

AncientGeek: Primary Sources Powering Historical Language Learning

Maria Moritz and Monica Lent and Thomas Köntges and Emily Franzini and
Maryam Foradi and Gregory Crane

University of Leipzig,

Humboldt Chair of Digital Humanities, Institute of Computer Science

Augustusplatz 10-11, 04109 Leipzig, Germany

[efranzini,lent,moritz]@informatik.uni-leipzig.de

[gregory.crane,maryam.foradi,thomas.koentges]@uni-leipzig.de

Abstract: This paper showcases development on a digital learning environment built for users interested in ancient languages. The environment adopts a two-pronged approach: first, it assesses user progress during the language learning phase by using exercises such as treebanking and alignment; then, it offers users the opportunity to contribute their own annotated data. This paper provides a description of user testing conducted by the eLearning team in order to understand how these methods affect user engagement and persistence. The results of user testing showed higher user engagement and retention rates when compared to a more traditional quizzing method.

Introduction

Learning ancient languages, such as Ancient Greek and Latin, has proven benefits not only for those interested in the Classics, but also those studying and working in other fields, including medicine, pharmacy, physics, and law (Calvert, 1999). The eLearning team of the Open Philology Project at the University of Leipzig has identified enrollment statistics for the United States, New Zealand, and many European countries, and while there are at least 3.5 million students of Latin and 700,000 students of Ancient Greek worldwide (Franzini, 2014), many more potential learners could be reached through high quality online learning environments.

In order to attract and retain learners of ancient languages, the team packages learning content (e.g. grammar lessons and exercises) within a user-friendly and responsive interface that engages the user, provides feedback, and rewards progress. In addition, the user's learning progress is recorded in order to generate further exercises. The originality of this web application rests on its content, which is taken directly from original Ancient Greek works. This is also true for the data used to build learning exercises, which is pulled programmatically from digitized original ancient texts. While typical Classical language education takes almost two years to equip students with all the tools necessary to begin reading classical—albeit, often heavily altered—texts, this approach provides learners with the immediate gratification that comes with learning the language by reading the original.

In addition to using primary source texts from the outset, this method of teaching is distinct from traditional approaches in yet another respect. Treebanking and translation alignment, which are novel approaches to learning the syntactic rules and structure of a language, are the primary forms of reinforcing learning material. The team conducted user testing to **aid understanding of** user engagement and quantify some of the differences between traditional teaching methods and this new approach. In the next section this paper introduces related work, then discusses the tools and methodologies behind the application, and finally provides user testing results that support the basic principles of this research.

Related Work

As an online learning environment, the application has the potential to serve on a large scale those interested in learning a historical language. Thus, related work can be found in three different fields: massive open online

courses, online language learning environments, and available online learning material in the field of Classical Studies.

Massive open online courses (MOOCs), such as edX and Coursera, started to receive much attention in 2011 (Pappano, 2012). Some of the world's leading universities, including Stanford, Harvard (Harvard Free Courses, 2014), and the University of California Berkeley use these systems to make some of their courses available online (Rodriguez, 2012).¹ Outside the field of MOOCs, but within that of online language learning, the clear leader is Duolingo. As a free and crowd-sourced modern language learning platform, Duolingo combines teaching vocabulary and grammar with crowdsourced translations of online resources. Competitors include Memrise, which allows users to create and share their own flashcard sets and mnemonics at no charge, and Mango Languages, which requires a subscription fee of \$150.²

Within Classical Studies, online learning tools are relatively scarce. Cambridge University Press has published a series of Latin textbooks, the Cambridge Latin Course, which provides online learning activities targeted at secondary school students, while UC Berkeley has published an online Ancient Greek tutorial.³ Though both are free and contain curated content, these systems are not designed with usability in mind, and neither keep track of user progress nor offer interactive activities based on original texts.

The Perseus Digital Library project used a crowd-sourced approach to build a corpus of morpho-syntactically annotated data of approximately 350,000 words (Bamman & Crane, 2011). In collaboration with Perseus, the Alpheios Project combines reading support with language learning through an application built into the web browser as a plugin.⁴

Vocabulary study apps that also allow users (mostly teachers) to build individual flashcard sets are widely available. Popular services include Anki, Mnemosyne, Super Memory and StickyStudy.⁵ These focus primarily on calculating which vocabulary the user has struggled with most so they can reinforce those words through repetitive drills.

