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Research Article

The Instructional Value of the Mobile–Assisted Croatian Language Learning App in Learning and Teaching the Croatian Language

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Abstract
The development of information and communication technology has enabled the increasing use of digital tools in Croatian language teaching, including mobile applications. Although mobile-assisted language learning has been widely studied in foreign and second language learning, its use in first-language teaching has received less attention. The aim of this study was to examine the instructional value of the Mobile-Assisted Croatian Language Learning (MACLL) application from the perspective of pre-service primary school teachers. The study included 17 fifth-year students at the Faculty of Teacher Education, University of Zagreb, and employed a convergent parallel mixed-methods design. Data were collected using a questionnaire developed specifically for this study, consisting of 15 closed-ended items on a five-point Likert scale and open-ended questions. The quantitative data were analysed using descriptive statistics, while the open-ended responses were analysed using qualitative content analysis. The results show that the respondents generally perceived the application as an appropriate and useful supplementary tool for Croatian language teaching. They considered it particularly suitable for practising orthographic and grammatical content. Interactive tasks, immediate feedback, and the possibility of independent work were also recognised as important features of mobile learning. At the same time, the respondents identified limitations related to social interaction, collaborative learning, and the development of written expression. These findings indicate that mobile applications can have a place in Croatian language teaching, particularly for short activities involving practice and revision. However, their value depends on how they are designed and integrated into the teaching process. The MACLL application should therefore be viewed as an additional instructional tool rather than a replacement for other forms of language teaching. Future research should examine its use with primary school learners in classroom settings.

Keywords: Croatian Language Teaching, Digital Tools, Instructional Value, Mobile Applications, Mobile Learning, Primary Education

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1. INTRODUCTION

The Croatian language subject plays a central role in the Croatian educational system because it enables the development of learners' basic language and communication competencies. Croatian language teaching focuses on developing functional literacy and on the adoption and proper use of the standard language through the linguistic skills of listening, speaking, reading, and writing. The development of these competencies is the basis for learners' successful participation in the educational process and social communication (Pavličević-Franić, 2018). In modern teaching approaches, a communicative approach to language is emphasised, in which learners acquire language through active use in different communication situations rather than through isolated language rules.

Contemporary Croatian language instruction emphasises learners' active engagement in the learning process and the adoption of various teaching strategies to foster the development of linguistic and communicative skills. In this regard, it is of paramount importance to cultivate a positive learner disposition towards the standard language, as such an attitude facilitates more effective mastery of linguistic norms and the development of communicative skills (Alerić & Gazdić-Alerić, 2009). Consequently, pedagogical approaches in Croatian language instruction aim to integrate linguistic knowledge with its functional application across diverse communicative contexts.

Enhancing learner linguistic competence demands a systematic, pedagogically informed instructional approach that promotes active involvement in language-based activities. Prioritising the development of language skills, especially reading and writing, is essential, as these competencies empower learners to express their ideas and engage critically with a diverse range of texts (Aladrović Slovaček, 2017). Research also indicates that linguistic competencies develop incrementally throughout the educational process and are influenced by factors such as learner age, linguistic experience, and instructional methods (Budinski, 2012). Therefore, pedagogical strategies in Croatian language teaching prioritise active learning and the advancement of linguistic proficiency in authentic communicative settings.

The development of digital technologies has transformed modern approaches to learning and teaching, enabling the application of new educational approaches, particularly mobile learning (m-learning). Mobile learning involves using portable digital devices, such as smartphones or tablets, to access educational content and engage in learning across different environments (Livazović & Svalina, 2021; Tan, 2023). This form of learning is characterised by high flexibility, as it allows access to teaching facilities at any time and place, thereby extending the learning process beyond the traditional classroom, which is particularly important in language learning that requires continuous practice and exposure. In doing so, learners can learn at their own pace and adapt the learning process to their needs and schedules (Shohor & Hashim, 2024).

The literature review shows that mobile applications are increasingly used as an additional tool in formal education and as a means of independent language learning (Sari & Ersanli, 2024). Linking formal education with non-formal and everyday learning can contribute to greater student independence in the learning process (Livazović & Svalina, 2021). Mobile language-learning applications often include interactive and multimedia elements, such as quizzes, audio and video recordings, and gap-filling tasks. In addition, advanced applications use speech recognition technologies. Such elements encourage learners' active participation in the learning process and provide immediate feedback on the accuracy of responses, which can contribute to more efficient adoption of teaching content (Smajla, 2022) and positively affect the development of learners' speaking skills (Metruk, 2024).

