and Data Integrity: By following these steps, we have minimized redundancy and ensured data integrity across the database.

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