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Chatbot Gamified and Automated Management of L2 Learning Process Using Smart Sender Platform

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Abstract: The purpose of this study was to examine the potential impact of integrating the Smart Sender platform to gamify and automate L2 e-classes on students' motivation, English language proficiency in reading and language use, engagement, and attitudes towards the platform. This experimental research employed a quasi-experimental design, specifically a non-equivalent control group design of a pre-test-post-test type. The study found that the use of chatbot-driven e-classes on the Smart Sender platform increased student motivation, improved their English language proficiency in reading and language use, and enhanced their engagement within L2 e-classes. Students expressed their appreciation for the ease of use and usefulness of this chatbot-based tool for improving their English language skills. The findings showed that the scores for motivation, engagement, and English language proficiency increased for both the experimental and control groups from pre-test to post-test, with a large effect size observed for the experimental group and a medium effect size observed for the control group. The statistically significant difference in the mean scores between the experimental and control groups indicates the positive impact of incorporating gamified chatbot-driven sessions within L2 e-classes on the Smart Sender platform.

Keywords: *Chatbot gamified and automated delivery, English language learning and teaching, higher education, smart sender platform.*

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Introduction

Chatbots are increasingly being integrated into language learning processes to enhance conventional teaching models (Belda-Medina & Calvo-Ferrer, 2022; Lychuk et al., 2021; Okonkwo & Ade-Ibijola, 2021). However, traditional teaching methods can be time-consuming, labour-intensive, and fail to cater to individual learning styles, leading to a lack of interest, motivation, and engagement among students. Pedagogical approaches such as gamifying and automating language learning processes with chatbots have been explored, resulting in reduced costs, saved time, and increased learning efficiency (Bobrytska et al., 2020; Huang et al., 2022). Recent studies have also shown that chatbots can provide personalised and immersive language learning experiences that match the learning styles, paces, and levels of individual students (Blackburn, 2019; Mirrlees & Alvi, 2020; Wong, 2021). Incorporating gamification techniques further increases the enjoyment and motivation of language learning, encouraging students to continue practising. In addition, the automation of language learning presents an opportunity to optimise the workload of teachers and administrators to focus on other critical tasks, saving universities time and resources while providing high-quality language education (Tsivitanidou & Ioannou, 2021). However, there remains a gap in the methodological application of using chatbots to increase and maintain students' learning motivation and engagement through gamifying and automating foreign language learning processes. The Smart Sender Platform (SmartSender, 2022) aims to address this gap.

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Literature Review

The literature highlights the utilisation of chatbots as an alternative to conventional MOODLE LMS-based distance learning for delivering learning content and managing students' learning processes, particularly in the context of foreign language acquisition (Lychuk et al., 2021). Furthermore, it has been suggested that chatbots have the potential to address the issue of high dropout rates in online courses, which is a significant concern in higher educational institutions (Lychuk et al., 2021). This problem is often attributed by the instructors to factors such as low motivation, ineffective time management skills, and student dissatisfaction (Xavier & Meneses, 2020). By incorporating chatbots, educational stakeholders can address various concerns, including cost reduction associated with delivering theoretical courses, the selection of highly qualified instructors, and expanding their reach in the international education market (Bobrytska et al., 2020). By exclusively relying on platforms like MOODLE LMS for delivering learning content and managing students' learning processes, university learners and educators may overlook the advantages of personalised and adaptive learning experiences, real-time interaction, and immediate feedback. These features foster active learning, encouraging continuous student participation. Additionally, the integration of chatbots can leverage gamification techniques, making language learning more engaging, motivating, and enjoyable. These benefits, surpassing the capabilities of traditional LMS platforms, hold the potential to enhance the overall language learning experience and improve student outcomes.

Gamification and Language Learning

In the relevant scholarly literature, gamification is considered a pedagogical strategy that utilises game elements, such as points, badges, leaderboards, virtual gifts, virtual money, and progress tracking, in non-game contexts to enhance the overall learning experience, including the acquisition of foreign languages (Costa, 2019; Deterding et al., 2011; Seaborn & Fels, 2015). It has been shown to be an effective means of supplementing traditional language learning approaches or environments with digitally-driven 'push-to-learn' tools that engage students, enhance their motivation, and improve learning outcomes (Al-Dosakee & Ozdamli, 2021; Dicheva et al., 2015; Mokhtari et al., 2021). Gamification has been employed in various aspects of foreign language teaching and learning, such as vocabulary acquisition, grammar, and conversation practice (Hamari et al., 2014; Petrović & Jovanović, 2021). The study conducted by Al-Dosakee and Ozdamli (2021) discovered that gamification had a positive impact on the motivation and engagement of foreign language learners.

The literature pertaining to gamification suggests that its mechanics and frameworks can be categorised based on the specific features of the environment in which they are used, the type of player, and the degree of involvement (Prasad & Mangipudi, 2021; Seaborn & Fels, 2015). Prasad and Mangipudi (2021) suggest that different gamification mechanics and frameworks can be employed in various environments, such as workplaces, classrooms, or public spaces, to engage users, players, or participants. For instance, gamification mechanics that incentivise productivity, innovation, and teamwork can be utilised in a workplace setting. Conversely, gamification mechanics that reward learning, collaboration, and creativity can be employed in a classroom setting. In online language learning platforms, gamification mechanics can create an immersive and motivating learning experience. Gil et al. (2015) underscored the importance of selecting, modifying, and validating player types to ensure the effectiveness and appropriateness of gamification mechanics and frameworks.

Chatbots for Gamification and Automation of Language Learning

The integration of chatbots into language learning has gained traction as a promising approach to improving students' foreign language learning experiences (Huang et al., 2022; Lychuk et al., 2021; Petrović & Jovanović, 2021; Xu et al., 2020). Several studies have investigated the use of chatbots in combination with gamification to automate language learning processes. For example, Johnson et al. (2022) found that the Escapeling Telegram bot improved grammar knowledge through sentence correction, enhanced vocabulary through word guessing, and encouraged writing practice by incorporating gamified and narrative elements to engage students. Additionally, chatbots have been used for the automation of language learning, as suggested by Shi et al. (2020), who proposed a concept for a transfer learning-based English language learning chatbot with a three-level-based learning system in a real-world application, integrating Google's recognition service and Open AI's GPT-2 with dialogue tasks in natural language understanding and natural language generation at WeChat mini-program.

