
My personal journey into creating word search puzzles in Cyrillic and Arabic using multilingual support in L^AT_EX

Jennifer Claudio

Abstract

Word search puzzles are a fun pastime and can be a helpful learning tool for spelling and letter recognition. After a brief history and educational rationale, I present my personal exploration of the *babel* and *polyglossia* language packages for L^AT_EX with the production of puzzles in Russian and Arabic.

1 Introductory history

Word search puzzles are fun pastimes, and their existence tends to be attributed to one of two claims. Normal E. Gibat, an American, was documented in 1968 as having generated a word search game in order to entice readers to interact with the publication known as the Selenby Digest. The intention was to create customer loyalty by publishing answers and new mixes in the subsequent issues. Due to the simplicity of the puzzles, Oklahoma teachers who were readers of the Selenby Digest were drawn to them for their own classroom use, and requested personalized puzzles to share with their students.

Pedro Ocón de Oro of Spain was also credited with producing word soup puzzles in the 1960s. In his puzzles, words were hidden in randomized letters, and solvers had to find the words. Other word puzzle inventions attributed to Pedro Ocón de Oro include the cuadrograma and the oconogram, of which there is evidence of publications in 1968 and 1976.

2 Educational and socio-emotional value in schools

Today, educators often use such puzzles as vocabulary recognition practice for students of all ages. In early learning, letter and word pattern skills can be built using word searches with a published list, and later used in conjunction with students performing activities such as fill-in-the-blanks to generate their own word lists to solve within a hidden puzzle to reinforce the word. Students who are working on early language acquisition, students with special needs, and students who are learning jargon-heavy content are often assigned word search puzzles. It is important to note that the value of the word search puzzle lies in the ability to develop word recognition.

In educational psychology, word search puzzles are also acknowledged as helpful for building student confidence. While word search puzzles are not well-received as a standalone activity for high-achieving,

older students done within their dominant language, the word search puzzle does offer a stepping-stone opportunity to encourage completion of other tasks. The positive reinforcement of “success” with word search puzzles encourages students who traditionally struggle in school to continue participating in other written tasks or worksheets.

Non-educational uses of word search puzzles include incorporation by student mental health services in helping students with focusing and coping exercises. Word search puzzles used in these situations often contain words with positive or otherwise uplifting meanings, and tend to have large text. The puzzles themselves are considered non-intimidating to students, but require sufficient attention to distract a student from immediate anxieties until a social worker, school psychologist, or intern is available to help a student.

3 World languages

Most school systems world-wide endorse, and often require, the study of a foreign language. In California (United States), typical language offerings at the high school level are Spanish and French. Depending on the region and relative language prevalence, languages such as Vietnamese might also be offered. Students who seek an opportunity to earn college credits during high school may also take the annual Advanced Placement (AP) language and culture exams for Chinese (Mandarin), French, German, Italian, Japanese, Spanish, and Latin. (Tangentially, a growing number of high schools are also offering American Sign Language to qualify for state requirements for world languages.)

To provide language authenticity, teachers of these languages often rely on their personal experiences with the language for instruction. These strategies could include using their own native childhood resources, integration of cultural practices innate to the language, recitation of prose and poetry, and examination of art that may reflect elements of the language itself.

Public information on the World Wide Web, language apps, and AP course materials complement textbooks and support teachers, but there are still gaps in the ease of control of customized worksheets and puzzles for students. In multilingual vocabulary building tasks, especially those that are associated with non-Latin alphabets, teachers are more likely to work with resources that are readily available rather than create something personalized for their style or teaching objectives.

With the exception of Chinese and Japanese, the AP exam thus far only offers exams and curriculum

for content that uses the Latin alphabet. This is in contrast to the top ten most spoken languages of the world, typically ordered as English, Mandarin, Hindi, Spanish, French, Arabic, Bengali, Russian, Portuguese, and Indonesian.

4 Exploring multilingual word searches

As a hobbyist of learning different alphabets and, ideally and with continued persistence, languages, I came across a book that taught Arabic writing. The first word search puzzle within the book, however, had errors and I could not find all of the words, a flaw that was verified by two native readers of Arabic. I enjoyed the puzzle and its intentions, especially since learning the Arabic alphabet is very different experience from English, particularly the difference of letter forms in initial, medial, and terminal positions and letters in their singular forms. I hoped to generate my own word searches in order to practice becoming familiar with the alphabet in this manner.