The integration of digital tools into teaching often increases learners' interest in the subject matter because this approach makes students more engaged and closer to their daily experience with technology (Opravž Ostrelič, 2020). Beyond their motivational impact, mobile applications offer significant pedagogical value by facilitating structured, interactive reinforcement and practice of the subject matter. Consequently, the integration of these tools into language pedagogy is increasingly being considered. Although mobile learning has been the subject of extensive research, studies addressing the implementation of mobile applications in Croatian language instruction remain underrepresented, particularly from the perspective of prospective teachers. Given that prospective teachers play a pivotal role in selecting and implementing instructional methods and tools, it is essential to examine their attitudes towards the use of mobile applications in Croatian language pedagogy. This paper, therefore, aims to investigate the instructional utility of the MACLL mobile application in Croatian language teaching, as perceived by students enrolled in teacher education programs.

1.1. Mobile–Assisted Language Learning

Mobile-assisted language learning represents a synergy of *Computer-Assisted Language Learning* (CALL) and *mobile learning*. Although research in the field of MALL has predominantly focused on foreign language learning and teaching (Stockwell, 2022; Shohor & Hashim, 2024), many of its underlying concepts and methodologies are directly applicable to the mother tongue.

Within the context of foreign language acquisition, numerous studies highlight that mobile applications, owing to their integration of multimedia content, interactive features, and gamification elements, support the development of various language skills and have significant potential for enhancing the language learning process (Essafi et al., 2024). The development of mobile applications for language learning is intrinsically linked to the evolution of digital educational platforms that utilise multimedia elements, personalised learning, and gamification. The implementation of such applications encourages active learner participation in the learning process and may enhance both motivation and learning efficiency (Okumuş Dağdeler, 2023; Pedaveti & Jeyanthi, 2025).

Sari and Ersanli (2024) conducted an extensive study on the application of MALL for the teaching and learning of English. The authors reviewed 26 articles published between 2017 and 2022 across three journals: CALL, *Language Learning and Technology*, and ReCALL. The primary objective of their systematic review of literature was to synthesise the findings of quasi-experimental studies regarding the correlation between the use of mobile applications for language learning and specific learning outcomes. The data showed a significant disparity in research focus, with investigations into vocabulary and oral proficiency disproportionately outweighing those dedicated to reading, listening, grammar, and writing. The study also demonstrated that the use of language learning applications generally has a positive effect on learners and learning outcomes.

Shohor and Hashim (2024) employed a systematic literature review methodology, surveying three academic databases: *Web of Science* (WoS), *Scopus*, and the *Education Resources Information Center* (ERIC). They analysed 11 papers published between 2020 and 2024 that investigate the implementation, impact, and role of MALL in English as a Foreign Language (EFL) instruction. The results indicated that implementing MALL technology can significantly improve learners' academic performance while fostering their engagement and motivation for reading and self-reflection. MALL also contributes to more effective oral skills development and facilitates the use of multimedia representations of knowledge, thereby making instruction more attractive and dynamic while immersing learners in interactive learning experiences that foster deeper engagement and a better understanding of curriculum content. Furthermore, MALL supports the development of communication skills by fostering interaction between teachers and students, contributes to creating a stimulating language-learning environment, and optimises online learning habits outside the classroom.

In recent years, research in the field of MALL has increasingly shifted its focus toward Collaborative Mobile-Assisted Language Learning (C-MALL). This approach emphasises the importance of collaborative learning, i.e., the process of knowledge construction through social interaction and communication among learners via educational mobile applications and digital platforms. This approach enables knowledge sharing, joint problem-solving, and the development of communication and collaborative skills (Guo, Jeyaraj, & Razali, 2024). Such an approach can be particularly relevant in language teaching, as it encourages communication and collaboration among learners.

However, research also points to potential negative effects of MALL, such as diminished focus, ineffective study-time management, and a lack of clarity in defining learning objectives (Zhang & Zuo, 2019). One key issue in implementing Mobile-Assisted Language Learning (MALL) is balancing autonomous learner-led study with teacher-supported guided learning (Chen, 2025).

One of the main challenges in implementing mobile technologies in education is ensuring that mobile applications are designed on sound pedagogical principles. Although applications offer attractive visual and interactive elements, their content is often insufficiently aligned with educational outcomes and the curriculum. Additionally, a significant challenge in integrating Mobile-Assisted Language Learning (MALL) into the instructional process lies in teachers' underdeveloped digital competencies, limited time and resources for creating or adapting mobile applications, and limited digital support and infrastructure.