AncientGeek: the Application

The name of the eLearning team's web application, AncientGeek, emphasizes the modern and entertaining spirit of its content, while providing structured information centered on ancient languages. The driving idea behind the application is the belief that most people are motivated to learn an ancient language because they want to read original texts in their original language. Because original texts have real-world relevance and were not constructed merely to illustrate a grammatical point, they meet the expectations of the learners better and have a positive effect on their motivation. In addition, original texts introduce the learner more authentically to the complex relationship between the author of the text and the social and historical environment in which the text was written. With this line of thinking, the application teaches learners a historical language using real vocabulary and grammar taken directly from these primary sources, so that everything they study is immediately relevant and useful for their text of interest.

[2] edX available at: <https://edx.org>. Coursera available at: <https://coursera.org>. UC Berkeley joins edX at: <https://www.edx.org/press/uc-berkeley-joins-edx>. (Accessed: 3 Sept. 2014)

[3] Duolingo at: <https://duolingo.com>. Memrise at: <http://memrise.com>. Mango Languages at: <http://mangolanguages.com>. Figures at: degreedirectory.org/articles/Online_Language_Tutorials_Mango_Language_Reviewed.html. (Accessed: 2 Sept. 2014)

[4] Cambridge Latin Course at: <http://cambridgescp.com/Upage.php?p=clc^top^home>. Tutorial at: <http://greek-language.com>. (Accessed: 4 Sept. 2014)

[5] Perseus Digital Library at: <http://www.perseus.tufts.edu/hopper>. Alpheios Project at: <http://alpheios.net/content/alpheios-texts>. (Accessed: 3 Sept. 2014)

[6] Anki at: <http://ankisrs.net>. The Mnemosyne Project at: <http://mnemosyne-proj.org>. Super Memory at: <http://www.supermemo.com/>. StickyStudy at: <http://stickystudy.com>. (Accessed: 2 Sept. 2014)

Primary Source Data and Content

The text selected for the pilot version of the application is the *History of the Peloponnesian War* by the Greek historian Thucydides, specifically, a section called *Pentecontaetia*. This text was chosen because much of the required data already existed and because of its relevance to people in disciplines such as Classics, History, and Political Science (Mara, 2009).⁶ As additional annotated data becomes available, the team will include more texts and authors in the learning interface.

The content of the application is divided into static or manually-written lesson material and programmatically-generated exercises. The lesson material is divided into short pages, referred to as slides, written in HTML and referenced by a table of contents. Each slide contains simple explanations of the Greek grammar (from the basics to advanced) inspired by well known textbooks such as (Hansen & Quinn, 1992), (Bottin et al, 2001), and (Moorwood, 2001), and is annotated with a reference to corresponding paragraphs in Smyth's *Greek Grammar For Colleges* (Smyth, 1920), a widely adopted guide that will allow users to access further explanations if needed. By contrast, the exercises are generated programmatically. For each slide that presents a grammar concept, there is a corresponding entry in the Smyth index. This reference is used to query the textual data for relevant examples, so that users are always presented with primary source material at all stages of learning.

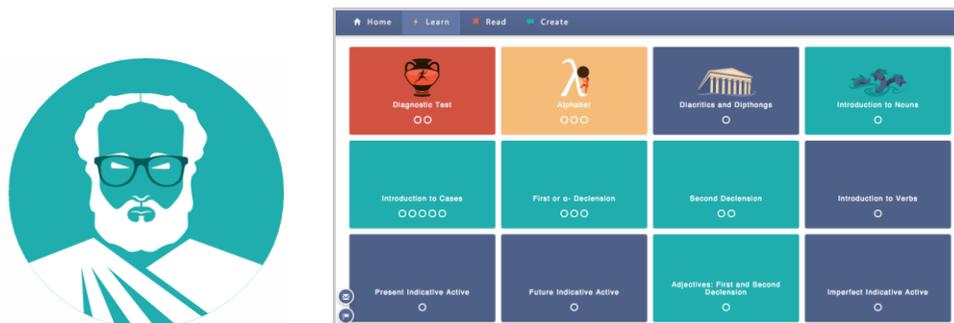


Figure 1: The historian Thucydides introduces the AncientGeek learning units, which present the user with both handwritten content and programmatically-generated exercises.