As a teacher, I am familiar with finding “quick-and-easy”¹ resources on the web, but I found that web-based word search generation is often limited to characters of the Latin alphabet.

Anecdotally describing a typical teacher, it is common to generate a word search puzzle using resources from the first-hit retrieved from a search engine, taking a screenshot of the puzzle that is generated, and pasting that image into a word processor document. Unfortunately this method not only results in a low-resolution capture, but it renders the teacher unable to edit the puzzle except by hand, especially if they are adding diacritics such as for Vietnamese, Spanish, or German.

Alternatively, there are teachers who cut and paste the letters into a text editor, but they, too, run into formatting and tabbing issues, which makes this method less convenient. The most time-consuming method would be for a teacher to manually create a grid, place letters of a word, then use filler letters to create the word soup.

The word search generator made available by Christian Lawson-Perfect on GitHub (github.com/christianp/wordsearch-generator) provides an

¹ While it might seem natural to question why teachers cannot typically make the effort to find better solutions for things such as word search puzzles, or to create their own solutions, it must be considered that a teacher’s time is truly not their own. During school hours, time is spent teaching or interacting with students. Preparatory periods during the school day are spent on follow-ups with families, supporting students with special needs, safety management, and more. Teachers often spend time well past work hours to ensure that all legal rights are met for students and to run extracurricular programs for students. Time pressure inevitably results in some teachers choosing “good enough” options for a task.

Alphabet:

Words:

Grid size:

Directions: ↖ ↑ ↗
 ← →
 ↙ ↓ ↘

Alphabet:

Figure 1: Input for Lawson-Perfect’s puzzle generator, including (last line) the alphabet used for filler letters.

```
\documentclass{standalone}
\usepackage[thinlines]{easytable}
\begin{document}
\begin{TAB}(e,15pt,15pt){|c|c|c|c|c|c|c|c|c|c|
A & A & N & H & T & C & G & E & Y & L \\
S & B & E & C & S & O & A & D & N & Q \\
E & E & P & L & E & M & O & H & T & U \\
M & L & R & B & O & M & I & L & I & O \\
I & I & O & E & E & U & E & E & N & T \\
G & A & D & O & B & T & L & L & T & R & I \\
R & N & U & C & E & A & C & A & E & E \\
O & I & C & R & A & T & G & O & D & N \\
U & T & T & L & A & O & D & F & F & T \\
P & S & N & T & H & R & A & L & E & T \\
\end{TAB}
\end{document}
```

Figure 2: Example L^AT_EX output from puzzle generator (template line abridged).

excellent solution to this problem, and to my personal delight, accommodates non-Latin characters. A user enters words, independent of language or alphabet, chooses a grid size, selects the direction options of the hidden words, and rolls the puzzle (Figure 1). An option to input custom filler letters was recently implemented, consequently enabling the filler letters to easily integrate non-Latin alphabets.

5 Word searches, TUG, and L^AT_EX

Happily, Christian’s word search generator also produces L^AT_EX markup (Figure 2). I was introduced to the T_EX Users Group community in 2008, but I still have not quite truly used T_EX or L^AT_EX. This project seemed to be a natural and low-risk starting point, and had the additional value of being something that I could share with my co-workers. The

markup made available by Christian’s word search generator allowed me the opportunity to tweak something existing rather than beginning from scratch. Although it is most certainly true that plenty of tutorials and learning opportunities exist, practice by manipulating pre-generated content offered an entry point with no excuse to avoid it.

I chose the Overleaf environment as my editor. Being able to compose while frequently recompiling to see my output made it conveniently possible to try and undo small changes while easily seeing any associated errors or warnings. Additionally, device independence removed the need for me to question working versions spread across machines. I imagine, though I do not yet have experience working collaboratively in Overleaf, that it will confer convenience if I am ultimately working with other authors or contributors on a project.

My first step involved looking at the automatically generated markup. I cut and pasted the default content into a new Overleaf document and compiled. As expected, a word search puzzle was generated without errors. My second step was to try generating an equivalent word search puzzle in another language that used a different alphabet. I created a word list in Russian using Google Translate, which I had proofed by two native speakers to avoid mismatches in pluralization and capitalization.