Lastly, MALL holds significant potential for promoting lifelong learning, as it can support long-term, autonomous language acquisition and assist learners in organising, monitoring, and evaluating their learning processes (Shalini Roy & Gandhimathi, 2025). While the cited research is primarily concerned with second language acquisition, the results can be extended to mother-tongue education, including Croatian, especially regarding the development of language competencies and the implementation of digital tools in the classroom.

1.2. Instructional Use of Mobile Applications in Croatian Language Teaching

The aim of Croatian language teaching is to develop learners' linguistic and communicative competence, i.e., the ability to use language effectively in diverse communicative situations. The development of this competence is based on the adoption of basic language activities, such as listening, speaking, reading, and writing (Pavličević-Franić, 2018). Literacy development and written expression skills also play a vital role in Croatian language instruction. Writing is a complex linguistic activity that involves text planning, sentence construction, and the application of orthographic and grammatical rules (Budinski, 2012). Modern approaches to teaching emphasise the need to apply teaching methods that encourage active learner participation. One such approach involves using creative activities and language games, which can improve understanding of linguistic content and foster a more positive attitude toward Croatian language lessons among learners (Aladrović Slovaček, 2017).

In this context, mobile applications can serve as an effective instructional tool, enabling varied types of interactive learning and the consolidation of subject matter through practice. Using such tools, learners can solve tasks related to orthography, grammar, or language comprehension and receive immediate feedback on the accuracy of their answers. This approach can foster higher levels of student motivation and encourage more active engagement during lessons.

Beyond these benefits, the integration of mobile technology involves a range of advantages and potential limitations. On the one hand, digital tools can make lessons more engaging and encourage active learning. On the other hand, their application requires the teacher to provide appropriate instructional preparation to ensure technology is used in ways that contribute to achieving educational outcomes.

Drawing on these pedagogical and instructional assumptions, a mobile application for Croatian language learning (MACLL) was developed to provide an interactive, instructionally sound digital tool for the acquisition and reinforcement of basic linguistic competencies. The application was developed using the MIT App Inventor online platform. It was designed to encourage the mastery of standard Croatian, including orthographic and grammatical content, vocabulary development, and written text comprehension. By integrating application design, subject matter, and pedagogical principles (Essafi et al., 2024), the project sought to enhance learner motivation and support the development of the core language skills: reading, writing, listening, and speaking.

The mobile application for Croatian language learning underwent evaluation by final-year students from the Faculty of Teacher Education, University of Zagreb, as part of the present research. The application evaluation was conducted according to criteria defining the quality of digital educational content in mobile learning. These criteria encompass instructional value, pedagogical foundation, technical functionality, and applicability in modern educational settings. The aim of the research was to examine pre-service teachers' perceptions of the potential of this mobile application for Croatian language instruction and to analyse their attitudes toward the instructional value of such digital tools.

Based on the aforementioned theoretical insights, it can be assumed that mobile applications have the potential to positively influence learner motivation through interactive and multimedia elements, as well as the efficiency of linguistic content acquisition. It is anticipated that the respondents will perceive the benefits of these tools more significantly than the drawbacks, while identifying specific constraints regarding communication and collaborative learning.

2. METHODOLOGY

A mixed-methods research approach was applied in this study, combining quantitative and qualitative methods of data collection and analysis. The research was conducted using a convergent parallel mixed-methods design, in which quantitative and qualitative data were collected simultaneously and integrated through a complementary analysis. Data were collected using a structured questionnaire designed specifically for this study, which examined respondents' attitudes toward the instructional suitability of the mobile application, its multimedia and interactive features, and its feasibility for use within Croatian language lessons. The quantitative component of the study relies on data gathered through closed-ended items formulated using a Likert scale. The qualitative component involves analysing open-ended responses using content analysis.

2.1. Aim of the Research

The aim of the research was to assess the instructional value of a Croatian language learning and teaching application from the viewpoint of pre-service primary school teachers, i.e., teacher education students. Specifically, the study sought to determine the degree to which respondents evaluate:

- The instructional appropriateness of the mobile application.
- The contribution of multimedia and interactive elements to learning.
- The versatility of the application in accommodating various linguistic content.
- The benefits and potential drawbacks of implementing the mobile application in the classroom.

Hypotheses

Based on the theoretical framework, the following hypotheses were formulated:

H1: Respondents assess the instructional appropriateness of the mobile application in Croatian language teaching positively.

H2: The multimedia and interactive elements of the mobile application contribute to learner motivation and more active learning.

H3: The mobile application is particularly suitable for learning Croatian language orthography and grammar.

H4: Respondents identify a greater number of benefits than drawbacks regarding the use of the mobile application in Croatian language instruction.

