

Utilising Grammar Checking Software within the Framework of Differentiated Language Teaching

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ABSTRACT

Grammar has always been a vital part of language teaching. Nowadays, in order for educators to support the students' learning needs, teaching approaches utilizing digital tools and differentiation seem to be of particular educational importance. Therefore, the goal of the current study is to investigate the role of digital tools and specifically of the grammar checking software (Neurolingo's "Greek Grammar Checker") in students' linguistic/grammar competence during a differentiated teaching approach. Specifically, the study explores whether the Grammar Checker supports more effectively the text production of high or average/low ability students in the framework of a differentiated teaching strategy (R.A.F.T.) as well as their beliefs towards the kind of support they received by the specific tool. The participants are high school students who attended the Experimental School of a Greek university (University of Patras) for the school year 2018-2019. Data analysis included the categorization of the participants' errors in the differentiated writing task as well as quantitative and qualitative analysis of their beliefs in relation to their competence level. Main findings suggest that high ability students, despite the fact that they made more mistakes, accepted the Grammar Checker's suggestions more willingly. Additionally, all students' groups seem to have an overall positive disposition towards the Grammar Checker reporting mainly the modernization of language teaching and the psychological boost it offers. Implications for the effective use of digital tools in differentiating language teaching regarding various ability groups are discussed.

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CCS Concepts

Applied computing → Computer-assisted instruction

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Differentiated teaching; language teaching; grammar checking software; digital tools in education

1. INTRODUCTION

1.1 The relationship between grammar teaching and writing competence

Grammar has always been considered a vital part of language teaching, especially in enhancing students' writing competence. Related literature, however, offers contradictory results on the efficacy of grammar teaching upon students' competence in writing. Empirical studies have concluded that there is no evidence that teaching grammar is of benefit in supporting writing development [16]. Other researchers, on the contrary, suggest that the teaching of grammar seems to have an overall positive effect on students' writing, particularly for more able writers [6].

Another major field of research related to grammar teaching is students' and teachers' opinions concerning the role of grammar teaching and error correction in enhancing students' writing competence. According to Liao & Wang [18], secondary students and teachers have considerably different opinions about grammar instruction and error correction, a finding also supported by other researchers. Specifically, Schulz [26] found that students had positive views about grammar instruction and corrective feedback in contrast to their teachers who had negative views.

Another part of the related literature explores the place and effects of grammar error correction / feedback on students' success. There are research results for the teaching of second language suggesting that grammar error correction doesn't seem to have significant positive effects on students' written output / writing competence. However, there are studies demonstrating significant positive effects, especially of written and explicit / implicit feedback on learners' accuracy [8] and understanding of grammatical structures. Students seem to prefer immediate error correction of their inappropriate use of grammar in the frame of second language teaching [2].

1.2 ICT in language teaching

The capacity for computers to provide instant and individualized feedback has long been recognized by educators as they have shifted from the behaviorist tradition of providing simplistic feedback in a correct-or-incorrect way to more pedagogically contextualized and robust methodologies [24]. Recently, computer-based methods, complementary to teachers' feedback and teaching, have been developed, mainly due to the previously mentioned fact that computers can provide immediate feedback based on a given student's learning condition [20]. Elaborating on the notion of immediateness of feedback Abuseileek [1] underlines also the element of individualization, namely the possibility for each learner to process material at his or her own pace, thus resulting in lower anxiety levels and a more relaxed atmosphere for learning.

1.3 Grammar checkers

An example of an ICT tool that has been widely utilized in language teaching combining some of the features discussed earlier are grammar checkers. Typically, grammar checkers work by scanning through a text and providing immediate feedback on grammar, spelling and punctuation errors. Grammar checkers can highlight issues such as subject-verb disagreement, split infinitives, double negatives, run-on sentences and incorrect use of prepositions. If the checker finds an error, it will explain the grammar rule and may also offer a solution which the user can accept or ignore (an indicative element of critical literacy). The checkers also highlight spelling errors and words that may have been confused. Some grammar checkers also offer feedback on style and vocabulary usage. An important point to note is that grammar checkers do not claim to teach grammar; they are a tool to bring potential problems to the writer's attention [6].