While the review of the extant literature does not suggest that the utilisation of chatbots for the gamification and automation of the language learning process constitutes a cutting-edge instructional innovation, there remains a dearth of research on chatbot-based tools, such as the Smart Sender platform, that facilitate communication and simulate the interaction process. The Smart Sender platform utilises a proactive approach to captivate individuals and sustain their engagement by employing chatbots and messaging services. It offers an intuitive interface that empowers non-technical users to construct various conversation and interaction scenarios. Additionally, the platform incorporates analytical features, including open rate and click-through rate (CTR) metrics, to track engagement levels and make necessary adjustments to optimise the conversation experience (Lychuk et al., 2021).

As such, the *purpose* of this study was to examine the potential impact of integrating the Smart Sender platform to gamify and automate L2 e-classes on students' motivation, English language proficiency in reading and language use, engagement, and attitudes towards the platform. The following were the research questions: (1) Did the integration of gamified chatbot-driven sessions in L2 e-classes using the Smart Sender platform result in significant differences in the variables under study compared to the conventional teacher-delivered classes conducted on the ZOOM platform for the control group? (2) How do the chatbot features in the L2 e-classes on the Smart Sender platform affect student motivation? (3) To what extent do L2 e-classes on the Smart Sender platform improve students' English language skills in reading and the use of language? (4) How do the gamification features in the Smart Sender platform affect student engagement in L2 e-classes? (5) How do students perceive the usefulness, ease of use, and satisfaction of the Smart Sender platform, which is a chatbot-based tool, for improving their English language skills, specifically in reading and the use of language?

The research hypotheses were formulated as follows:

H₀: The utilisation of gamified chatbot-driven sessions in L2 e-classes using the Smart Sender platform will not result in any significant impact on students' motivation, engagement, language proficiency, and attitudes towards the Smart Sender Platform.

H₁: The utilisation of gamified chatbot-driven sessions in L2 e-classes using the Smart Sender platform will have a significant effect on students' engagement, language proficiency, and attitudes towards the Smart Sender Platform.

Methodology

Research Design

This experimental research employed a quasi-experimental design, specifically a non-equivalent control group design of a pre-test-post-test type, where participants were assigned to either the experimental group (EG) or control group (CG) based on their availability and willingness to take part in the study (Rogers & Révész, 2020). Both the EG and the CG received training for the Foreign Language (English) sub-test of the Master's Comprehensive Test (MCT) (Ministry of Education and Science of Ukraine, 2022). While the EG received it via gamified chatbot-driven sessions, the CG was trained using conventional training through teacher-delivered classes conducted on the ZOOM platform. The study mainly relied on quantitative data collection approaches to measure and compare the effectiveness of the two training methods, such as pre- and post-test surveys to monitor motivation and engagement (see Appendices A and B), and assessment data drawn from the students' pre- and post-treatment performance on the EL trial sub-test of the MCT. In addition to quantitative data collection methods, the study also employed qualitative data collection through open-ended questions. Specifically, participants were asked the question 'Do you have any additional comments or suggestions regarding the Smart Sender platform for English language exam preparation?' (See Question 9 in Students' Attitudes Toward the Smart Sender Platform Questionnaire, Appendix C) to gather additional insights and feedback on the platform. These qualitative data were analysed using thematic analysis to identify common themes and patterns in participants' responses.

The study's timeline encompassed six distinct phases, each with its own set of objectives and deliverables. The research's structural composition in each phase is depicted in Figure 1.

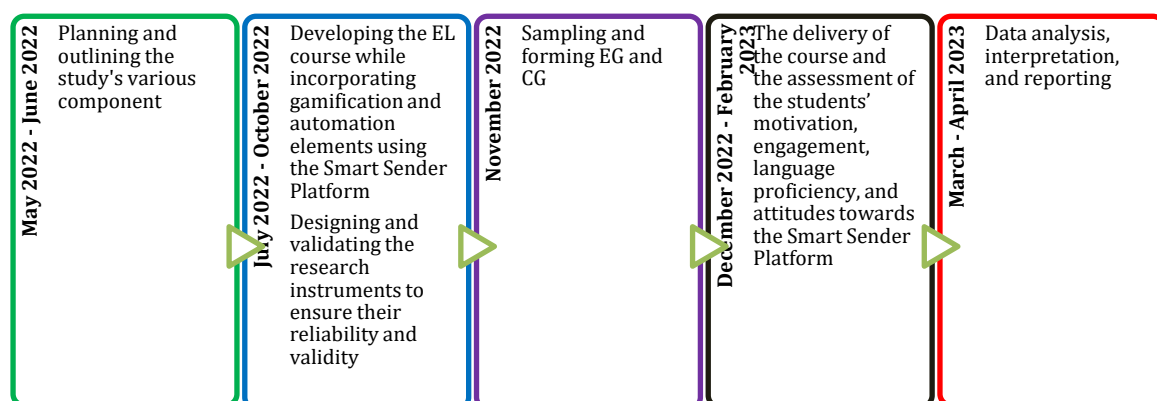


Figure 1. The Flow of the Study With the Outline of the Activities

As can be seen in Figure 1, the study started with the planning phase, followed by the design phase, sampling phase, experimental phase, and data analysis, interpretation, and reporting phase. The study lasted from May 2022 to April 2023.