2.2. Participants

A total of 17 respondents participated in the study (N = 17). The sample consisted of graduate students (fifth year) from the Faculty of Teacher Education, University of Zagreb. All participants were female. The participants had previously completed coursework relevant to the evaluation of the application, including multimedia and instructional design, mobile application programming, Croatian language (including grammar and orthography), and other information technology-related courses. This educational background provided them with relevant knowledge and competencies for evaluating both the instructional suitability of the application and its basic multimedia and instructional design features. Participants' exact ages were not collected; therefore, an age range cannot be reported. Given the small and specific sample, the findings are considered indicative and are not intended to be generalised to the broader population.

2.3. Research Instrument

The research instrument was a survey questionnaire specifically constructed for this study. The questionnaire was not adopted or adapted from any previously published questionnaire or measurement instrument. It was developed specifically for the evaluation of the MACLL application and its particular linguistic content and instructional features. The questionnaire was developed based on the theoretical framework of mobile language learning and the instructional application of digital tools in teaching. The items were grounded in previous research concerning MALL and instructional strategies for language teaching.

Prior to its administration, the questionnaire was reviewed by both authors, who have expertise in Croatian language teaching methodology, to assess the clarity, relevance, and appropriateness of the items in relation to the purpose of the study and the content of the MACLL application. As this is a preliminary study with a small sample, the instrument's reliability was not statistically validated, which is considered a limitation. The questionnaire covers the following research dimensions: instructional appropriateness, multimedia and interactive features, linguistic content, and practical application in teaching. The questionnaire comprised a total of 15 closed-ended items on a 5-point Likert scale (1 = *strongly disagre*e, 5 = *strongly agre*e). All closed-ended items were formulated as positive statements; no negatively phrased items

were included. Each item had a minimum possible score of 1 and a maximum possible score of 5. No overall questionnaire score was calculated, as the items were analysed descriptively within their respective thematic dimensions rather than combined into a single composite score. The items are organised into four thematic clusters in accordance with the research dimensions.

Examples of closed-ended items include: *The mobile application is well-suited to the teaching methods used in Croatian language classes for primary education learners, Multimedia and interactive elements (text, images, sound) facilitate understanding of the Croatian language content,* and *The mobile application is suitable for learning Croatian language orthography content (e.g., č/ć, đ/dž, capitalization).* Open-ended questions provided insights into the respondents' opinions regarding appropriate linguistic content, task examples suitable for mobile formats, and the benefits and drawbacks of implementing mobile applications in Croatian language instruction.

Examples of the open-ended questions included questions concerning which Croatian language content respondents considered most suitable for the MACLL application, which types of language tasks they considered appropriate for the mobile format, and what they perceived as the main benefits and drawbacks of using the application in Croatian language teaching.

2.4. Procedures

Participation in the study was voluntary and anonymous, ensuring the ethical treatment of all respondents. Before completing the questionnaire, respondents were informed of the study's objective, and the collected data were used exclusively for research purposes. Participants were informed by the course instructor about the opportunity to participate in the study, and participation was entirely voluntary and anonymous. The study was conducted in person in a classroom setting, and data were collected using a paper-and-pencil questionnaire. Prior to the evaluation, participants received step-by-step instructions for accessing the MACLL application through the MIT App Inventor platform and connecting it to their mobile devices. They were then instructed to explore the application independently and subsequently complete the questionnaire based on their evaluation of its instructional and multimedia features.

The respondents were first introduced to the mobile application developed on the MIT App Inventor online platform. They downloaded the application to their mobile devices (Android and iOS) and reviewed it independently. Once they had explored the application's functionalities, the respondents were asked to complete the questionnaire.

The mobile application consists of a total of 26 screens organised into four sections, plus two main screens. The application's sections are divided by primary school grade levels: the first features five questions (1st grade), the second seven (2nd grade), the third eight (3rd grade), and the fourth four questions (4th grade). The question screens include various combinations of interactive button icons (BACK, CHECK, and NEXT), depending on the task type. The questions are presented as written text, while the available answers are highlighted with different font colours and accompanied by interactive sound effects. The application provides multimodal feedback, including audio prompts and colour-coded visual cues, to indicate the correctness of an answer (depending on the task type). The multimedia instructional design of the mobile application was developed in accordance with the principles of the Cognitive Theory of Multimedia Learning (Mayer, 2014a, 2014b, 2014c).

The research was conducted in December 2025 and lasted a total of 90 minutes. The procedure consisted of a 20-minute introductory and download phase, a 30-minute review of the application, and up to 40 minutes were allocated for completing the questionnaire.