1.4 Grammar checkers in language teaching

1.4.1 Positive effects of grammar checkers in language teaching

There is strong evidence supporting the utilization of grammar checkers in language teaching and their positive effects mainly in students' writing competence. Particularly, Potter & Fuller [21] found that the use of English grammar checkers for secondary students increased their motivation, engagement and confidence in grammar rules and English language proficiency overall. Grammar checking software allows for students to learn in an inquiry based and formative learning environment since they progress through a process of assessments of their strengths and weaknesses, taking control of their own learning and particularly through their own active analysis, using questioning and problem solving [21]. Particularly, Burston [5] found that advanced students of French benefited tremendously from a French grammar checker.

1.4.2 Limitations and negative impact of grammar checkers in language teaching

Grammar checking software, however, presupposes an enhanced critical literacy level by the users, as they must be perceptive about accepting and rejecting its recommendations [9]. Moreover, current grammar checkers are restricted in their operation by their inability to perform semantic analysis. They function almost entirely on the basis of surface level morphosyntactic relationships. According to Burston [5] extrinsic reward seems to be a salient factor in the motivation to eliminate morphosyntactic errors and, hence, to use a grammar checker. Moreover, this element must be combined with that of guidance by an

experienced user. However, more effective use of a grammar checker does not in itself lead to improvement in self-monitored writing. This can be attributed to the fact that, when used as an ex post facto correction tool, a grammar checker does not affect the underlying source of a problem.

Some researchers have investigated the impact of spell and grammar checking options in text processors. They have found a significant positive effect only for the group of "poor writers", since "good writers" start to rely on the spelling and grammar checkers completely, while ignoring their own instincts [19].

Several studies have also investigated and evaluated the use of the spelling and grammar checkers and their implications for language literacy development for school-age children and their English writing. Heift & Rimrott [14] found that the participants in their study submitted the correct word only if it appeared in the spelling checker suggestion list, concluding at the same time that the order in which the words appear in the suggestion list (mostly the first one) seemed to be an influencing factor for students to select one word over another. Additionally, Figueredo & Varnhagen [10] found that all student groups of their study were able to correct more surface errors with the aid of the checkers than they were with the dictionary. They concluded that "the main source of difficulty for students, at that level, in the dictionary condition was in detecting the surface errors without the help of the checkers" (p. 730).

1.4.3 The role of educators and students

It should be noted that grammar checkers seem to have been widely accepted in the educational community, since many students trust them due to the fact that they are very unsure of their own spelling and grammar, especially in the frame of mother tongue teaching in secondary education [4]. Another advantage of Grammar Checkers, which seems rather appealing, is that it relieves teachers' workload [15]. According to other studies [17] student teachers are positive towards the use of Grammar Checkers in classroom settings, focusing mainly on the elements of reviewing systematic character and collaboration in the reviewing process.

1.5 Differentiated language teaching

Differentiation involves having multiple ways to structure a task so that each student is provided with an opportunity to perform at an acceptable level of difficulty [3]. Additionally, another significant element in a differentiated language teaching setting is providing students with self-autonomy during the writing process. At the same time there must be formative assessment and proper guidance which will promote students' success and growth. Students need to own the process at the level they are at. In this act of self-regulation the teacher plays an important role in facilitating students to internalize these skills [7, 22].

1.6 Digital differentiation

Differentiated learning routes meet the demand to teach students at their own level, even when they are in the same classroom. The combination of digital and differentiated learning routes provides teachers with the possibility to do all the above, even in large classrooms. A different strand of evaluations focuses on IT as a differentiation tool. IT is particularly suited to provide differentiation, as algorithms offer the opportunity to develop individual learning paths. For language, several experiments have been conducted, but none of them have found positive effects. Specifically, studies have not found positive effects by computer-based training on students' literacy skills [12, 20, 23]. As

Haelermans, Ghysels, & Prince [13] state “It should be noted that almost all of the above-discussed studies apply differentiation using computers, but hardly any of them study micro differentiation using computers in the classroom. Computers are used as remedying devices outside of regular classes, rather than incorporated in teaching to all students. A few studies do discuss differentiated instruction using technology (e.g., [25]). However, these studies do not study effects of digital differentiation at the micro level but mainly discuss principles and guidelines on how to implement technology-based differentiation in the classroom.