Outline of the Experiment Based on Chatbot Gamified and Automated L2 Course

The course comprised a total of 15 comprehensive lessons, which were designed to equip the students with essential skills and strategies necessary for success in the EL sub-test of the MCT (Ministry of Education and Science of Ukraine, 2022). The lessons were divided into 2 General Test Techniques lessons, 4 lessons in Reading, 4 lessons in the Use of Language, and 5 Integrated lessons on reading and the use of language. Each lesson encompassed a range of 10 exercises that aimed to enhance the students' language proficiency in reading and the use of language, while simultaneously improving their critical thinking skills, information synthesis abilities, and vocabulary and grammar. The performance of the EG students was evaluated using a binary scale, where a 'pass' was assigned 2 points and a 'fail' was assigned 0 points. Both 'pass' and 'fail' results received an encouraging notification. The chatbot automatically assessed certain types of answers such as matching and multiple-choice, while manual assessment by the course moderator was required for other types of questions, such as paraphrasing, sentence, and summary completion. To simulate time pressure, the chatbot was programmed to provide the activities within a specific timeframe and 'control' keeping to it. One minute before the time was due, students received a notification reminding them of the remaining time. As students advanced through the course, they earned status badges reflecting their achievements, including "General Genius" (awarded for mastering the General Test Techniques lessons), "Reading Rockstar" (awarded for excelling in the Reading lessons), "Language Legend" (awarded for mastery of the Use of Language lessons), "Integrated Dynamo" (awarded for conquering the Integrated lessons), "Smarty Pants" (awarded for outstanding performance on critical thinking exercises), "Word Whiz" (awarded for dominating the vocabulary exercises), and "Grammar Ninja" (awarded for exceptional performance in grammar exercises). Each member of the research team acted as a course moderator, responsible for supervising and providing feedback to 5-6 students. The moderators were required to upload the students' scores to the leaderboard web app, which can be accessed through the following link: <https://keepthescore.co/board/rqpzxlpqtqxpr/>. This web app was used to track the students' progress throughout the course (Keepthescore, 2023). The EL course aimed at enhancing the EG students' language proficiency and test-specific awareness and skills (Ministry of Education and Science of Ukraine, 2022). The course trained the EG students to efficiently perform several test-related activities such as matching, TRUE/FALSE/NOT GIVEN or yes/no/not given, multiple choice, choosing paragraph heading, completing the sentences, labelling or completing visuals, or classifying. The comprehensive structure of the Smart Sender automated and gamified course is presented in Table 1, which outlines the detailed framework of the course.

Table 1. Outline of the Structure of the Smart Sender Automated and Gamified EL Course

Test Aspect or Skill to Train	Lesson Materials/Topics	Skill	Test practice
General Test Techniques	Explanation and trying out of skimming, scanning, identifying main ideas, understanding vocabulary in context, recognising reference and inference, and identifying the writer's attitude or opinion.	<ul style="list-style-type: none"> Reading: Line-by-line, diagonally, zig-zag, back line-by-line, and down-top reading techniques. Note-taking: mind mapping, charting, abbreviations and symbols, summary method, and list method. 	Matching, multiple choice, True/False/Not given
	1. My Family is my Castle	Skimming, matching headings to paragraphs, scanning	Matching headings, multiple choice, classifying
	2. The benefits of gardening as a hobby: A look at how gardening can improve mental and physical health.	Skimming, scanning, predicting, sentence completion, labelling, or completing visuals	Sentence completion, matching endings, multiple choice
	3. Embracing change: How to navigate unexpected career changes and adapt to new opportunities.	Identifying main ideas, understanding vocabulary in context	Summary with a word list, matching, multiple choice, True/False/Not given
Reading	4. Art as a Reflection of Society: Understanding Culture through Creative Expression	Recognising reference and inference, identifying the writer's attitude or opinion	Matching names with ideas, yes/no/not given (author's opinion)
	1. Vocabulary-building techniques.	Contextual understanding of words and recognition of their meaning, word usage, synonyms, and antonyms	Matching, multiple choice, classifying
Use of Language			

Table 1. Continued

Test Aspect or Skill to Train	Lesson Materials/Topics	Skill	Test practice
	2. Common errors in verb tenses and how to avoid them	Test-taking strategies, critical thinking, contextual understanding of grammar and vocabulary	Error correction exercises, word maps or mind maps, word games and puzzles, grammar activities
	3. Different ways of paraphrasing	Use of synonyms, substituting the sentence structure, changing the register of the statement	Error correction exercises, matching, sentence completion, multiple-choice, improving sentence structure and coherence
	4. Idioms and phrasal verbs	Paraphrasing to make the ideas more vivid and engaging, contextual understanding of idioms and phrasal verbs	Matching, sentence completion, and multiple-choice to identify the contextual usage
Use of Language via Reading & Reading via Use of Language	1. The Power of Character in Navigating Peer Relationships	Skimming and note-taking, matching headings to paragraphs, scanning, time management, predicting the context based on the parts of speech, word formation	Matching headings, multiple choice, classifying, summary method, and list method
	2. Music: Playing an instrument as a hobby and the positive effects on mental health.	Scanning, predicting the context, charting, sentence completion, use of articles, use of verb tenses, prepositions, and conjunctions	Matching, sentence completion, multiple-choice, error correction of common errors in verb tenses
	3. Fuelling Your Body for Success: The Connection Between Nutrition and Athletic Performance	Scanning, labelling the diagram, TRUE/FALSE/NOT GIVEN vs yes/no/not given, the use of conditional sentences	Matching names with ideas, summary completion, multiple-choice, true/false/not given, error correction
	4. The Fine Line Between Friendship and Romance: Navigating Love in Your Early 20s	Skimming and scanning, note-taking: list method, understanding and using indirect speech, use of adjective clauses	Matching, multiple-choice, yes/no/not given, sentence completion, error correction
	5. Urban Green Spaces: Why We Need Them and How to Create Them	Skimming and scanning: time management, predicting the context based on the grammar indicators, summarising, paraphrasing	Matching, completion, multiple-choice, error correction, and note taking

The reading component of the course delved into various test-related domains including the personal sphere, encompassing topics such as “daily life and its challenges”, “family dynamics”, “personality traits”, “interpersonal relations”, “friendship and romance”, “hobbies”, and “career planning. The public sphere, on the other hand, covered topics such as “nature and the environment”, “cultural expression and art”, “sports and healthy living”, “history and cultural heritage”, “travel and leisure”, and “food and shopping”. Additionally, the educational sphere was explored, highlighting themes such as the “advantages of education”, “student life, and “education for career development”.

The use of language component of the course comprehensively covered various aspects of grammatical inventory that are relevant to the test. These aspects included the fundamental grammatical categories of nouns, such as singular and plural forms, as well as the possessive case. Similarly, the course delved into the nuances of articles, including definite, indefinite, and zero articles, and expounded on the various types of adjectives and degrees of comparison. Additionally, the course explored the different types of numerals, including cardinal, ordinal, and fractional numerals, and offered an in-depth analysis of pronouns, including their various types. Furthermore, the course covered the intricacies of verbs, encompassing regular and irregular verbs, mood, tense-aspect forms, modal verbs, verb forms, and constructions. Other grammatical categories covered included adverbs, prepositions, conjunctions, and sentences, including simple, compound, impersonal, and conditional sentences. Lastly, the course provided insights into direct and indirect speech and word formation.

