



Using NLP Tools to Enhance Italian Language Teaching: A Qualitative Study in Higher Education

Katerina Florou

National and Kapodistrian University of Athens, Greece

Abstract

Recent discussions surrounding the factors that influence teachers' effectiveness have sparked increased interest and research into the dynamics of teachers' interpersonal relationships as well as their overall classroom performance, as noted in previous studies [3] and [9]. While a number of studies have delved into various aspects of teacher effectiveness, including the use of corpora in language learning [12], there remains a significant gap in the literature regarding the relationship between teachers' effectiveness and the integration of Natural Language Processing (NLP) tools in classroom settings. This study seeks to bridge that gap by investigating the impact of NLP tools on teachers' professional development, with a particular focus on their use in teaching the Italian language. In this study, the role of NLP tools was explored through the lens of peer and self-assessment [11], involving trainee teachers in the process. Specifically, students from the Italian Language and Literature department at the University of Athens were tasked with creating and delivering lessons on a linguistic phenomenon, text, or vocabulary unit using NLP tools. To assess the comparative effectiveness of these tools, the same students were required to prepare and deliver an additional lesson on the same topic using alternative teaching strategies that did not incorporate NLP tools. After delivering both lessons, the trainee teachers were evaluated based on predetermined criteria for teacher effectiveness, with assessments conducted by their peers as well as through self-assessment. The findings from this research indicate a strong positive reception toward the use of NLP tools among the trainee teachers, with many expressing a clear inclination to adopt such tools in their future language teaching practices. Nonetheless, the study also highlighted certain challenges, particularly concerning limited access to digital teaching resources in specific educational environments. These findings suggest both the potential benefits and the practical obstacles of incorporating NLP tools into language education, pointing to areas for further development and support within the educational infrastructure.

Keywords: Teachers' effectiveness, Natural Language Processing, Italian as a Foreign Language

1. Introduction

Natural Language Processing (NLP) encompasses a collection of computational methodologies tailored to analyze and represent natural language texts across various levels of linguistic scrutiny. The primary objective of NLP is to facilitate human-like processing of language, which can be applied to a diverse array of tasks and applications, as noted by Lindy [13]. This research specifically harnesses NLP to investigate its potential benefits in the realm of foreign language education, with a particular focus on teaching Italian as a foreign language. This study presents a dual focus: firstly, it delves into the utilization of NLP tools and evaluates their effectiveness within classroom environments. Secondly, it seeks to understand the viewpoints of prospective Italian language educators regarding how these NLP tools can be leveraged to enhance both the effectiveness and engagement levels of their instructional practices.

The insights gathered from this research will be primarily based on qualitative evaluations, which will be detailed in the subsequent sections of the paper. Importantly, the findings will reflect the perspectives of teachers rather than students, shedding light on an area that has not been extensively explored in existing literature. This teacher-focused perspective is expected to offer valuable insights for future Italian language instruction and support the professional development of language instructors, particularly in relation to integrating NLP technologies into their teaching methodologies or adapting existing curricula to meet evolving needs.

2. Background



Numerous studies in educational contexts have demonstrated the positive impact of Natural Language Processing (NLP) tools. These tools can provide supplementary support in language instruction [6], while also being instrumental in processing student feedback. For instance, NLP aids educators in identifying areas for improvement in teaching methods and materials, ultimately leading to enhanced educational outcomes [17]. By analyzing educational content and outcomes, NLP helps educators pinpoint gaps in curricula and areas that could benefit from additional resources or alternative methodologies. Moreover, NLP offers an efficient system for managing linguistic input in natural settings, analyzing words, sentences, and texts.