Additionally, the majority of relevant studies focus on reading comprehension. For example, Given et al.'s [12] study, although examining specific digital tools, focuses on remedial students and reading. Also, Rouse & Krueger [23] study explores the effect of a specific digital tool (Fast ForWord) for reading comprehension. Similarly, Potocki et al.'s [20] paper concerns reading comprehension strategies with CAI (computer assisted instruction).

1.7 Current study's rationale

As it was analyzed in the introduction, the majority of the studies focus on second language teaching and mostly on reading comprehension. Also, it can be understood by the afore mentioned studies that there is a significant gap in relevant research concerning the effects of digital tools in students' text production competence and especially in their grammatical competence through the use of grammar checking software. Moreover, based on the notion that differentiated teaching allows for individual learning paths to be utilized, students' differentiated writing through the utilization of grammar checking software should be explored.

2. THE CURRENT STUDY

2.1 Method

The goal of the current study is to investigate the possible effects of a Grammar Checker for Modern Greek in a differentiated language teaching setting. Since the majority of the relevant studies concern second language and reading, it seems appropriate that the current study will explore differentiation in text production in mother tongue teaching with the support of a specific digital tool ([Greek Grammar Checker](#)). The Greek Grammar Checker has been developed in conjunction with linguists, engineers as well as educators, since its utilization in language teaching is more than evident. Specifically, the Greek Grammar Checker used the formalism Mnemosyne (called Kanon), which makes use of the framework of Unification Grammars [11]. The particularity of the Greek Grammar Checker –which sets it apart from other grammar checkers– is that it not only examines and verifies each word in relation to its context, but also focuses primarily on the detection of the words or/and phrases described as problematic (morphologically or stylistically). If the word or phrase has the required characteristics, it is considered correct. Otherwise, the grammar checker suggests to the user to use either the right type (by comprehensively describing and reminding the relevant grammar rule) or another word with the right characteristics. The feature of the rules' description is of particular importance, since it was designed by educators having in mind its potential for grammar teaching.

Specifically, the questions that drove the study were:

1. Which student group (high ability/average ability) would be more supported by the Greek Grammar Checker in the frame of a differentiated language teaching process?

2. Which are the participant students' beliefs related to the utilization of the Greek Grammar Checker in differentiated language teaching?

The current study's participants were secondary high school students (N=20) of the Experimental School of Patras (third biggest city) in Greece. Data were collected during the school year 2018-2019. The participants at the time of the study were 16-18 years old (M=16,9) and had a considerably high linguistic competence (M=17,2/20) since a prerequisite for entering an Experimental School in Greece is passing demanding exams which include extensive and rigorous testing of linguistic competence in mother tongue. The majority of the participants were girls (62%).

In order for the first research question to be investigated, students were divided into three groups based on their linguistic competence in mother tongue discipline (Modern Greek language) (high, average and low ability). The two groups were asked to write a text in the frame of a specific communicative context (a major problem in their city). Both groups had to make use of some given words or phrases that native speakers tend to use incorrectly (syntactically, grammatically or semantically). Each text was written in a three phase process in the classroom and had a duration of approximately three teaching hours. The whole writing activity was based on the R.A.F.T. (Role, Audience, Format, Title) teaching strategy, an indicative strategy of differentiated teaching. Text production activities based on this strategy are constructed for each student group in order to respond taking a different role, addressing their text to different audiences (formal/informal), in a different format (letter, speech, e-mail etc.) and under a different title.