2.5. Data Analysis

The data were processed using descriptive statistics in SPSS. For each item, basic statistical measures were calculated, including the arithmetic mean (*M*), standard deviation (*SD*), and response frequencies, enabling an analysis of the respondents' attitudes toward the instructional value of the mobile application.

The results were interpreted according to respondents' level of agreement on a 5-point Likert scale, with higher values indicating greater agreement with the statements.

Responses to the open-ended items were analysed using qualitative content analysis. The method consisted of several stages:

1. Transcription and response review: all of the respondents' responses were first reviewed and analysed in their original form.
2. Response coding: key terms and recurring ideas in the respondents' responses were extracted.
3. Categorisation: similar responses were grouped into thematic categories (e.g., orthographic content, grammatical content, learner motivation, and drawbacks of application use).
4. Interpretation of results: the categories were analysed and described based on their frequency of occurrence and substantive meaning.

This approach enabled a systematic analysis of respondents' views on the benefits, drawbacks, and practical use of the mobile app in Croatian language teaching.

To enhance the trustworthiness of the qualitative analysis, both authors independently reviewed and coded the open-ended responses. The independently generated codes and categories were subsequently compared and discussed. Any differences in coding or categorisation were resolved through discussion until agreement was reached on the final thematic categories. This procedure was used to reduce individual researcher bias and enhance the consistency and credibility of the qualitative interpretation.

3. RESULTS

3.1. Descriptive Analysis

A total of 17 respondents participated in the study. The collected data were analysed using descriptive statistics. Arithmetic mean (*M*) and standard deviation (*SD*) were calculated for each item. The results are presented in tables according to the thematic clusters of the questionnaire.

Table 1. Assessment of the Instructional Appropriateness of the Mobile Application

Item	Mean	SD
The mobile application is well-suited to the teaching methods used in Croatian language classes for primary education learners.	4.18	1.07
The structure and organisation of content within the mobile application enable clear and gradual acquisition of Croatian language content.	4.00	1.22
The language tasks in the mobile application are aligned with the objectives of Croatian language teaching.	4.24	1.03
The mobile application enables the learner to take an active role in learning Croatian.	3.88	1.05

The analysis of the results in Table 1 suggests that the respondents predominantly assess the instructional appropriateness of the mobile application in Croatian language teaching as positive. The arithmetic means range between $M = 3.88$ and $M = 4.24$, indicating a high level of agreement among respondents with the stated items. The highest value was recorded for the item *the language tasks in the mobile application are aligned with the objectives of Croatian language teaching* ($M = 4.24$), while the lowest value was recorded for the item *the mobile application enables the learner to take an active role in learning Croatian* ($M = 3.88$). The obtained results suggest that the respondents consider the mobile application to be a pedagogically and instructionally appropriate tool for Croatian language teaching. The standard deviation values range from 1.03 to 1.22, indicating moderate dispersion in the respondents' responses.

Table 2. Multimedia and Interactive Elements in Croatian Language Learning

Item	Mean	SD
Multimedia and interactive elements (text, images, sound) facilitate understanding of the Croatian language content.	3.47	1.42
The interactive tasks in the mobile application encourage learners to engage in independent thinking and active learning of Croatian.	3.88	1.17
The feedback in the mobile application helps learners identify and correct errors in Croatian.	3.53	1.70

The analysis of the results in Table 2 shows that respondents have a moderately positive attitude towards multimedia and interactive elements in learning the Croatian language. The arithmetic means range between $M = 3.47$ and $M = 3.88$. The highest value was recorded for the item *the interactive tasks in the mobile application encourage learners to engage in independent thinking and active learning of Croatian* ($M = 3.88$). The lowest value was recorded for the item *Multimedia and interactive elements (text, images, sound) facilitate understanding of the Croatian language content* ($M = 3.47$). The results suggest that the respondents recognise the importance of interactive elements in the learning process, although their attitudes in this dimension are somewhat more moderate than in other dimensions of the research. The standard deviation values are somewhat higher ($SD = 1.17–1.70$), indicating greater diversity in respondents' opinions regarding the role of multimedia and interactive elements. The more moderate values in this dimension may point to design limitations of the analysed application or the need for a more pedagogically considered integration of multimedia elements into teaching.