Sample and Data Collection

The study employed convenience sampling techniques to recruit students for participation in the quasi-experiment. Forty-three undergraduates (aged between 21 and 22) majoring in Law ($n = 19$) and International Law ($n = 8$) at the Institute of Law for the Kyiv National Economic University named after Vadym Hetman (KNEU) (Ukraine) were offered to take part in the experiment. Twenty-seven students agreed to be included in the control group. Forty-two undergraduates (aged between 21 and 23) majoring in Commercial Law ($n = 16$), and Administrative, Financial, and Information Law ($n = 12$) at the State University of Trade and Economics (SUTE) (Ukraine). Twenty-eight students agreed to participate in the experiment and formed the EG. The Mean value for the cumulative Grade Point Average (GPA) for the EG students was 2.9 which corresponded to 80-82% (B-), according to the ECTS, 100-point scale. The Mean value for the GPA of the EC was 2.5 which corresponded to 77-79% (C+) (ECTS). The groups were considered homogeneous based on the participants' similar majors and GPAs.

The data were collected in both groups before and after the intervention. The questionnaires on motivation and engagement were electronically disseminated via email using a truncated URL and QR code. The data on students' attitudes toward the use of the Smart Sender Platform were only collected from the EG students. The study also utilised pre-test and post-test students' scores in the EL trial sub-test of the Master's Comprehensive Test (MCT) to assess the progress in the participants' English language proficiency.

The study utilised multiple data sources to assess the students' motivation, engagement, language proficiency, performance in the EL trial sub-test, and their attitudes towards the Smart Sender Platform. It used the researcher-designed instruments which included the Motivation: Pre-Test and Post-Test Questionnaires, Engagement Pre-Test and Post-Test Questionnaires, and the Students' Attitudes Toward the Smart Sender Platform Questionnaire. The validation process of the above instruments involved a panel of five Ph.D. holders in fields such as Psychology, Pedagogics, and Psychometrics. When evaluating the face validity of the researcher-designed questionnaires the experts used a Likert scale with 5 indicating the item is extremely suitable for a given purpose, 4- the item is very suitable for that purpose; 3 - the item is adequate, 2- the item is inadequate, and 1- the item is irrelevant and, therefore, unsuitable. When they evaluated the construct validity and internal consistency of the questionnaire items, they used a 5-point Likert scale ranging from 'strongly disagree' to 'strongly agree.' The experts were also authorised to modify any questionnaire item to improve their quality. The item-level content validity index (IL-CVI) of the motivation questionnaires was .96, while the engagement questionnaires had an IL-CVI of .95. The survey questionnaire on students' attitudes towards the Smart Sender Platform had an IL-CVI of .97. According to Taherdoost (2016), these values suggested 'sufficient agreement' among the experts. The calculated inter-rater reliability for the motivation and engagement questionnaires, based on Fleiss's Kappa coefficient, was .629 and .670, respectively. The coefficient for the students' attitudes questionnaire was .662. Polit and Beck's (2006) criteria classified these coefficients as demonstrating 'good agreement' among the experts. These findings, combined with the previously obtained IL-CVI values, provide evidence that the researcher-designed instruments are reliable and suitable for use as statistical measures in the study.

Analysing of Data

The pre-test and post-test scores of both the EG and CG were analysed using the Paired Samples t-test to determine whether there were significant differences in the variables of interest between the group that received gamified chatbot-driven sessions in L2 e-classes using the Smart Sender platform and the control group that received conventional teacher-delivered classes on the ZOOM platform. Additionally, ANCOVA was employed to investigate the effects of chatbot features, L2 e-classes, and gamification features on students' motivation, English language skills, and engagement. All assumptions of the statistical tests were checked prior to conducting the ANCOVA analysis. These assumptions include the normality of residuals, homogeneity of variances, linearity, independence of observations, and absence of multicollinearity. By ensuring that these assumptions were met, we can have confidence in the validity and reliability of the results obtained from the statistical tests. Furthermore, the study used descriptive analysis of the data drawn from the survey on the EG students' attitudes toward the Smart Sender Platform. The data were processed using the *Jamovi* computer software (version 2.2.5) (Jamovi Project, 2021).

The survey question, 'Do you have any additional comments or suggestions regarding the Smart Sender platform for English language exam preparation?' (Question 9 in the Students' Attitudes Toward the Smart Sender Platform Questionnaire, see Appendix C), provided qualitative data that were analysed using thematic analysis. The initial step of the analysis involved transcribing the students' responses into a text document and generating initial codes from the responses. These codes were then organised into themes, which were subsequently evaluated for reliability by an independent volunteer researcher. The themes were deemed reliable and utilised to report and interpret the findings, as well as to consider their implications.

Results

The study rejected the H_0 hypothesis and the results of the study drawn from using the Paired Samples t-test and ANCOVA indicated that the incorporation of gamified chatbot-driven sessions within L2 e-classes, utilising the Smart Sender platform, yielded noteworthy differences in the variables examined when compared to conventional teacher-delivered

classes conducted via the ZOOM platform for the control group. The study provided evidence that the utilisation of chatbot features in L2 e-classes on the Smart Sender platform increased student motivation, while L2 e-classes driven by the Smart Sender platform were found to improve students' English language proficiency in reading and language usage. The gamification features present in the Smart Sender platform were found to enhance student engagement within L2 e-classes. Moreover, students expressed their appreciation for the ease of use and usefulness of this chatbot-based tool in improving their English language skills, specifically in reading and language usage.

The Results Obtained From the Paired Samples T-test

The paired sample t-test was administered to monitor student motivation, engagement, and students' English language proficiency in reading and language usage in both EG and CG. Table 2 presents the results of measurements drawn from the pre- and post-test surveys to monitor motivation and engagement and the EL trail sub-test pre- and post-intervention results.