In our research design, the first group (with an average grade in Modern Greek) had to write a text as a citizen of the city to a candidate Mayor of the city. Correspondingly, the team with the highest performance in the Modern Greek language course had to write a text in which they would respond as mayor candidates to the city problems that their fellow citizens had indicated as important. It must be clarified that the texts of the two groups were not drafted in parallel as the second group had to consider the text of the first group.

When the texts of both groups were completed, the first group (average ability) first gave its text to be corrected and/or improved (at a syntactic, grammatical and semantic level) by the students of the higher performing group. It is worth noting, however, that the suggestions of the students in the second group were minimal. Then the students in the first group used the Grammar Checker for Modern Greek - they rewrote their text - and saw the Grammar Checker's suggestions. They then decided which changes they had to accept and rewrote their text and gave it to the students of the second group. Below (figures 1, 2) is a student's text imputed in the grammar checker for self-correction.

Respectively, the students of the second group (high ability) responded to the text given by their classmates and at first, they tried to optimize it without the help of the Grammar Checker. Instead, they relied on each other's help. After writing the text in its final form, they also exploited the capabilities of the Greek Grammar Checker to review it. This group did not change its text based on the Grammar Checker's suggestions. These students have confidence in their linguistic ability and they do not consider intelligence systems - such as the grammar checker - really helpful and supportive. They trust their abilities more than the grammar checker. They don't believe that writing a text without

any errors is difficult, even for experts. Through self-evaluation each student was concerned about possible problematic elements of their text.

In the end, a group of students (students with the lowest performance in the language course) were asked to create a poster with the problems of the city in which they had to use as many words as possible from the text they have previously written. After the poster was created and before its final printing, the team had to check its text through the Grammar Checker and make any appropriate changes. It is worth pointing out that no valuable data were produced for this group, as the text they used was too small, with everyday speech, and therefore they could not make the most out of the Grammar Checker's capabilities.

In order for the second research question to be explored, the participants answered a questionnaire with two open-ended questions about how they experienced the advantages and disadvantages of the specific tool in language teaching in the classroom. Finally, the participants' answers were categorized and analyzed in relation to their ability/competence level (see table 2).

Data were then analyzed using SPSS (v. 20) and are presented on a descriptive level. They are also tabulated according to the participants' level of learning readiness.

Αγαπητοί ψηφοφόροι, Θα ήθελα να αναφερθώ σε ένα πρόβλημα που μαστίζει την πόλη μας. Το κυκλοφοριακό είναι ένα διεθνές πρόβλημα και έχω σκοπό να μειωθούν οι αρνητικές συνέπειες μέχρι το τέλος της θητείας μου. Στην επίλυση του κυκλοφοριακού θα εμπεριέχω τις γνώμες σας καθώς οποιοσδήποτε ζει στην πόλη μας έχει το δικαίωμα να συμβάλλει στην βελτίωσή της. Αρχικά [...] θα έχω ως δευτερεύων τρόπο αντιμετώπισης την δημιουργία νέων δρόμων. Έτσι οι πολίτες φτάνουν στον προορισμό τους πιο γρήγορα από ότι παλαιότερα. Τέλος θα αυξήσουμε τις προϋποθέσεις για να γίνει κάποιος οδηγός έτσι ώστε να εντάξουμε στην κοινωνία μια νέα γενιά οδηγών που θα είναι πιο προσεκτικοί αλλά και πιο φιλικό προς το περιβάλλον. Σας ευχαριστώ πολύ για

Figure 1. Sample of a participating student's text inputted into the Greek Grammar Checker.