Interactive Learning Tools and Didactic Methodologies

Historical languages present a unique set of challenges in respect to both the methodologies and the tools required to study them. One factor is the language that the learner wants to learn, and another is the first language (L1) of the learner. For example, the Latin *accusativus-cum-infinitivo* construction tends to be easier for an L1-English learner than an L1-German learner, while it tends to be the opposite for the Greek genitive absolute. In addition, Ancient Greek courses in Germany, for example, are heavily based on the assumption that the learner already has an understanding of Latin. According to the curriculum of a German Classical High School, Ancient Greek is often an L4, after Latin and English. It is not surprising that the teaching method of the first-learned historical language has traditionally had a significant influence on that of the second historical language. However, with growing flexibility in universities' curricula, this connection between Ancient Greek and Latin will not necessarily continue to exist.

Historical languages also differ from modern languages in that they do not have the advantage of being directly applicable to real-life situations, making vocabulary acquisition more challenging (Keip, 2009, p. 13). Furthermore, the fact that students of historical languages are presented with an exhaustive number of grammar exercises and paradigms for rote memorization also drives people away from the subject altogether.

[7] Thucydides' *Pentecontaetia* (at: <http://www.perseus.tufts.edu/hopper/text?doc=Perseus:text:1999.01.0199>) had already been morpho-syntactically annotated (Mambrini, 2012), as required by the application. (Accessed: 2 Sept. 2014)

AncientGeek instead shifts the focus back to the original text: learners are only quizzed on material that appears in the target text, rather than memorizing forms that fill out a paradigm table but will never actually be encountered. To ease this process, the application includes two user-friendly didactic tools: the Alignment Tool and the Dependency Parse Tree Tool. Both of these are didactic games that provide immediate feedback, whilst simultaneously annotating the text and adding new data.

The Alignment Tool displays a literal translation of the ancient text in the modern languages offered in the interface, in which each word is linked to its translation. When a user hovers over a word in the Greek text, the corresponding word or phrase in the translation is also highlighted (Fig. 2). The advantage of this tool is that learners can start aligning existing translations before making original contributions. This helps learners form connections between the original text and common translation variants in their respective L1s. In this way, beginners are gradually guided through their text of interest, rather than having to wade through the translation unassisted.

λύω, I untie		
Present Indicative Active		
Singular		
1st	λύ ω	I untie
2nd	λύ εις	You untie
3rd	λύ ει	He/She/It unties
Plural		
1st	λύ ομεν	We untie
2nd	λύ ετε	You untie
3rd	λύ ουσι(ν)	They untie

The Present Indicative Active in the Pentecontaetia

The following is an example of how Thucydides himself makes use of a present indicative active verb in the Pentecontaetia.

ἄμα δὲ καὶ τῆς ἀρχῆς ἀπόδειξιν ἔχει τῆς τῶν Ἀθηναίων ἐν οἴῳ τρόπῳ κατέστη .

Besides, [this] contains an explanation by what means the Athenian power has been established .

— The History of the Peloponnesian War, 1.90.4

Keep Reading »

Figure 2: The AncientGeek Alignment Tool enables complete beginners, who have only learned their first verb tense, to access Thucydides in Greek and put their new knowledge to use in a meaningful way.

Place the definite articles under the noun.

Each of these fragments shows the same pattern — a definite article that belongs below the noun it refers to!

The → Wars

οἱ πόλεμοι

2 root

ATR: οἱ

SBJ: πόλεμοι

The → Days

αἱ ἡμέραι

2 Complete!! root

ATR: αἱ

SBJ: ἡμέραι

The → Work

τὸ ἔργον

0 root

ATR: τὸ

SBJ: ἔργον

Figure 3: In this exercise a user is presented with the same tree structure as it applies to words with differing morphologies. As the user continues to build trees with more features, each decision provides a more nuanced picture of what they know, along with opportunities to provide personalized feedback.

The second tool, the Dependency Parse Tree Tool (Fig. 3), measures a user’s understanding of the source material’s grammar. Since it is already known that identifying the syntax and morphology of a sentence strongly suggests an understanding of the text itself (The Prague Dependency Treebank, 2006), it is possible to interpret how well a user understands grammatical concepts based on the way they complete the exercise of building a parse tree (Harrington, 2013). With each move of a word node between the branches of a parse tree, the user communicates what they understand about that word itself, the parent to which it belongs, and ultimately its syntactic role in the sentence as a whole.