Table 2. Results Yielded from Pre- and Post-Test Surveys on Motivation, Engagement, and the Pre- and Post-intervention Scores in EL Trail Sub-Test

Group	Variable	Mean		SD		t	df	p	Mean dif.	SE dif.	Cohen's d
		Pre	Post	Pre	Post						
EG	Motivation	3.08	4.06	0.283	0.133	-10.3	27.00	<.001	-0.982	0.095	-2.97
CG		3.09	3.78	0.305	0.122	-6.99	26.00	<.001	-0.688	0.098	-2.02
EG	Engagement	3.17	4.08	0.298	0.135	-6.48	27.00	.001	-0.910	-0.140	-2.65
CG		3.21	3.60	0.273	0.141	-3.64	26.00	.015	-0.395	-0.108	-1.49
EG	EL scores	65.55	80.7	1.002	0.529	-19.5	27.00	.003	-15.2	0.780	11.3
CG		67.00	75.8	1.38	1.84	-6.19	26.00	.008	-8.80	1.42	3.09

As can be seen in Table 2, motivation scores significantly increased for both the experimental group (EG) and control group (CG) from pre-test to post-test, $t(27) = -10.3, p < .001$ and $t(26) = -6.99, p < .001$, respectively. A calculation of a difference in the increase of motivation between the EG and CG showed that it was 9.46% higher in EG than in CG which was considered significant for the research. The effect size was large for the EG (Cohen's $d = -2.97$) and medium for the CG (Cohen's $d = -2.02$). The mean difference was -0.98 ($SE = 0.095$, 95% CI $[-1.17, -0.79]$) for the EG and -0.69 ($SE=0.098$, 95% CI $[-0.89, -0.49]$) for the CG.

For engagement, the results indicated a significant increase in mean scores for both EG ($M_{pre} = 3.17, M_{post} = 4.08$) and CG ($M_{pre} = 3.21, M_{post} = 3.60$), with a large effect size for EG (Cohen's $d = -2.65$) and moderate effect size for CG (Cohen's $d = -1.49$). The difference in the mean scores between the pre-test and post-test was statistically significant for the EG ($t(27) = -6.48, p < 0.001$) and the CG ($t(26) = -3.64, p = .015$). The mean difference was -0.910 ($SE = -0.140$, 95% CI $[-1.27, -0.549]$) for the EG and -0.395 ($SE = -0.108$, 95% CI $[-0.89, -0.49]$) for the CG. The calculation comparing the increase in engagement between the EG and CG revealed a significant difference, with the EG showing a 17.28% higher increase compared to the CG.

For EL scores variable, both EG and CG demonstrated an increase in mean scores from pre-intervention (EG - $M = 65.55, SD = 1.002$; CG - $M = 67.00, SD = 1.38$) to post-intervention (EG - $M = 80.7, SD = 0.529$; CG - $M = 75.8, SD = 1.84$), with a large effect size in the EG (Cohen's $d = 11.3$) a medium effect size in the CG (Cohen's $d = 3.09$). The mean difference between the EG and CG was statistically significant ($t(27) = -19.5, p = .003$, 95% CI $[-15.2, -8.80]$). The analysis of the difference in the increase of EL scores between the EG and CG revealed that there was a significant 10.13% higher improvement in the EG compared to the CG indicating that the incorporation of gamified chatbot-driven sessions within L2 e-classes utilising the Smart Sender platform showed to be more effective in improving EL scores than conventional teacher-delivered classes conducted via the ZOOM platform for the control group.

The paired sample t-test results indicate that there is a statistically significant difference between the mean scores of the pre-test and post-test for the experimental group in the motivation variable. The mean difference between the pre-test and post-test scores was -0.910 ($SE = 0.140, p = .001$, Cohen's $d = -0.854$), indicating a large effect size. This suggests that the intervention had a significant impact on improving the motivation of the experimental group.

Based on the data presented in the table, it was proved that the incorporation of gamified chatbot-driven sessions in L2 e-classes utilising the Smart Sender platform led to significant improvements in motivation and engagement levels among students in the experimental group compared to the control group.

The Results Drawn for ANCOVA

ANCOVA statistical analysis was employed to assess the potential influence of chatbot features, L2 e-classes, and gamification features on students' motivation, engagement in L2 e-classes, and English language (EL) trial sub-test results. In this analysis, a covariate related to the outcome variable, specifically students' English language proficiency

before the intervention, was included to control for its impact. The purpose of controlling for this covariate was to ascertain whether the observed group differences were primarily due to the treatment or if they could be attributed to pre-existing disparities in the covariate.

Table 3. Results of Measurements Performed Before and After the Intervention Based on the ANCOVA test, EG, and CG

ANCOVA – Post-test	Sum of Squares	df	Mean Square	F	p	η^2	ω^2
Overall model	17339.59	2	18969.9	752.4	<.001		
Pre-test	17330.71	1	17330.71	1286.9	<.001	0.997	0.991
Treatment	988	1	988	18.7	.002	0.056	0.053
Residuals	14.22	3	4.74				

According to an ANCOVA analysis conducted on post-test data and presented in Table 3, the results indicate that the predictors (pre-test and treatment) accounted for a significant amount of variance in the outcome variable, $F(2, 3) = 752.4, p < .001$. Specifically, the pre-test variable was found to be significant, $F(1, 3) = 1286.9, p < .001$, with a large effect size ($\eta^2 = 0.997, \omega^2 = 0.991$), suggesting a strong association between pre-test and post-test scores. Additionally, the treatment variable was found to be significant, $F(1, 3) = 18.7, p = .002$, with a medium effect size ($\eta^2 = 0.056, \omega^2 = 0.053$), indicating that the treatment had a significant impact on post-test scores. Furthermore, the residual variance was small ($SS = 14.22$), indicating that the model accounted for most of the variance in the outcome variable.

Results Obtained From the Survey on Students' Attitudes Toward the Use of the Smart Sender Platform

These results show the descriptive statistics of a survey with 12 Likert-type questions, which measure EG students' attitudes towards the Smart Sender Platform (see Table 4).