Αγαπητοί ψηφοφόροι, Θα ήθελα να αναφερθώ σε ένα πρόβλημα που μαστίζει την πόλη μας. Το κυκλοφοριακό είναι ένα διεθνές πρόβλημα και έχω σκοπό να μειωθούν οι αρνητικές συνέπειες μέχρι το τέλος της θητείας μου. Στην επίλυση του κυκλοφοριακού θα εμπεριέχω τις γνώμες σας καθώς οποιοσδήποτε ζει στην πόλη μας έχει το δικαίωμα να συμβάλλει στην βελτίωσή της. Αρχικά [...] θα έχω ως δευτερεύων τρόπο αντιμετώπισης την δημιουργία νέων δρόμων. Έτσι οι πολίτες φτάνουν στον προορισμό τους πιο γρήγορα από ότι παλαιότερα. Τέλος θα αυξήσουμε τις προϋποθέσεις για να γίνει κάποιος οδηγός έτσι ώστε να εντάξουμε στην κοινωνία μια νέα γενιά οδηγών που θα είναι πιο προσεκτικοί αλλά και πιο φιλικό προς το περιβάλλον. Σας ευχαριστώ πολύ για

Γραμματικό Λάθος
Το λήμμα 'κυκλοφοριακός' συγγέεται με το 'κυκλοφορικός'. Κυκλοφοριακός σημαίνει 'αυτός που αναφέρεται στην κυκλοφορία των πεζών', κυκλοφορικός σημαίνει 'αυτός που αναφέρεται στην κυκλοφορία του αίματος'

Γραμματικό Λάθος
Το 'το' πρέπει να έχει τελικό -v.

Figure 2. The process of grammar checking to a participating student's text through the Greek Grammar Checker.

2.2 Results

Data analysis showed that there was no notable difference in the errors made by the two groups of students. Both groups of students who wrote the text had the same choices that deviated from the level of a successful written speech. The first group (with average rating in the Greek language) had more errors in syntactic and morphological level, while the second group (with the lowest performance in the language course) had more semantic and standardization errors.

2.2.1 Acceptance of the Grammar Checker's suggestions

As can be seen in table 1, the majority of errors suggestions by the Grammar Checker were made, as expected, for students of average learning readiness. Students of both groups, though, seem to have accepted far less than the half of them, a finding that is particularly interesting, if the originality and the support provided by the Greek Grammar Checker would be taken into account.

From the total amount of errors suggested by the Grammar Checker to the texts of students of average learning readiness (n = 213), the participant students accepted and corrected only the 38% of them. Interestingly enough, high ability students made considerably less mistakes (n = 136), but their final error acceptance was almost the same as the average group's (36.7%), indicating their more positive disposition and the support they received by such a tool.

Table 1. Participants' error acceptance suggested by the Greek Grammar Checker in relation to their learning readiness level.

	Average level		High level	
	f	%	f	%
Errors suggested by the Greek Grammar Checker				
error	91	46.5	54	39.7
suggestion	66	31	47	34.6
information	56	26.3	35	25.7
Errors accepted by the participants				
error	65	80.2	38	76
suggestion	15	18.5	12	24
information	1	1.2	0	0

N = 16

2.2.2 Students' beliefs for the Greek Grammar Checker

As can be seen in table 2, the majority of the participant students believe that the Greek Grammar Checker definitely has advantages for the teaching of mother tongue, mainly concerning its modernization (not focus on drills and text reviews by hand). In relation to gender, the majority of boys (40%) think that the Greek Grammar Checker offers a modern aspect of language teaching, while most girls (27.3%) think also that it contributes to a more solid linguistic understanding. As far as the Grammar Checker's disadvantages are concerned, the majority of girls (60%)

stressed out the fact that it can't track all mistakes, pointing towards its next, more elaborate versions.

Specifically, some of the participating students' comments were:

"Finally, the language lesson is being modernized" (Mary)

"I am not afraid to write a text" (Helen)

"I understand my mistakes" (Tom)

"Dissimilar with the teacher's correction" (Jane)

"Self-evaluation at last" (John)

Table 2. Participants' beliefs for the Greek Grammar Checker in relation to their learning readiness level.