NLP leverages various grammatical rules and linguistic frameworks, including derivations, inflections, grammatical tenses, semantic systems, lexicons, corpora, morphemes, and tense structures. These approaches can be effectively integrated into educational settings to enhance students' comprehension of learning materials and curricular content [2]. There is substantial evidence supporting the use of NLP tools to enhance foreign language instruction. These advanced technologies provide numerous benefits that can significantly improve teachers' effectiveness and agency in the classroom [5]. NLP-powered chatbots and language learning applications, for instance, offer personalized learning experiences tailored to individual student needs and preferences [14]. By analyzing students' language proficiency and learning patterns, these tools generate customized exercises, reading materials, and feedback, enabling teachers to address different learning styles more efficiently.

Additionally, NLP tools support educators in delivering immediate feedback and evaluations to students [15]. Speech recognition and natural language processing technologies facilitate the automatic assessment of pronunciation, grammar, and writing skills. Previous research has sought to complement the limitations of manual classroom observation by utilizing NLP to provide teachers with scalable, automated feedback on instructional practices [8]; [18]. These approaches offer low-level statistics on instructional strategies—such as the frequency of specific teaching techniques used in the classroom—differing from the high-level, actionable feedback provided during coaching sessions [19]. This automation also frees up valuable time for teachers, allowing them to focus on more complex instructional tasks and personalized student guidance.

Furthermore, NLP-based video captioning and subtitling tools can significantly improve the accessibility of classroom materials for students with hearing impairments or those who benefit from visual support [16]. By automatically generating captions or subtitles, these tools ensure that all students have equal access to content, fostering inclusivity in language learning environments. Additionally, Text-to-Speech (TTS) and Speech-to-Text (STT) tools powered by NLP have the potential to streamline content creation for teachers [1]. Educators can use TTS to create engaging audio materials—such as dialogues, stories, and articles—while STT tools can transcribe lectures and discussions, providing students with valuable resources for review and practice.

Recent advances in NLP have produced models like ChatGPT, which demonstrate remarkable few-shot and zero-shot capabilities. These models have been applied to various educational NLP tasks, including essay writing [4], offering essay feedback [7], and assisting students in analyzing literary texts [10].

3. Methodology

This study constitutes an evaluation of a project carried out as part of the training program for prospective Italian language teachers, with a specific focus on the integration of NLP (Natural Language Processing) tools. The trainees were tasked with designing and conducting a micro-teaching activity in which they would deliver a lesson on a topic of their choice. The lesson was to be presented in two phases: first, using traditional methods and materials of their choice, and then employing NLP tools. Prior to engaging in this project, participants attended a series of lectures on the application of NLP tools in linguistic analysis and language pedagogy. Participation in this project was regarded as a critical element for the successful completion of the lecture series, as it allowed the trainees to gain practical, hands-on experience in both traditional and technologically enhanced teaching methods.

3.1 Profile of the Participants

The participants in this research were undergraduate students from the Department of Italian Language and Literature, who voluntarily opted to receive specialized training in the use of NLP tools. They participated in the experiment to gain pedagogical experience in preparing and delivering



lessons with digital tools, while also benefiting from peer feedback. The group comprised 26 students between the ages of 19 and 40. Fourteen participants were first-time university students, aged 19 to 25, while twelve were mature students attending university for the second or third time. All participants had a satisfactory command of the Italian language and expressed a clear intention to pursue careers in teaching the language.

Throughout the experiment, each participant selected a grammatical or lexical topic, or a subject for thematic development, in consultation with the instructor. Drawing on a shared corpus, participants conducted a 20-minute micro-teaching session utilizing digital tools, specifically NLP tools. In addition, the same topic was taught in a separate classroom setting where the use of NLP tools or other digital aids was prohibited, allowing for a direct comparison between traditional and technologically-assisted teaching methods.

3.2 Evaluation Criteria

The rest of the teacher trainees served as observers and evaluators during the micro-teaching sessions. They assessed both sessions (traditional and NLP-based) based on a set of criteria that the group had collectively identified as aligning with contemporary teaching standards. These criteria included:

- a) The inductive teaching method (criterion 1),
- b) The use of authentic texts (criterion 2), and
- c) A student-centered approach (criterion 3).