Table 4. Descriptives Obtained From the Survey on Students' Attitudes Toward the Use of the Smart Sender Platform

	Mean	SE	95% Confidence Interval		SD	Skewness		Shapiro-Wilk	
			Lower	Upper		Skewness	SE	W	P
Q1	4.50	0.1206	4.26	4.74	0.638	-0.920	0.441	0.918	<.001
Q2	4.36	0.1381	4.09	4.63	0.731	-0.688	0.441	0.861	<.001
Q3	4.39	0.1295	4.14	4.65	0.685	-0.699	0.441	0.857	<.001
Q4	4.50	0.1311	4.24	4.76	0.694	-1.074	0.441	0.702	<.001
Q5	4.64	0.1056	4.44	4.85	0.559	-1.302	0.441	0.841	<.001
Q6	4.79	0.0790	4.63	4.94	0.418	-1.473	0.441	0.808	<.001
Q7.1	4.32	0.1366	4.05	4.59	0.723	-0.584	0.441	0.774	<.001
Q7.2	4.50	0.1311	4.24	4.76	0.694	-1.074	0.441	0.702	<.001
Q7.3	4.43	0.1304	4.17	4.68	0.690	-0.817	0.441	0.742	<.001
Q8.1	4.31	0.0942	4.03	4.40	0.499	0.453	0.441	0.764	<.001
Q8.2	4.75	0.0833	4.59	4.91	0.441	-1.221	0.441	0.841	<.001
Q8.3	4.65	0.0811	4.57	4.84	0.441	-1.224	0.441	0.738	<.001

As can be seen in Table 4, the mean scores for the questions range from 4.31 to 4.79, indicating that overall, respondents' attitudes are positive towards the topic being measured. The standard deviation (SD) values range from 0.418 to 0.731, suggesting that the responses for each question are moderately consistent, with some variability among respondents. The lowest SD is observed for Q6, indicating a high level of agreement among respondents. The highest SD values are for Q2 and Q7.1, suggesting more diverse opinions among respondents for these questions. The skewness values show that the distribution of responses for each question is negatively skewed, except for Q10.1 which is slightly positively skewed. It's worth noting that the responses to Q5 and Q6 have relatively high mean scores, indicating a more positive attitude toward the topic. On the other hand, Q8.1 has the lowest mean score, indicating a more negative attitude towards the topic. Overall, these results suggest that the respondents have a generally positive attitude towards the topic being measured, but with some variations in opinions among the different questions.

Thematic analysis of the feedback provided by participants regarding the Smart Sender platform for English language test preparation yielded several themes. The first theme pertained to technical support, with participants suggesting hiring a technical person to assist learners when chatbots encounter technical issues such as bugs or glitches. The second theme highlighted the importance of sharing video-recorded chatbot-driven classes to counteract stigma and negative attitudes towards this learning approach. The fourth theme focused on collaboration, with participants suggesting the formation of small teams to work together to train for the test. The fifth theme pertained to boosting confidence, with participants recommending inviting someone who had taken the test before to chat online with students or share a recorded video to increase their confidence in the test. Finally, the sixth theme highlighted the need for sharing

information about the platform and the benefits of technology-enhanced learning, as some people may be hesitant to try new learning methods.

Some quotes are presented below:

"I think, a technical guy should be there to troubleshoot the chatbot when it runs into bugs or glitches. It's really annoying when technical issues disrupt my learning, and having a dedicated person to handle them would be a game-changer."

"I suggest they record the chatbot-driven classes so that students can review them later, without feeling embarrassed or self-conscious. Some people might laugh at us for using chatbots, but if we have access to recorded lessons, we can learn without worrying about what others think."

"I think students should team up and work together to prepare for the test. It's more motivating to have support and encouragement from others, and we can also learn from each other's strengths and weaknesses."

"Why don't they invite someone who aced the test last year to share their experience and tips with us? It would be really inspiring to hear from someone who's been in our shoes, and it could give us the confidence we need to succeed."

"I think they should do a better job of promoting this way of learning because some people are stuck in their ways and don't realize how effective it can be. We need to break out of our comfort zones and embrace new methods if we want to succeed."

Discussion

The present study investigated the effects of incorporating gamified chatbot-driven sessions within L2 e-classes, utilising the Smart Sender platform, on student motivation, engagement, and English language proficiency in reading and language usage. The results of the study were analysed using the Paired Samples *t*-test and ANCOVA and revealed that the experimental group (EG) demonstrated noteworthy differences in the variables examined when compared to the control group (CG) who received conventional teacher-delivered classes conducted via the ZOOM platform. The novelty of this study lies in the utilisation of a marketing tool as a "push factor" to establish and foster communication with the customers for delivering educational content and managing the learning process, thereby creating a digitally-driven "push-to-learn" tool.

Specifically, the utilisation of chatbot features in L2 e-classes on the Smart Sender platform was found to increase student motivation, while L2 e-classes driven by the Smart Sender platform were found to improve students' English language proficiency in reading and language usage. Additionally, the gamification features present in the Smart Sender platform were found to enhance student engagement within L2 e-classes. Furthermore, students expressed their appreciation for the ease of use and usefulness of this chatbot-based tool in improving their English language skills, specifically in reading and language usage. These findings go in line with the studies conducted by CommLab India (2022), Haristiani (2019), Huang et al. (2022), and von Wolff et al. (2020) who found that chatbots were capable of addressing the students' learning styles, paces, and levels of individual students, thereby leading to more efficient learning outcomes.

To monitor student motivation, engagement, and English language proficiency in reading and language usage, a paired sample *t*-test was administered to both EG and CG, with pre- and post-test surveys and EL trail sub-test pre- and post-intervention results being compared. The increase in motivation between the EG and CG showed that it was 9.46% higher in EG than in CG, and the increase in engagement between the EG and CG revealed a significant difference, with the EG showing a 17.28% higher increase compared to the CG, the difference in the increase of EL scores between the EG and CG revealed that there was a significant 10.13% higher improvement in the EG compared to the CG indicating that the incorporation of gamified chatbot-driven sessions within L2 e-classes utilising the Smart Sender platform showed to be more effective in improving EL scores than conventional teacher-delivered classes conducted via the ZOOM platform for the control group.

These findings provide empirical evidence that incorporating gamified chatbot-driven sessions within L2 e-classes on the Smart Sender platform has a positive impact on student motivation, engagement, and English language proficiency in reading and language usage. The implications of these findings for language educators and researchers are discussed, and further research is recommended to explore the potential of chatbot-driven platforms in language learning contexts. It is important to note that while the present study focuses on investigating the impact of gamified chatbot-driven sessions utilising the Smart Sender platform in L2 e-classes, it does not aim to conduct a comparative analysis between Smart Sender and other available platforms. Addressing the above-mentioned limitation in future research by comparing the effects of Smart Sender with alternative platforms will enhance the study's credibility and provide deeper insights into the unique benefits of Smart Sender. Furthermore, while highlighting the positive aspects of the Smart Sender platform, enhancing customisation options to accommodate diverse learning needs and preferences, as well as incorporating more interactive and adaptive features to foster student engagement and challenge in L2 e-classes, will further differentiate it from existing learning management systems.