Table 3. Language Content in the Mobile Application

Item	Mean	SD
The mobile application is suitable for learning Croatian language orthography content (e.g., č/ć, đ/dž, capitalisation).	4.24	0.97
The mobile application can contribute to understanding the grammatical content of the Croatian language.	4.18	1.01
The language tasks in the mobile application can contribute to the development of reading comprehension in Croatian language teaching.	3.53	1.23
Contextual language tasks (e.g., sentence completion) can contribute to the development of functional literacy in Croatian language teaching.	3.76	1.30

The analysis of the results in Table 3 shows that respondents consider the mobile application suitable for learning different language content. The arithmetic means range from $M = 3.53$ to $M = 4.24$. The highest value is recorded for the claim *the mobile application is suitable for learning Croatian language orthography content (e.g., č/ć, đ/dž, capitalisation)* ($M = 4.24$). In contrast, the lowest value is recorded for the claim *the language tasks in the mobile application can contribute to the development of reading comprehension in Croatian language teaching.* ($M = 3.53$). These results suggest that respondents consider the mobile application especially suitable for practising orthography and grammar content. Standard deviations range from 0.97 to 1.30, indicating relatively moderate variability in respondents' responses.

Table 4. Implementing the Mobile Application in Croatian Language Teaching

Item	Mean	SD
The mobile application can be implemented in various stages of a Croatian language lesson (introduction, practice, revision, and assessment).	4.24	0.90
The mobile application enables the adaptation of language tasks to learners' varying levels of Croatian language proficiency in Croatian language classes.	3.82	1.13
The language tasks in the mobile application are suitable for pair work or group work in Croatian language classes.	2.53	1.28
The mobile application can be used for formative monitoring of learners' progress in Croatian language classes.	3.94	0.97

The analysis of the results in Table 4 shows that respondents positively assess the possibilities of implementing the mobile application in Croatian language teaching. The arithmetic means range between $M = 2.53$ and $M = 4.24$. The highest value is recorded in the claim *the mobile application can be implemented in various stages of a Croatian language lesson (introduction, practice, revision, and assessment)* ($M = 4.24$), indicating that respondents see the mobile application as a flexible tool in the teaching process. The lowest value is recorded in the claim *the language tasks in the mobile application are suitable for pair work or group work in Croatian language classes* ($M = 2.53$), which may suggest certain reservations among the respondents regarding the application's use in collaborative learning settings. The standard deviation values range from 0.90 to 1.28, indicating moderate dispersion in respondents' responses. The low assessment of applicability for pair or group work may indicate the individualised nature of the application, which does not sufficiently support collaborative learning formats.

3.2. Open-Ended Item Analysis

Based on recurring patterns, thematic clusters and corresponding codes were identified regarding suitable language content, task types, and the benefits and drawbacks of implementing the MACLL mobile application in Croatian language teaching.

Table 5. Clusters and Codes Obtained by Open-Ended Item Analysis

Clusters	Codes
Suitable language content for the MACLL mobile application	• orthographic content • grammatical content • classification and categorisation of linguistic units
Examples of language tasks for the MACLL mobile application	• lexical categorisation tasks • multiple choice tasks • word or sentence completion tasks
Benefits of using the MACLL mobile application	• increased motivation • instant feedback • increased learners' interest in the subject matter
Drawbacks of using the MACLL mobile application	• lack of graphomotor activities • decreased social interaction among learners • technical difficulties or limitations of the application

The following section presents the results of the qualitative analysis of respondents' answers within the identified thematic clusters, along with selected examples that illustrate specific research findings.

The analysis of the open-ended items resulted in the identification of several thematic clusters relating to: 1) language content that, according to the respondents, is most suitable for learning via the MACLL mobile application; 2) examples of tasks appropriate for mobile-assisted learning; 3) benefits of implementing the MACLL mobile application in Croatian language teaching; and 4) drawbacks of implementing the MACLL mobile application in Croatian language teaching.

3.2.1. Suitable Language Content for the MACLL Mobile Application

The analysis of responses shows that respondents consider mobile apps especially suitable for learning orthography-related content. The most frequently mentioned examples include distinguishing between the sounds č and ć, the use of ije and je, and the capitalisation rules.

One respondent states:

> *I consider content such as č or ć, ije or je, and capitalisation to be the most appropriate because students can learn through play.*

In addition to orthography, respondents frequently mention grammatical content, especially topics involving the sorting and classification of linguistic units:

> *Parts of speech can be successfully practised through sorting tasks in the mobile application.*

In addition to orthographic content, respondents also suggest tasks involving sorting parts of speech or classifying linguistic units:

> *I consider all content that can be sorted or divided into categories suitable, such as sorting nouns, verbs, and adjectives.*

Some respondents emphasised that the mobile application is not equally suitable for all teaching content, especially literature and communication:

> *The mobile application is not the most appropriate for literature and communication, as they require oral and written expression.*

These results confirm that respondents primarily perceive mobile applications as a tool for practising content based on clear rules.