	Average level		High level	
	<i>f</i>	%	<i>f</i>	%
Advantages of the Greek Grammar Checker				
modernization of language teaching	2	18.2	3	60
psychological boost	3	27.3	0	0
better understanding	3	27.3	1	20
motivation boost	2	18.2	0	0
self-assessment	1	9.1	1	20
Disadvantages of the Greek Grammar Checker				
anxiety to the user due to numerous labelling	3	60	0	40
inability to track all mistakes	0	0	1	100

N = 16

As can be seen in table 2, the majority of high ability students did not refer to aspects of psychological/motivational boost through the Greek Grammar Checker. On the other hand, they mentioned / highlighted deeper learning processes such as self-assessment that can be fostered with the support of the specific electronic tool.

2.3 Discussion

The goal of the current study was to investigate the possible effects of grammar checking software (Greek Grammar Checker) in a differentiated language teaching setting.

As far as the first research question is concerned (which student group would be more supported by the Greek Grammar Checker), it has to be mentioned that students accepted only a few errors (about 37-38%) from the ones suggested by the Grammar Checker. This finding can be interpreted in many ways. Firstly, errors are often not accepted by students, perhaps due to the regulatory role that grammar has played in their life. Mistakes disappoint and displease them, while their pedagogical use has not been fully exploited by teachers. An additional reason that students do not accept mistakes may be the evaluation methods and techniques used in the assessment of a student's school performance. Evaluation at school is linked to testing and, therefore, to grades. The quality of learning is being converted into grades, thus not being a supportive learning tool, or an effective teaching tool. Students with the fewest mistakes are welcome while those with the most mistakes are disapproved. There is a perception, the fewer mistakes students have, the higher the grade. It is not easy

for a student to accept his/her mistakes. In addition, the failure to accept mistakes is probably due to the student's limited ability to perceive and process information. Students are unable to memorize information or retrieve old knowledge and thus do not consider the Grammar Checker's specific instructions to be correct. The fact also that students are native speakers, gives them the illusion of the language's absolute knowledge.

Additionally, another possible cause of the participants not accepting more error suggestions is the fact that the Grammar Checker interface may not be so friendly to the students. Self-motivation and self-evaluation are processes not familiar to them, since they are not systematically cultivated within the Greek educational system. Interestingly, participating students of average linguistic competence made many more mistakes, while students of the high competence group made almost half, but accepted and corrected many more. This may indicate their preference for such digital tools, which seem to be more suitable to their learning needs and profile. It is widely known that high ability students prefer an "individual path" to knowledge construction and this seems to be the case according to the current study's findings as well. Further investigation with a broader sample may reveal significant differences between competence groups.

The current study's findings seem to be in line with those of Abuseileek [1], who stressed the element of individualization in digitally supported language learning, a possible indication of why high ability students are supported more by the grammar checking software. Additionally, the elements of inquiry based and formative learning environment, self-reflection and problem solving [21] may also be possible processes that allow for high ability students to be more effectively supported by the grammar checker. The findings of Olsen & Williams [19] regarding significant positive effects only for the group of "poor writers" don't seem to be supported by the current study's findings. Of particular interest, however, would be the investigation of long term effects on self-monitored writing, since the grammar checker is not used merely as an ex post facto correction tool, but supports students during the writing process.

Regarding the second research question (beliefs of the participants for the utilization of the Greek Grammar Checker in language teaching) the participant students reported mainly the modernization that the specific tool brings to the teaching of mother tongue (e.g. no focus on drills and text reviews by hand) and the psychological boost deriving from its use. These findings seem to agree with those of other studies [21] regarding the increase in motivation and confidence in grammar rules and English language proficiency overall. On the other hand, the participants believe that its main disadvantage is the fact that it can't track all mistakes. These results seem to be not in line with previous research relevant to the Greek Grammar Checker's possible utilization by educators, which revealed the elements of the systematic and collaborative character of the reviewing process [17]. This is a rather interesting comparison, as it shows the different elements on which different groups of native speakers with different needs focus in the frame of a classroom. This finding underlines the multiple potential that the specific tool can offer to different groups of users inside and outside of the classroom. On the other hand, the element of its inability to track all mistakes definitely reveals that there is a need for more elaborate versions of the Grammar Checker, which would be more advantageous to students and their linguistic needs.