The present study contributes to the existing literature on the use of gamification in foreign language teaching and learning. Specifically, the study builds upon theoretical concepts that provide a foundation for the effective application of gamification mechanics (Hamari et al., 2014; Kim et al., 2017). These theoretical frameworks include self-determination theory (Cherry, 2022; Noels et al., 2019; Rahayu et al., 2022), flow theory (dos Santos et al., 2018; Vann & Tawfik, 2020), behaviorism (Al-Dosakee & Ozdamli, 2021; Budiman, 2017; Figueroa Flores, 2015), and cognitive load theory (Ragsdale, 2019; Sweller, 2017; Turan et al., 2016). By demonstrating the positive impact of incorporating gamified chatbot-driven sessions on student motivation, engagement, and language proficiency, this study provides empirical support for the effectiveness of these theoretical frameworks in practical language learning contexts. These findings also have important implications for language educators and researchers seeking to optimise the design of language learning tools and programs through the effective use of gamification mechanics.

The aforementioned findings are consistent with case studies that have shown the potential of chatbot-driven platforms in foreign language education. For example, Mageira et al. (2022) employed educational AI chatbots to deliver cultural content in a foreign language using the Content and Language Integrated Learning (CLIL) approach. The chatbot provided conversational exercises and real-time feedback, resulting in a high student satisfaction rate of over 90%. Another study by Guo et al. (2022) programmed and utilized a chatbot to assist students in producing high-quality arguments while learning argumentative writing within a foreign language course. These case studies demonstrate the versatility of chatbot-based tools in foreign language education and their potential to enhance learning outcomes.

Conclusion

The study provided evidence that the utilisation of chatbot features in L2 e-classes on the Smart Sender platform increased student motivation and improved their English language proficiency in reading and language usage. Additionally, the gamification features present in the Smart Sender platform enhanced student engagement within L2 e-classes. The study participants expressed their appreciation for the ease of use and usefulness of this chatbot-based tool in improving their English language skills, specifically in reading and language usage. The paired sample t-test was employed to assess student motivation, engagement, and English language proficiency in reading and language usage in both the experimental and control groups. The pre- and post-test survey results were analysed, along with the pre- and post-intervention scores in the EL trail sub-test. The findings showed that motivation scores significantly increased for both groups from pre-test to post-test, and the effect size was large for the experimental group and medium for the control group. Additionally, there was a significant increase in mean scores for both groups for engagement, and a large effect size was observed for the experimental group, while a moderate effect size was observed for the control group. The results also showed an increase in mean scores for both groups for the English language proficiency variable, with a large effect size observed for the experimental group and a medium effect size observed for the control group. The difference in the mean scores between the experimental and control groups was statistically significant, indicating the positive impact of incorporating gamified chatbot-driven sessions within L2 e-classes on the Smart Sender platform.

Recommendations

Based on the empirical evidence of the effectiveness of gamification and automation features of the Smart Sender Platform in enhancing the teaching and learning of English as a second language (L2) at universities, it is recommended that teachers and scientists in the field of foreign language education consider incorporating the Smart Sender Platform into their instructional design. The chatbot-based tool is user-friendly and proved useful for improving students' English language skills. Furthermore, the gamification elements in the platform provide a means to increase student engagement, which is essential for successful language learning. Both researchers and practitioners are advised to collaborate with developers of the Smart Sender Platform to customise the platform to meet the specific needs of their students and integrate it seamlessly into their curriculum.

Further research could focus on the effectiveness of chatbot features in improving English language proficiency in other skill areas such as writing, listening, and speaking. Additionally, research could be conducted on the use of chatbot technology in language learning for learners with different language proficiency levels and ages. Further investigation into the specific gamification features that were most effective in increasing student engagement and motivation could also be studied. Lastly, a comparative study could be conducted to evaluate the effectiveness of the Smart Sender platform against other language learning platforms that incorporate chatbot technology.

Limitations

Although chatbots managed by the Smart Sender have shown promising results for the automation and gamification of foreign language learning, it is important to consider the limitations and challenges associated with their use. Technical issues, such as bugs or glitches, can negatively impact the learning experience and cause frustration for students. While chatbots can provide interactive and conversational experiences, they cannot fully replace the social and cultural nuances that are inherent in language learning, as human interaction is important for building relationships and cultural understanding. Additionally, while chatbots can save time and money in the long run, there may be significant costs associated with their development and implementation, which could be a barrier for some universities. Finally, some

students and educators may be resistant to change and prefer conventional teaching methods, which may hinder the adoption of chatbot technology.

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Conflict of Interest

The authors declare no conflict of interests of legal, financial, or commercial nature that could be perceived as prejudicing the impartiality of the research reported.

Authorship Contribution Statement

Nozhovnik: Conceptualization, design, and digitalisation of the EL course using the Smart Sender Platform, drafting the manuscript, data collection, statistical analysis, reporting, and monitoring EG students' progress. Harbuza: Literature review, EL course, and lessons design, editing the manuscript, data collection, monitoring EG students' progress, final approval. Teslenko: Data collection, design of the course lessons, critical revision of the manuscript, liaison with experts and colleagues from Kyiv National Economic University, monitoring EG students' progress. Okhrimenko: Critical revision, design of the course lessons, monitoring EG students' progress, proofreading. Zalizniuk: Design of the course lessons, statistical analysis, and reporting, monitoring EG students' progress, sources data acquisition, critical revision of the manuscript, proofreading the manuscript. Durdas: Design of the course lessons, monitoring EG students' progress, statistical data acquisition, critical revision of the manuscript, and proofreading the manuscript.

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Appendices

Appendix A: Motivation: Pre-Test Questionnaire (can be accessed via the link: <https://forms.gle/DF3SEjs2UKCWBE3N6>)

Using the scale below, please rate your motivation for the L2 learning facilitated by the Smart Sender Platform before the experiment.