Beyond its usefulness as a method for programmatically evaluating a users’ understanding, having students represent the sentence’s structure visually is a proven method for teaching the syntactical analysis of a sentence (Bechthold-Hegelhaupt, 2001, pp. 106-107). Treebanking is also an effective tool for learning-by-doing, a concept introduced by (Dewey, 1985). This concept ultimately stems from constructivism theory, which asserts that the student constructs new knowledge themselves by actively applying previously learned methods and knowledge to new tasks. In this way, treebanking allows learners to advance their own knowledge themselves with every tree they create.

Making Primary Sources Accessible to Beginners

The project’s commitment to original, primary source texts is exceptionally challenging when developing appropriate learning exercises for early stage users—especially without deviating from the vocabulary and grammar present in the original. To this end, the team developed an algorithm that uses the sentence’s morpho-syntactical data to simplify it by removing extraneous words or phrases, rather than modifying them.⁷ Using this strategy, it is possible to eliminate the same words an advanced student might initially ignore while deducing the main meaning of the sentence, thereby making even complex passages accessible to beginners.

After a user is comfortable working with shortened sentences, they are equipped to read in the application’s assisted reading environment: the AncientGeek Reader (Fig. 4). This Reader is designed to make it easy for people of varying levels of proficiency to read Ancient Greek by giving them the appropriate level of help. While too much help can make a learner too dependent on tools, too little makes more difficult texts inaccessible. The Reader strikes a balance between ease of access to resources and encouraging a fluent understanding of Ancient Greek.



Figure 4: The AncientGeek Reader. The morphology of each word is hidden by default but easily accessible to users.

[8] For further information see: <https://github.com/gcelano/work-in-progress/blob/master/simplify-sentences.xq> and <https://github.com/OpenPhilology/phaidra/blob/master/api/api.py>.

Localization

The AncientGeek application provides the users with a choice of modern languages so that they may learn, practice, and share within their individual comfort zones. At the time of writing the *Penteconteatia* has been translated into English, Croatian, and Farsi, and the interface has been localized for English and Farsi speakers. It is important to note that AncientGreek is localized, rather than merely translated, because localization also considers differences between users from varying cultural backgrounds. In Farsi, for example, where the language is written from right to left, translating the content is only the first step. While English speakers expect to proceed through pages in the AncientGeek Reader by clicking on the right side of the screen, speakers of Farsi expect to proceed by going left. By paying attention to these details, localization ensures that users from diverse nationalities benefit from the interface's design in a way that considers their behaviors, expectations, and preferences.

Evaluating Learner Persistence in an eLearning Environment

In recent years, teachers in university classrooms have begun using treebanking and alignment as methods of teaching Ancient Greek and Latin (Crane & Babeu, 2011, pp. 63-65). The Perseus Digital Library at Tufts University in Boston and its collaborating projects, Perseids⁸ and Alpheios, supplement classroom learning with teaching tools that depict complex syntactic structures visually. These tools also provide a way for users to contribute directly to philological research at a very early stage of learning. At Tufts, it was reported that students enjoyed the interactive nature of the exercises and felt a sense of satisfaction in being able to contribute to the Classical community. To compare levels of user engagement for these methods to those of traditional learning, the team conducted the user testing described in this section of the paper.

Motivation and Engagement Theory

Studies have shown that across the board, voluntary online courses have low retention rates (Kolowich, 2013). As a response to this observation, the project is interested in ways to increase the motivation and engagement of the learner as a means to improve retention. Independently from language-learning ability or aptitude, motivation can be defined as “the extent to which the individual works or strives to learn the language because of a desire to do so and the satisfaction experienced in this activity” (Gardner, 1985, p. 10). Considering the definition of motivation by (Kanfer & Ackerman, 1989), who describe it as “the proportion of total attentional effort directed to the task (intensity), and the extent to which attentional effort towards the task is maintained over time (persistence)”, it is possible to speculate that a user is successful in an online learning environment if effort to learn is exerted over a relatively long period of time.

A further reason for valuing intrinsic motivation is that there is a strong correlation between student interest and learning success (Schiefele et. al, 1993). In addition, another study has shown a strong correlation between learning success during university and sheer effort exerted by the student (Schiefele et. al, 1995). Considering these findings, effort in the form of time spent studying seems to be more important than the method the student uses to study during that time. This leads us to believe that a student will be successful in a learning environment simply by *voluntarily* spending more time in it. For these reasons, the team conducted a test to analyze users' persistence in its learning environment and how it is influenced by the method of quizzing. The following section describes the test format.