The evaluations were conducted through recorded observations, which were subsequently discussed in a roundtable format. The peer trainees were assigned two tasks:

1. To identify key strengths and missed opportunities for effective instructional strategies, and
2. To offer actionable suggestions for improving the lessons by incorporating additional teaching methods or approaches.

3.3 Teaching Material / Corpus

For the micro-teaching sessions incorporating NLP tools, a corpus of texts from the national university entrance exams was used. These exams assess proficiency in the Italian language, particularly in the reading comprehension section, through authentic informational texts, such as articles from electronic journals on contemporary issues (typically corresponding to the B2 level of language proficiency). A collection of texts from the past decade was compiled to form a standardized corpus of authentic materials, all of which were comparable in terms of length, genre, and difficulty.

While all participants had access to the same corpus, they were allowed the flexibility to adapt the material to suit their specific teaching objectives. For the micro-teaching sessions without NLP tools, participants had the freedom to select their teaching materials. These could include textbooks (in either digital or printed form), grammar guides, vocabulary resources, or raw authentic texts, depending on the participant's instructional goals and preferences.

3.4 Tasks

By observing the tasks that participants chose to manage during their micro-teaching sessions and the way they implemented them, it becomes clear that they largely relied on the logic of NLP tools in making their selections. This was combined with the conventional thinking of teachers regarding which linguistic phenomena are considered difficult for students of Italian to grasp. The table below provides a categorization of the micro-teaching tasks and the use of NLP tools:

TASK/ PHENOMENON	NO OF PARTICIPANTS	NLP FUNCTION	
Prepositions	3	Concordancer	Uses of "a", "di", "da"
Prepositions	1	Collocates	"di" as a complement
Auxiliaries	3	Concordancer	"essere", "avere"
Articles	1	Concordancer	"gli" + noun
Pronouns	1	Concordancer	"questo" vs "quello"
Lexis	3	Concordancer	"anni", "dopo", "che"
Syntax	4	Collocates	"che" vs "di", "di" + infinitive, "che" + mode



Words Frequency	9	Frequency index	
Readability	1	Readability index	

Table 1. The tasks and the NLP functions used

The participants implemented the exact same tasks in their micro-teaching sessions without the use of NLP tools, primarily utilizing an Italian language textbook as the main resource (in four cases) accompanied by a dictionary (for pronouns and syntax). In only two instances, they used a grammar book along with accompanying exercises (for the preposition "a" and the auxiliary verb "essere"). In none of the micro-teaching sessions were video or audio files used.

The assessment process took the form of a structured discussion guided by a pre-established questionnaire, which was designed around the previously mentioned teaching criteria. Participants conducted both self-assessments and peer evaluations, initially determining whether the two microteaching sessions for each individual aligned with the established criteria. They then offered detailed feedback on individual performance and the overall quality of the project. Selected comments from these evaluations were submitted to the researcher and are incorporated into the study's findings.

4. Results

As illustrated in the previous table, the majority of participants selected the area of grammar, likely for reasons of increased security and confidence. It is noteworthy that with an equal number of micro-teaching sessions (9), we observe the consistent use of word frequency as a tool in the teaching process. The lessons indicate that word frequency was employed as a foundation to facilitate the production of similar texts in the target foreign language. For instance, trainees would instruct students to use NLP tools to identify the most frequent words in a given text or set of texts and subsequently create a comparable written text incorporating these frequent words.

In contrast, in the equivalent lessons without NLP tools, participants attempted to teach the frequent occurrence of certain words as a prompt for written production, relying on authentic texts—either from the textbook or in photocopied form—where the teacher manually identified the most common words. This approach appeared to negatively affect the evaluation of the "traditional" micro-teaching sessions (Table 2), likely due to the limitations in dynamism and engagement compared to the NLP-assisted lessons.