- | | | | |
|---|----------------------------|---|----------------|
| 1 | Strongly disagree | 4 | Agree |
| 2 | Disagree | 5 | Strongly agree |
| 3 | Neither agree nor disagree | | |



1. I am motivated to learn English.
2. I am willing to put in the effort to improve my English skills.
3. It is important for me to improve my English language skills.
4. I feel confident in my ability to learn English.
5. I believe that learning English will be beneficial for my future.
6. I feel I have control over my English learning.
7. I am willing to try new things to improve my English skills.
8. I am motivated to complete all the assigned activities.
9. It is important for me to succeed in the EL sub-test of the Master's Comprehensive Test (MCT).
10. I am enthusiastic about the potential benefits that the EL course, specifically designed for the EL trial sub-test of the MCT, could bring to my performance.
11. I am determined to carefully examine and incorporate the feedback provided by an EL course moderator or teacher to improve my learning outcomes.
12. I believe that the EL course will be responsive to my needs.

Motivation: Post-Test Questionnaire (can be accessed via the link: <https://forms.gle/4uEjYbCdWFGExCiA7>)

Using the scale below, please rate your motivation for the L2 learning facilitated by the Smart Sender Platform after participation in the experiment.

- | | | | |
|---|----------------------------|---|----------------|
| 1 | Strongly disagree | 4 | Agree |
| 2 | Disagree | 5 | Strongly agree |
| 3 | Neither agree nor disagree | | |



1. I am more motivated to learn English than I was before taking the EL course.
2. I really enjoyed learning English in the way it was delivered.
3. I feel more confident in my ability to learn English than I did before the course.
4. I believe that the way the EL course was delivered helped me learn English faster.
5. I was willing to spend more time learning English.
6. I feel I learned more from the EL course training sessions.
7. I found the way the EL course was delivered more fun than I used to have earlier.
8. The format of English language learning increased my motivation to learn English.
9. The use of rewards and encouragement increased my motivation to learn English.
10. I feel motivated to participate in English language learning activities due to the format of EL learning used in the course.
11. I am confident that I will continue to improve my English language skills in the future.
12. I am more confident in my ability to face challenges in English language learning due to the format of my learning sessions.

Appendix B: Engagement Pre-Test and Post-Test Questionnaires

Pre-Test (available at: <https://forms.gle/dWESdhChYM5GH14n7> or via the QR code)

Using the scale below, please rate your involvement experiences while studying a foreign language before participating in the experiment.

- | | | | |
|---|----------------------------|---|----------------|
| 1 | Strongly disagree | 4 | Agree |
| 2 | Disagree | 5 | Strongly agree |
| 3 | Neither agree nor disagree | | |



1. My current level of motivation to learn English is high.
2. I often attend English language classes.
3. I often practise English outside of the classroom.
4. I have a regular study schedule for learning English.
5. I would rate my current English language proficiency in reading and writing high.
6. I feel comfortable communicating in English.
7. My expectations from the English language course are high.

Post-Test

(Available at: <https://forms.gle/cSe9Ph7unzky7Zdc9> or via the QR code)

Using the scale below, please rate your involvement experiences while studying a foreign language before participating in the experiment.

- | | | | |
|---|----------------------------|---|----------------|
| 1 | Strongly disagree | 4 | Agree |
| 2 | Disagree | 5 | Strongly agree |
| 3 | Neither agree nor disagree | | |



1. My current level of motivation to learn English is high.
2. I often practised English outside of the classroom during the period of doing the course.
3. I established a regular study schedule for learning English during the period of the course.
4. I would rate my current English language proficiency in reading and writing high after taking the course.
5. I stayed more engaged in the learning process.
6. I feel that my engagement with the English language sessions has improved throughout the course.
7. *Time spent online per session:*

On average, how much time do you spend online during each session?

- | | | | |
|---|-------------------------|---|---------------------|
| 1 | Very little time | 4 | Quite a bit of time |
| 2 | Some time | 5 | A lot of time |
| 3 | Moderate amount of time | | |

8. Number of sessions dropped:

How frequently did you drop the study sessions?

- | | | | |
|---|-----------|---|------------|
| 1 | Never | 4 | Often |
| 2 | Rarely | 5 | Very often |
| 3 | Sometimes | | |

9. Rewards or positive feedback received and valued:

How much did you value the rewards or positive feedback earned in the sessions?

- | | | | |
|---|------------|---|-------------|
| 1 | Not at all | 4 | Quite a bit |
| 2 | Somewhat | 5 | Very much |
| 3 | Moderately | | |

Appendix C: Students' attitudes toward the Smart Sender Platform Questionnaire
(Can be accessed via the QR code or the link: <https://forms.gle/KCn6LSnGbbRekFSNA>)



1. To what extent are you satisfied with the Smart Sender platform for English language exam preparation?

1 Very dissatisfied	4 Somewhat satisfied
2 Somewhat dissatisfied	5 Very satisfied
3 Neutral	
2. To what extent do you find the Smart Sender platform useful for improving your English language skills?

1 Not useful at all	4 Somewhat useful
2 Not very useful	5 Very useful
3 Neutral	
3. To what extent did you find the Smart Sender platform easy to use?

1 Very difficult to use	4 Somewhat easy to use
2 Somewhat difficult to use	5 Very easy to use
3 Neutral	
4. How would you rate the quality of the Smart Sender platform?

1 Very poor	4 Good
2 Poor	5 Excellent
3 Average	
5. To what extent are you likely to recommend the Smart Sender platform to others?

1 Very unlikely	4 Somewhat likely
2 Somewhat unlikely	5 Very likely
3 Neutral	
6. To what extent do you think the Smart Sender platform was effective in preparing you for the English language exam?

1 Not effective at all	4 Somewhat effective
2 Not very effective	5 Very effective
3 Neutral	
7. To what extent did the following features of the Smart Sender platform help you improve your English language skills? (Please rate each feature on the same 5-point Likert scale, with options ranging from 'Not helpful at all' to 'Very helpful')
 - 7.1. Interactive chatbots
 - 7.2. Gamification features
 - 7.3. Automated EL course
8. To what extent did the following features of the Smart Sender platform hinder your improvement of English language skills? (Please rate each feature on the same 5-point Likert scale, with options ranging from 'Very hindering' to 'Not hindering at all')
 - 8.1. Interactive chatbots
 - 8.2. Gamification features
 - 8.3. Automated EL course
9. Do you have any additional comments or suggestions regarding the Smart Sender platform for English language test preparation? (Please provide your feedback in the space provided below.)

Thank you for participating in this survey. Your feedback is valuable to us.