To accommodate the non-Latin alphabets, I initially used the *babel* language package. After communication with Boris Veytsman regarding the font options, I switched to the *polyglossia* package.

The second language I explored for this project was Arabic, and here I was faced with handling the right-to-left writing system and letters that have different forms depending on their position within a word. By setting up the preamble to support *arabtex*, the word search puzzle correctly generated an image in right-to-left as intended. Regrettably, due to insufficient skill and knowledge of language packages available at the time that I began this project, I deliberately omitted generating word search puzzles using the Arabic diacritics for short voweling.

As an impractical but interesting exploration, I created a puzzle blending words and filler letters in both Russian and Arabic (Figure 3). The *polyglossia* package handles this with a default main language and additional alphabets used within the document.

Ultimately, I created a title and a word list table within L^AT_EX as these could be used as worksheets that include a word list, as seen in Figure 4. Improvements to this project that have been considered include word search puzzle generation built internally within L^AT_EX, which would include automatic sheet

ع	ر	ع	ل	ك	ت	ت	Т	ش	И
И	و	ب	С	Р	О	Я	С	ل	С
ر	ب	ن	م	Е	Б	ا	И	ل	ت
م	ي	ه	ط	В	Л	س	Ч	ل	ا
ل	ا	ر	ر	Е	А	К	Е	Р	Т
س	ن	М	س	Т	К	Н	Р	С	م
م	ب	ن	ن	К	О	Е	Я	س	م
ا	С	م	Б	А	К	Б	م	ي	غ
ء	ر	ه	ن	А	م	О	ي	С	س
Б	Д	Ж	О	Д	ا	ع	ب	ش	ع

Figure 3: Puzzle mixing Russian and Arabic.

ПРИРОДА										طبيعة										
В	Е	Т	Е	Р	П	Г	Р	Л	Е	ن	ص	ش	ش	ث	ب	غ	ر	ر	ؤ	ت
А	С	Р	Е	К	А	Е	О	Ш	Ы	ح	ض	ا	ل	ق	م	ر	ة	م	ؤ	ؤ
М	Д	Е	Р	Е	В	О	С	Р	Ш	ر	ي	ح	ن	ر	ف	ة	ة	ز	ل	ل
О	С	М	Ы	О	Р	П	Г	О	А	س	ا	م	ا	ء	س	ئ	ئ	ع	ن	ج
Б	С	Л	Б	Т	С	Н	Ы	Р	К	ز	ا	ل	ش	م	س	ش	ص	ه	ب	ب
Л	Л	Е	У	О	Р	Д	А	Б	Н	ح	ي	خ	ش	ب	ط	خ	م	ر	ل	ل
А	Н	Д	Л	Н	З	А	С	Ш	Ы	ق	ض	ب	ي	م	ب	ر	ت	ق	ن	ن
К	В	Н	Л	Е	А	Н	В	М	Р	ئ	ء	غ	ؤ	غ	ي	م	ر	ة	ج	ج
О	Ц	Т	В	Л	Ы	А	Ф	А	Н	ي	ة	و	ي	خ	ة	ئ	ا	ي	ي	ي
Е	К	З	Ф	Д	М	Л	И	Б	Т	ل	ؤ	ا	ل	ن	ج	و	م	ث	ر	ل

ветер	гора	дерево			
дождь	звезды	луна		النجوم	القمر
небо	облако	песок		رياح	حشب
река	солнце	травы		غيم	سماء
				نهر	نجيل
					النمس

Figure 4: Full puzzles in Russian and Arabic, with titles and word lists.

generation with all components such as title, word list, and answer key.

6 Acknowledgments

For support in this project, I acknowledge my father, Dennis Claudio for his early attempts at generating a word search puzzle in L^AT_EX. I am additionally thankful to Christian Lawson-Perfect for his responses regarding the puzzle generator, to Boris Veytsman for his input on the Cyrillic alphabet for both Russian and Ukrainian, and to Mohamed Mehrez for the instructional tutorial on IguanaT_EX as a PowerPoint add-on. I am also grateful to my native and fluent word search reviewers: Rachel Rudyak, Dana Zhytnik, Samiya Ali, AbdulBaqi Matrook, Anita Taft, and Yusuf Alam.

- ◇ Jennifer Claudio
Santa Clara, California, USA
claudioj (at) esuhsd dot org