Regarding tasks related to grammar and syntax, it seems that both types of lessons (particularly those incorporating NLP) fulfilled the criterion of student-centered learning. In some cases, authentic texts were also employed in the micro-teaching sessions without NLP. However, as expected given the nature of the corpus, authentic texts were consistently used in the micro-teaching sessions involving NLP. This regular use of authentic materials in conjunction with NLP tools may have contributed to a richer, more interactive learning environment, further enhancing the perceived effectiveness of these sessions.

The table below presents whether the criteria set by the participants were met, as well as which criteria were satisfied in each type of microteaching session:

Trainee	Task	Lesson without NLP			Lesson with NLP		
		Criteria			Criteria		
		1	2	3	1	2	3
1	Preposition "a"						
2	Preposition "a" & "di"						
3	Preposition "di" and "da"						
4	Preposition "di"						
5	Auxiliaries "avere" & "essere"						
6	Auxiliaries "avere" & "essere"						
7	Auxiliary essere (passive)						
8	Article "gli"						
9	Questo /quello						
10	Significance of "anni"						
11	Significance of "dopo"						
12	Significance of "che"						
13	Syntax of "che"						



14	Syntactical difference “che” / “di”						
15	Clauses of “che+ congiuntivo”						
16	Clauses of “di” + infinitive						
17	Differences in texts’ readability						
18	Most frequent nouns of text no 3 (written production)						
19	Most frequent nouns of text no 10 and no 9 (written production)						
20	Most frequent adjectives of the corpus (create phrases)						
21	Most frequent articles of the corpus (and the collocates)						
22	Most frequent articles (and the collocates) of the corpus						
23	Most frequent content words of the corpus (identify the arguments)						
24	Most frequent functional words (formulate the rule)						
25	Most frequent pronouns of the corpus (create phrases)						
26	Common frequent words in all texts (make a list)						

Table 2. Tasks and the fulfillment of criteria

During the post-lesson discussions, all participants acknowledged that they needed to invest significantly more time and effort in preparing microteaching lessons that integrated NLP tools. A common concern expressed by participants was the fear that the use of digital tools, perceived as somewhat impersonal or “cold,” might hinder the fulfillment of teaching criteria, particularly in fostering student engagement and interaction. Despite these apprehensions, the prevailing sentiment was that microteaching sessions utilizing NLP were ultimately more successful in meeting the established pedagogical criteria. Moreover, these sessions were deemed to be more engaging for both teachers and students, offering a playful and enigmatic quality that contributed to their overall effectiveness.

The use of NLP in the classroom was widely seen as lending additional credibility to the teacher. This perception likely stems from the fact that NLP-based methods are not only viewed as innovative but also as inherently aligned with student-centered teaching practices. The dynamic nature of NLP tools allowed for more tailored and responsive learning experiences, which participants felt enhanced the educational process. In contrast, the microteaching lessons that did not incorporate NLP tools appeared to be constrained by traditional methodologies. These sessions often relied heavily on textbook-based instruction or repetitive strategies, which limited their creativity and adaptability.

It is essential to underscore a significant area of discourse among participants concerning the authenticity of the language presented in concordances produced by natural language processing (NLP) tools. Participants expressed skepticism regarding the extent to which this language can be deemed “authentic” and representative of natural language usage. This concern prompts critical questions for further exploration, particularly in relation to how students themselves assess the application of NLP tools in the classroom, especially when compared to the use of authentic texts. One could argue that excerpts generated by these tools, even if derived from genuine discourse, are often structured in a manner that may lead students to conclusions that align more closely with predetermined linguistic rules rather than accurately reflecting the language employed by native speakers.

5. Conclusion

When examining the overall outcomes of the experiment, it is evident that despite certain limitations, the use of NLP tools in the classroom was positively evaluated in several aspects. The participants’



competence in utilizing these tools was also highlighted. Feedback from the participants, both in their self-assessments and in their evaluations of their peers, was overwhelmingly positive, even enthusiastic at times. This suggests a strong acceptance of NLP tools in educational contexts and reinforces the potential of such technologies to enhance both teaching and learning experiences. NLP tools appear to promote the image of the teacher as a researcher while simultaneously encouraging students to engage in research, resulting in the enhancement of metacognition.