[9] Perseids at: <http://sites.tufts.edu/perseids/>. (Accessed: 3 Sept. 2014)

User Testing Format

Figure 5: Types of exercises included in the AncientGeek Method test.

In order to test the hypothesis that translation alignment and treebanking have a higher user engagement level than the typical traditional translating and word-parsing system, the team created two user tests, each comprising one type of quizzing method. One test—which, for the sake of this explanation will be called AncientGeek Method—contained treebanking and alignment exercises based on shortened sentences from Thucydides’ text. The other test, the Traditional Method, comprised parsing exercises presented as multiple-choice questions and translating exercises, also based on shortened Thucydides sentences (Figs 5 and 6). The tests were assigned at random to anonymous users with, at minimum, a basic knowledge of Ancient Greek. Both tests were made up of more than 20 slides each, where the last one was a short survey to help us create a broader picture of the user’s background. Users were informed on the first slide that they should answer as many questions as they liked and were free at any point to skip to a survey or leave the page and end the test. The aim was to observe how many users grew tired of either one testing method or the other, and, by contrast, which method retained the most users. The team was also interested to discover how long it would take the average user to complete each slide in order to assess its level of difficulty.

Figure 6: Types of exercises included in the Traditional Method test.

The test set ran over a long weekend. At the end of this period all user-submission figures were collected. User submissions were session-based, meaning that while a “set” of slides was submitted under a session-related identifier, it was assumed that the user associated with this session was not answering another set of slides.

Evaluation of User Testing Results

By the end of the testing period, 262 testers had participated worldwide, with the majority of submissions coming from the USA, Europe, and New Zealand. Users were reached through a variety of channels: namely Classical Association mailing-lists, social media, and targeted emails. Overall the community contributed over 1000 sentences of Ancient Greek, which can be broken into the following figures: 430 sentences translated using the Traditional Method, 241 sentences translated in the form of alignment data, and 425 sentences annotated in the form of parse trees.

The survey results show that a great number of users hold a postgraduate degree and the majority are between the ages of 25 and 35. By drawing initial, albeit rough, conclusions, the team observed that the application would likely be better suited to a university undergraduate and postgraduate level audience (86% of overall testees), as 79.5% of this group felt more confident than younger groups with the overall navigation of the application.

Results also show that a higher number of participants who initially accessed the Traditional Method test decided to proceed with the exercises, while many who accessed the AncientGeek Method test were put off by the first slide and decided not to complete the task. It is the team’s suggestion that the unfamiliarity of the first task—a treebanking exercise—was what caused people to abandon the test. However, (Fig. 7) shows that, despite the higher number of participants willing to begin the Traditional Method test, a higher number also dropped out more quickly. In fact, users working with the AncientGeek Method decreased at a more moderate rate than those working with the Traditional Method. While the average drop-off rate from slide to slide was -9.8%, the Traditional Method saw a higher drop-off of -11.4%. This would indicate that despite the initially smaller number, users were more persistent with treebanking and aligning than with answering traditional quiz questions.

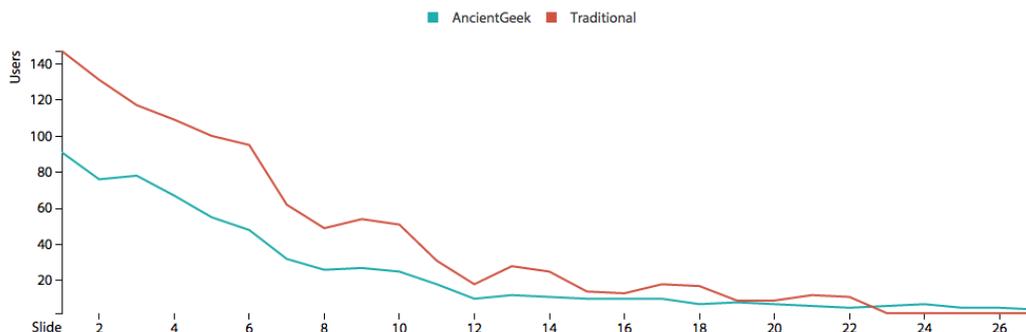


Figure 7: The number of users working with the AncientGeek Method decreased at a more moderate rate than those working with the Traditional Method. AncientGeek saw an averaged change of -9.8% in between one slide and the next, whereas the Traditional Method saw an average change of -11.4%.