3.2.2. Examples of Language Tasks for the MACLL Mobile Application

In the respondents' answers, various types of tasks were identified that, in their view, could be implemented within the MACLL mobile application. Their responses show a preference for short, clear, and automatically verifiable tasks that allow for quick feedback. The most frequently mentioned are tasks involving sorting words according to specific orthographic or grammatical features, such as:

Sort the words into tables based on whether they are written with č or ć. Sort the nouns, verbs, and adjectives into the appropriate columns.

Respondents also mention multiple-choice tasks that allow for a simple assessment of knowledge:

Select the correctly spelled word from the options provided.

In addition, fill-in-the-blank tasks for words or sentences are mentioned, in which learners are required to type in the appropriate letter or word. Such tasks are considered suitable because they allow for easy task creation and quick verification of answer accuracy:

It would be good to have a task where learners fill in words with the letters č or ć and receive immediate feedback.

The obtained results suggest that respondents prefer tasks that enable quick verification and simple evaluation of answers.

3.2.3. Benefits of Implementing the MACLL Mobile Application

The respondents cite increased learner motivation, interactivity, and immediate feedback as the main benefits of the MACLL mobile application.

One respondent states: *The benefits lie in practicality for teachers and are motivating for learners.*

Another respondent emphasises the importance of feedback: *The advantage of the mobile app is that it allows you to check your knowledge quickly, and learners can check their answers themselves.*

It is also noted that applications can increase learners' interest in the subject matter:

Learners find it more interesting to solve tasks on a mobile phone than to write.

The obtained results confirm the importance of the motivational and interactive potential of mobile applications in learning.

3.2.4. Drawbacks of Implementing the MACLL Mobile Application

In addition to these benefits, respondents also point out certain drawbacks of using mobile applications in Croatian language teaching. The most frequently cited drawback is the lack of written expression and graphomotor activities: *Learners should write more by hand because it helps them remember the content better.* Additionally, reduced social interaction and collaborative work among learners are mentioned: *The drawbacks include a lack of social interaction and the possibility that learners become overly absorbed in the application.* Some respondents also cite technical difficulties or limitations of the application: *A drawback could be if the application is poorly designed and does not provide adequate information to the learners.*

These findings highlight the constraints of mobile applications regarding the development of communicative abilities and fine motor/graphomotor skills.

4. DISCUSSION

The results of this study are largely consistent with the theoretical frameworks of Croatian language teaching methodology and Mobile-Assisted Language Learning (MALL) presented in this paper, while also pointing to certain limitations in the use of mobile applications in the teaching process.

Hypothesis H1 indicates that respondents evaluate the mobile application as an instructionally appropriate tool in Croatian language teaching. This finding can be interpreted within the framework of

contemporary language teaching methodology, which emphasises active learner participation and the implementation of various instructional methods that foster the development of linguistic and communicative competences (Pavličević-Franić, 2018). The results indicate that mobile applications can contribute to achieving these objectives, particularly through an individualised learning approach and opportunities to practice content outside the classroom (Livazović & Svalina, 2021).

Hypothesis H2 indicates that respondents hold moderately positive attitudes regarding the role of multimedia and interactive elements. This finding can be interpreted in the context of Smajla's (2022) claims, which emphasise that digital technologies can contribute to more effective learning, but only if they are thoughtfully integrated into the instructional process from a teaching-methodology perspective. The respondents' more moderate assessments may be further explained by the potential limitations of the specific application, such as its simpler design or insufficiently developed interactive elements. Nevertheless, the research results are consistent with Sari and Ersanli (2024), who report that mobile applications have a positive effect on language acquisition, particularly in improving concentration and motivation. The motivational potential of mobile learning may also be related to the familiarity and accessibility of mobile devices, as well as to the possibility of active and independent engagement with learning content. Interactive tasks and immediate feedback allow learners to check their responses and recognise errors during the learning process. Recent research also indicates that mobile-assisted language learning can support learner motivation and engagement by providing flexible, interactive, and self-directed learning opportunities (Metruk, 2024; Shalini Roy & Gandhimathi, 2025).

Hypothesis H3 can be considered confirmed, as respondents perceive the mobile application as highly suitable for practising orthography and grammar. This result is consistent with Budinski's (2012) findings, which emphasise the importance of systematic practice of language rules in the development of linguistic competence. The suitability of the mobile application for orthographic and grammatical content may be related to the nature of the tasks used for practising such content. Orthographic and grammatical rules can be practised through short tasks with clearly defined answers, such as multiple-choice, classification, and word or sentence completion tasks. These types of tasks also allow learners to receive immediate feedback and repeat the activity when necessary. This is also evident in the qualitative findings of this study, as respondents most frequently identified orthographic and grammatical content as suitable for the mobile application and suggested tasks based on sorting, selecting, and completing linguistic units. Although most MALL research has focused on second- and foreign-language learning, a recent systematic review also points to the potential of mobile-assisted learning for grammar development and highlights the role of interactive and personalised learning environments (Álvarez Martínez et al., 2025).