Overall, the high level of the current study's originality should be noted, since it is the first study trying to combine digital tools on the micro-level of a differentiated language teaching approach. Additionally, data collection was realised through authentic texts, focusing on differentiated text production in mother tongue with the support of grammar checking software, aspects that were not thoroughly explored until now.

The current study, however, comes also with certain limitations related mainly to the small sample size, which did not allow for further statistical analyses. Moreover, a broader geographical dispersion and participating students not attending an experimental school would possibly offer more robust data and generalizable findings.

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4. REFERENCES

- [1] Abuseileek, A. F. 2009. The effect of using an online-based course on the learning of grammar inductively and deductively. *RECALL* 21, 3 (Sept. 2009), 319-336. DOI=<https://doi.org/10.1017/S095834400999005X>
- [2] Almuhimedi, R. and Alshumaimeri, Y. 2015. Effective error correction in grammar classes: A students' perspective. *American International Journal of Contemporary Research* 5, 6 (Dec. 2015), 127-138.
- [3] Awada, G. M. and Faour, K. H. 2018. Effect of Glogster and cooperative learning differentiated instruction on teachers' perceptions. *TEwT* 18, 2 (Apr. 2018), 93-114.
- [4] Bourjaili Radi, O. 2014. Teachers' perceptions of the individual case studies' literacy performance and their use of computer tools. In *Proceedings of the 11th International Conference on Cognition and Exploratory Learning in Digital Age (CELDA 2014)* (Porto, Portugal, October 25-27, 2014), 79-86.
- [5] Burston, J. 2001. Exploiting the potential of a computer-based grammar checker in conjunction with self-monitoring strategies with advanced level students of French. *CALICO Journal* 18, 3, 499-515. DOI=<https://doi.org/10.1558/cj.v18i3.499-515>
- [6] Cavaleri, M. and Dianati, S. 2016. You want me to check your grammar again? The usefulness of an online grammar checker as perceived by students. *JALL* 10, 1, A223-A236.
- [7] Connor, C. M. D., Morrison, F. J., Schatschneider, C., Toste, J. R., Lundblom, E., Crowe, E. C., and Fishman, B. 2011. Effective classroom instruction: Implications of child characteristics by reading instruction interactions on first graders' word reading achievement. *J RES EDUC EFF* 4, 3 (Jul. 2011), 173-207. DOI=<https://doi.org/10.1080/19345747.2010.510179>
- [8] Ellis, R., Loewen, S., and Erlam, R. 2006. Implicit and explicit corrective feedback and the acquisition of L2 grammar. *STUD SECOND LANG ACQ* 28, 2 (Jun. 2006), 339-368. DOI=<https://doi.org/10.1017/S0272263106060141>
- [9] Ericsson, P. and McGee, T. 2002. The politics of the program: as the invisible grammarian. *Computers and Composition* 19, 4 (Dec. 2002), 453-470. DOI=[https://doi.org/10.1016/S8755-4615\(02\)00142-1](https://doi.org/10.1016/S8755-4615(02)00142-1)
- [10] Figueredo, L. and Varnhagen, C. K. 2006. Spelling and grammar checkers: Are they intrusive? *BRIT J EDUC TECHNOL* 37, 5 (Apr. 2006), 721-732. DOI=<https://doi.org/10.1111/j.1467-8535.2006.00562.x>
- [11] Gakis, P., Panagiotakopoulos, C. T., Sgarbas, K., and Tsalidis, C. 2016. Design and construction of the Greek grammar checker. *DIGIT SCHOLARSH HUM* 32, 3 (Jul. 2016), 554-576. DOI=<https://doi.org/10.1093/ilc/fqw025>
- [12] Given, B. K., Wasserman, J. D., Chari, S. A., Beattie, K., and Eden, G. F. 2008. A randomized, controlled study of computer-based intervention in middle school struggling readers. *BRAIN LANG* 106, 2 (Apr. 2008), 83-97. DOI=<https://doi.org/10.1016/j.bandl.2007.12.001>
- [13] Haelermans, C., Ghysels, J., and Prince, F. 2015. Increasing performance by differentiated teaching? Experimental evidence of the student benefits of digital differentiation. *BRIT J EDUC TECHNOL* 46, 6, (October (Nov. 2015), 1161-1174. DOI=<https://doi.org/10.1111/bjjet.12209>
- [14] Heift, T. and Rimrott, A. 2008. Learner responses to corrective feedback for spelling errors in CALL. *System* 36, 2, (June. 2008), 196-213. DOI=<https://doi.org/10.1016/j.system.2007.09.007>
- [15] John, P. and Woll, N. 2018. Using grammar checkers in the ESL classroom: the adequacy of automatic corrective feedback. *Future-proof CALL: language learning as exploration and encounters – short papers from EUROCALL 2018* (Vol. 2018, December. 2018), 118-123. DOI=<https://doi.org/10.14705/rpnet.2018.26.823>
- [16] Jones, S., Myhill, D., and Bailey, T. 2013. Grammar for writing? An investigation of the effects of contextualised grammar teaching on students' writing. *Read Writ* 26, 8 (Sept. 2012), 1241-1263. DOI=<https://doi.org/10.1007/s11145-012-9416-1>
- [17] Kokkinos, T., Gakis, P., and Iordanidou, A. 2018. Exploring the role of Information and Communications Technology (ICT) in language teaching: the case of the Greek Grammar Checker. In *Proceedings of International Conference Confronting Contemporary Educational Challenges through Research* (Master in Education, Patras, Greece, June 30 – July 02, 2017), 304-315.
- [18] Liao, M.C. and Wang, H.C. 2009. Perception differences of EFL teachers and students in grammar instruction and error correction. *ETL* 33, 1 (Spr. 2009), 101-146. DOI=[10.6330/ETL.2009.33.1.04](https://doi.org/10.6330/ETL.2009.33.1.04)
- [19] Olsen, K. and Williams, J. 2004. Spelling and grammar checking using the web as a text repository. *JASIST* 55, 11 (Mar. 2004), 1020-1023. DOI=<https://doi.org/10.1002/asi.20053>
- [20] Potocki, A., Ecalle, J., and Magnan, A. 2013. Effects of computer-assisted comprehension training in less skilled comprehenders in second grade: A one-year follow-up study. *COMPUT EDUC* 63 (Apr. 2013), 131-140. DOI=<https://doi.org/10.1016/j.compedu.2012.12.011>
- [21] Potter, R. and Fuller, D. 2008. My new teaching partner? Using the grammar checker in writing instruction. *English Journal* 98, 1, 36-41.