It was also evident that the average user spent 89 seconds on a treebanking slide, while users answering multiple choice questions about the same sentence spent 68 seconds. Figure 8 shows, for example, that on slide 22 users spent, on average, less than a minute answering multiple choice questions, while users treebanking spent an average of 6 minutes. These results show that, although the treebanking task took six times longer to perform, users remained more engaged than those performing multiple choice. Similarly, it was observed that the average user spent 3:18 minutes on traditional translating, while others spent 4:42 minutes aligning. In conclusion, the AncientGeek Method seems more engaging than the Traditional Method, and despite their initial trepidation, users

are willing to adopt an innovative method to perform tasks that they are familiar with, namely parsing and translating a Greek sentence.

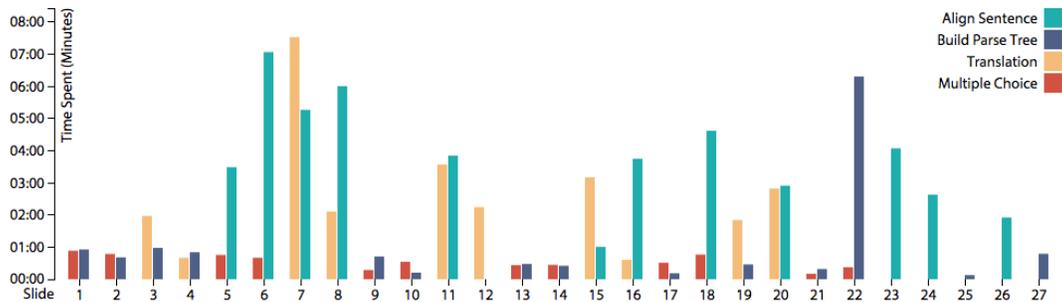


Figure 8: The average user spent 1.49 minutes on a treebanking exercise (19.4 minutes in total) and 4.69 minutes on alignment (61 minutes total). In contrast, the average user spent 1.13 minutes on multiple choice (13.62 minutes in total) and 3.3 minutes on translating (34.05 minutes total).

Conclusion

AncientGeek offers users the opportunity to read original ancient texts from day one, while offering the feedback and personalization that can only be achieved on a large scale by a web-based application. Its interface design and localization support further strengthen its broad appeal and accessibility to people from a wide range of backgrounds and levels of proficiency. The user testing conducted to date has generated large-scale interest and feedback, further confirming that this novel approach resonates with potential end users. Moving forward with development, the team will include more grammar units, localize for more languages, add more primary source texts, and support original user annotations in the form of translations, alignment data, and parse trees. The next round of testing will focus on the motivation behind second-language acquisition through the Attitude/Motivation Test Battery (A/MTB), developed by (Gardner, 1985). Results from this test, combined with the results of our first test, will help the eLearning team measure the motivation and attitude of AncientGeek’s audience, and drive development in a user-oriented way.

Acknowledgments

The team would like to acknowledge the Sächsische Aufbaubank (Development Bank of Saxony), the European Social Fund, and the Free State of Saxony for funding our project *Die Neuerfindung der geisteswissenschaftlichen Publikation im digitalen Zeitalter* (PNr. 100146401).

Bibliography

- Bamman, D., & Crane, G.** (2011). The Ancient Greek and Latin dependency treebanks. In Caroline Sporleder, Antal van den Bosch, & Kalliopi Zervanou (Eds), *Language technology for cultural heritage: Selected papers from the LaTeCH Workshop Series* (pp. 79–98). Berlin, Germany: Springer-Verlag.
- Bechthold-Hengelhaupt, T.** (2001). *Alte Sprachen und neue Medien*. Göttingen, Germany: Vandenhoeck & Ruprecht.
- Bottin, L., Quaglia, S., & Marchiori, A.** (2002). *Nuovo lingua greca corso di lingua greca per il biennio. Teoria*. Milan, Italy: Minerva Scuola.
- Calvert, J. B.** (1999, 03.07.). Professional Latin. Retrieved from <http://mysite.du.edu/~etuttle/classics/latin/latin20.htm>