Hypothesis H4 can be considered confirmed, in that the respondents recognise more benefits than drawbacks in the implementation of the MACLL mobile application. The main benefits highlighted are learner motivation and interactivity; this aligns with the findings of Opravž Ostrelič (2020), which demonstrate that the integration of ICT enhances learners' interest in learning materials. Simultaneously, the respondents also highlight certain limitations, particularly reduced social interaction and insufficient opportunities for developing written expression.

The low assessment of the mobile application's applicability for pair or group work further confirms these limitations and points to the importance of collaborative learning in the language classroom. Research in the field of mobile-assisted collaborative language learning (C-MALL) emphasises that digital tools can support the development of communication and collaborative skills when designed to encourage interaction among learners (Guo et al., 2024). The obtained results suggest that the analysed application supports such forms of learning to a lesser extent, which can be attributed to its design characteristics.

The results of this study are consistent with the theoretical assumptions that the MACLL mobile application can have significant instructional value in Croatian language teaching, particularly in practising language content and enhancing learner motivation. However, its implementation demonstrates certain limitations in the development of communication and written language competencies. Therefore, instead of being seen as a replacement for contemporary teaching methods, the MACLL mobile application should be considered a functional asset that enriches the instructional process, provided its use is thoughtfully integrated from a teaching methodology perspective and aligned with the intended educational outcomes.

From a practical perspective, the findings suggest that mobile applications could be used as a supplementary tool in Croatian language teaching, particularly for practising and revising orthographic and

grammatical content. Their use may be especially appropriate for short activities in which learners can work independently and receive immediate feedback. However, the lower ratings related to pair and group work indicate that mobile applications should not replace activities based on communication, collaboration, and written expression. When developing or selecting such applications, attention should therefore be given not only to their technical and multimedia features but also to their instructional purpose and connection with learning outcomes. The findings may also be useful for the further development of digital materials for Croatian language teaching and for future research examining their use with primary school learners in actual classroom settings.

The obtained results may also be influenced by the specific characteristics of the analysed mobile application and by sample limitations, which must be considered when interpreting the findings. Furthermore, the results reflect the perception of prospective teachers rather than the direct effects of the mobile application's implementation on learners.

5. CONCLUSION

The aim of this study was to examine the instructional value of the MACLL mobile application in the learning and teaching of the Croatian language from the perspective of pre-service teachers. The research results suggest that the respondents perceive the mobile application as an instructionally appropriate and functional tool that can contribute to more effective language acquisition.

The findings also indicate that the mobile application has particular potential for practising orthographical and grammatical content and for increasing learner motivation, while providing immediate feedback. At the same time, certain limitations were identified, particularly in social interaction and the development of written expression, which point to the need for its careful, instructionally grounded integration into the teaching process.

The results suggest that the analysed mobile application can have significant instructional value in Croatian language teaching; however, its effectiveness depends on the method of application, its design, and its alignment with the intended educational outcomes. In this regard, the mobile application should be viewed as an additional instructional tool that can enrich the educational process, rather than as a substitute for standard forms of teaching.

A limitation of this study is the small, convenience sample of respondents, which means the results cannot be generalised. Furthermore, the study was conducted from the perspective of pre-service teachers, which may have influenced their perceptions of the mobile application's instructional value.

Future research should include a larger, more diverse sample and examine the effects of mobile application integration in a real classroom environment, particularly from the learners' perspective. It is recommended to develop and evaluate mobile applications that, alongside individual learning, promote collaborative learning formats and the development of communicative and written language competencies.

This study contributes to the field of Croatian language teaching methodology by providing insight into pre-service teachers' perceptions of integrating mobile applications into their teaching, which represents an important aspect of their future professional practice.

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Research Ethics. Participation in the study was voluntary and anonymous. All participants were informed about the purpose of the research and provided informed consent prior to participation. The collected data were used exclusively for research purposes and were processed in accordance with applicable ethical standards for educational research.

Data Availability Statement. All data can be obtained from the corresponding author.

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AI Statement. We used ChatGPT (OpenAI) to assist with the translation of selected words and sentences and to search for recent literature relevant to the topic. The identified sources were checked and verified by the authors. We reviewed the final version of the manuscript and take full responsibility for its content.

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