- [22] Roiha, A. S. 2014. Teachers' views on differentiation in content and language integrated learning (CLIL): Perceptions, practices and challenges *JLE* 28, 1 (Dec. 2012), 1-18. DOI= <https://doi.org/10.1080/09500782.2012.748061>
- [23] Rouse, C. E. and Krueger, A. B. 2004. Putting computerized instruction to the test: A randomized evaluation of a "scientifically based" reading program. *Economics of Education Review* 23, 4 (Aug. 2004), 323-338. DOI= <https://doi.org/10.1016/j.econedurev.2003.10.005>
- [24] Salaberry, M. R. 2001. The use of technology for second language learning and teaching. *Mod. Lang. J.* 85, 1 (Aug. 2007), 1-19. DOI= <https://doi.org/10.1111/0026-7902.00096>
- [25] Scalise, K. 2007. Differentiated e-learning: five approaches through instructional technology. *IJLT* 3, 2 (Aug. 2007), 169-182. DOI= <https://doi.org/10.1504/IJLT.2007.014843>
- [26] Schulz, R. A. 2001. Cultural differences in student and teacher perceptions concerning the role of grammar instruction and corrective feedback: USA-Colombia. *Mod. Lang. J.* 85, 2 (Dec. 2002), 244-258. DOI= <https://doi.org/10.1111/0026-792.00107>