- Crane, G. R., & Babeu, A.** (2011). Global editions and the dialogue among civilizations. *Perspektiven einer corpusbasierten historischen Linguistik und Philologie: Internationale Tagung*, Berlin-Brandenburgerische Akademie der Wissenschaften, Berlin, Germany. Pp. 11–80.
- Dewey, J.** (1916). Democracy and education. In Jo Ann Boydston (Ed.) (1985), *J. Dewey: The middle works*, vol. 9. Carbondale, IL: Southern Illinois University Press.
- Franzini, E.** (2014, 12.06.). Update! Total number of secondary level students studying Latin and Ancient Greek in the world. Retrieved from <http://www.dh.uni-leipzig.de/wo/update-total-number-of-secondary-level-students-studying-latin-and-ancient-greek-in-the-world/>
- Gardner, R. C.** (1985). *Social psychology and second language learning: The role of attitudes and motivation*. London, England: Edward Arnold.
- Hansen, H., & Quinn, G. M.** (1992). *Greek: An intensive course*. New York, NY: Fordham University Press.
- Harrington, J. M.** (2013). Meaningful distinctions: The utility of Perseus Project Latin treebanking tools for Latin research-based pedagogy. *CAMWS: 109th annual meeting*, Iowa City, IA. Retrieved from <https://camws.org/meeting/2013/files/abstracts/347.Meaningful%20Distinctions.pdf>
- Harvard Free Courses** (2014). Harvard Free Courses. Retrieved from <http://harvard.edu/faqs/free-courses>
- Kanfer, R., & Ackerman, P. L.** (1989). Motivation and cognitive abilities: An integrative/aptitude-treatment interaction approach to skill acquisition. *Journal of Applied Psychology Monograph*, 74 (4), 657–690.
- Keip, M., & Doepner, T.** (2009). *Interaktive Fachdidaktik Latein*. Göttingen, Germany: Vandenhoeck & Ruprecht.
- Kolowich, S.** (2013, 08.04.). Coursera takes a nuanced view of MOOC dropout rates. *The Chronicle of Higher Education*. Retrieved from <http://chronicle.com/blogs/wiredcampus/coursera-takes-a-nuanced-view-of-mooc-dropout-rates/43341>
- Mambrini, F.** (2012, 26.11.). Treebanking in the “World of Thucydides”. *Center for Hellenic Studies Research Bulletin*. Retrieved from <http://wp.chs.harvard.edu/chs-fellows/2012/11/26/treebanking-in-the-world-of-thucydides/>
- Mara, G.** (2009). Thucydides and political thought. In Stephen G. Salkever (Ed.), *The Cambridge companion to Ancient Greek political thought* (pp. 96–125). Cambridge, England: Cambridge University Press.
- Moorwood, J.** (2001). *Oxford grammar of Classical Greek*. Oxford, England: Oxford University Press.
- Pappano, L.** (2012, 02.11). The Year of the MOOC. *The New York Times*. Retrieved from http://www.nytimes.com/2012/11/04/education/edlife/massive-open-online-courses-are-multiplying-at-a-rapid-pace.html?pagewanted=all&_r=0
- The Prague Dependency Treebank** (2006). The Prague Dependency Treebank 2.0. Retrieved from <http://ufal.mff.cuni.cz/pdt2.0/>
- Rodriguez, C. O.** (2012, 05.07). MOOCs and the AI-Stanford like courses: Two successful and distinct course formats for Massive Open Online Courses. *European Journal of Open, Distance and E-Learning*. Retrieved from <http://eurodl.org/?article=516>
- Schiefele, U., Krapp, A., & Schreyer, I.** (1993). Metaanalyse des Zusammenhangs von Interesse und schulischer Leistung. *Zeitschrift für Entwicklungspsychologie und Pädagogische Psychologie*, 25, 120–148.
- Schiefele, U., Wild, K.-P., & Winteler, A.** (1995). Lernaufwand und Elaborationsstrategien als Mediatoren der Beziehung von Studieninteresse und Studienleistung. *Zeitschrift für Pädagogische Psychologie*, 9, 181–188.
- Smyth, H. W.** (1920). *A Greek grammar for colleges*. New York, NY: American Book Company.
- Tennant, J., & Gardner, R. C.** (2004). The computerized mini-AMTB. *CALICO Journal*, 21, 245–263.