The participants' conclusions about their overall experience and the project are outlined below:

- "It was actually easier than I thought, and using NLP involves interaction."
- "I like traditional teaching, but [Participant] made AntConc feel like a game when it came to formulating rules with the students."
- "I prefer teaching certain structures using NLP, because searching is familiar to both the students and me, and the textbook is boring."
- "I'm not sure if it's good for students to spend too much time in front of the computer, but the NLP interface is user-friendly, especially in how it uses authentic texts. I will definitely use it."

To conclude, NLP tools have the potential to significantly enhance foreign language teachers' agency and effectiveness in the classroom. By providing personalized learning experiences, automated feedback, enhanced accessibility, and streamlined content creation, these technologies empower educators to deliver more engaging, efficient, and inclusive language instruction.

However, it's essential for teachers to strike a balance between the use of technology and the human connection that is at the heart of effective language learning. For this reason, the trainees emphasized that NLP tools are helpful in teaching. They are not a panacea and cannot establish a direct connection with the language; they can only facilitate its learning process.

6. Challenges and Limitations

While NLP tools offer numerous benefits, there are also challenges and limitations to consider. Access to digital teaching resources may be restricted in certain educational contexts, and teachers may need to dedicate time to learning how to effectively integrate these tools into their instruction. This study provides teachers the opportunity to work in a classroom fully equipped with the necessary computer network and access to online tools and digital applications, a condition also assumed for the students learning Italian. However, in reality, particularly in public schools, such resources are not always available.

Furthermore, it is essential to maintain a balance between the use of technology and the human connection in language learning. As Stanford education researchers Dora Demszky and Rose Wang [19] emphasize, "A fundamental aspect of learning is the human connection between the student and the teacher, and the motivation to learn is driven by that relationship. It is not truly possible to replicate this connection with a robot." What emerges from this type of research is that the teacher remains in control of the technology, rather than being subservient to it.

Future studies on foreign language instruction could focus on longitudinal research into the integration of NLP tools, examining their long-term impact on both teachers' instructional practices and students' language learning outcomes. This would help determine whether the initial enthusiasm for NLP tools translates into lasting pedagogical change and improved student performance. Additionally, it would be valuable to study different teacher populations. Since the participants in this study represented a relatively homogenous group, future research could explore the effectiveness of these tools with teachers of varying characteristics, such as younger or older educators, or those with limited technological experience.

A study on the balance between technology and human interaction would also be highly beneficial. Investigating how teachers can best achieve a balance between leveraging NLP tools and maintaining the human connection essential for effective foreign language learning would be valuable. Such research could explore strategies for integrating technology without diminishing the interpersonal aspects of teaching.

Moreover, health and well-being considerations could be examined. As some participants expressed concerns about extended screen time with NLP tools, future research could investigate the potential effects of using these tools on students' cognitive load, attention, and overall well-being, particularly in technology-intensive learning environments.

One crucial area for future research that arises from the learners' perspective is the evaluation of students' attitudes towards the implementation of natural language processing (NLP) tools in the educational setting. It would be particularly valuable to explore whether the students' perceptions of these technological interventions align with the positive sentiments expressed by their instructors.



Additionally, it would be insightful to determine the degree to which students' assessments of the efficacy and appropriateness of NLP tool integration correspond with evaluations of their teachers' competence in effectively leveraging such technology to enhance the learning experience. Examining both the teachers' and students' perspectives can provide valuable insights into the challenges, benefits, and best practices associated with integrating these technologies into the educational landscape. This knowledge can inform the development of more effective and engaging learning environments that cater to the needs and preferences of all stakeholders involved in the educational process.

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