

omegaUp: A Decade of Growth and Impact in Latin American Coding Education

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Abstract. Ten years ago we presented in this journal omegaUp, an open-source contest management platform for the Mexican Olympiad in Informatics. Today, it has grown into a comprehensive education technology tool empowering tens of thousands of students in Latin America, from beginners to competitive programmers. In this article we discuss the main achievements in the past decade including free online courses, content quality assurance, improved UX, as well as becoming the host of important competitions such as the Iberoamerican Olympiad in Informatics and the national olympiads in Ecuador, Mexico, and Peru. .

Keywords: contest management system, omegaUp, cloud, user-experience, online judge, informatics education.

1. Introduction

omegaUp is an online platform that provides educational resources for competitive programming. It was originally developed as a contest management and training platform for the Mexican Olympiad in Informatics and other competitions in Latin America (Chávez *et al.*, 2014), but it has since grown into a comprehensive tool for teaching and learning computer science. This report provides an overview of the history and development of OmegaUp, as well as its current features and offerings.

2. omegaUp’s Growth

Over the past decade omegaUp has seen tremendous growth as measured by many metrics that we explore in this section:

- omegaUp has over 221,000 registered users, over 9,000 public problems and has hosted over 11,000 contests as of January 2024.
- On a typical month omegaUp sees about 27,000 active users.

→ omegaUp has graded over 5 million submissions since its launch in 2012 and has seen sustained growth over the years as can be observed in Fig. 1.

At omegaUp we have 4 main types of user:

- Contestant – Those users who use omegaUp to train their competitive programming skills and/or to compete in programming competitions supported by the platform.
- School Student – Those users who use omegaUp for their school classes.
- Coach – Those users who coach students for programming competitions and use omegaUp for that purpose.
- School Teacher – Those users who are school teachers and use omegaUp to manage their classes.

Observations:

- 90% of our users are students, 10% are teachers.
- We have about 22.6 students per teacher in the school segment but only 5.8 contestants per coach in the competitive segment. Which is expected given that competitive programming groups tend to be smaller than school classes.

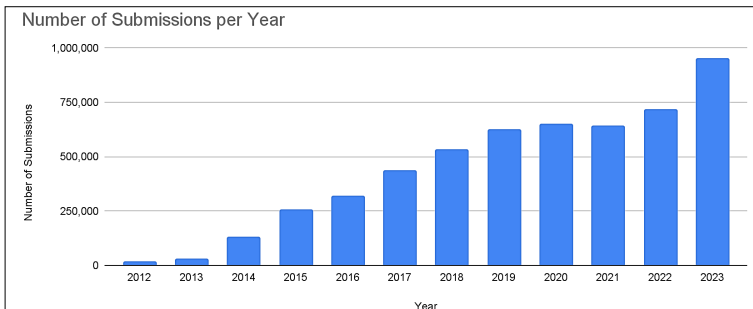


Fig. 1. Number of code submissions to omegaUp per year.

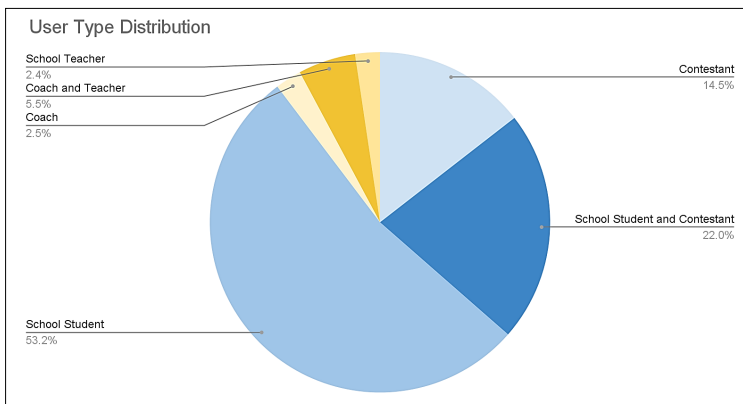


Fig. 2. Distribution of omegaUp users by type.

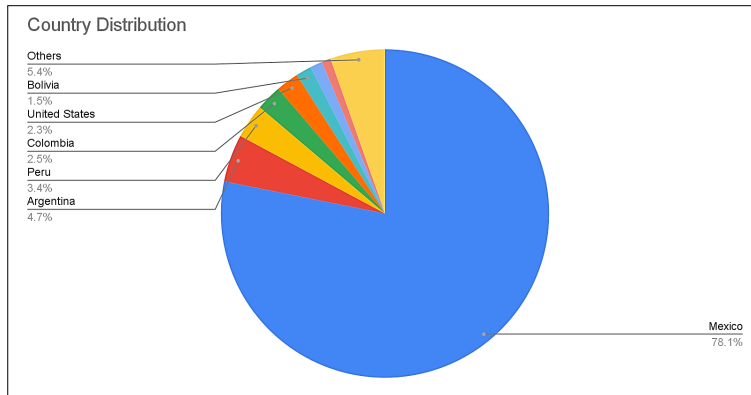


Fig. 3. Distribution of omegaUp users by country of residence.

- 70% of school teachers are also coaches. This is expected given that omegaUp started out as a competitive programming platform exclusively and that's how it gained its original user base.

According to Google Analytics, 78% of omegaUp's traffic comes from Mexico and the rest comes mostly from Latin American countries as shown in Fig. 3.

3. Enhancing User Experience

While the core online judging functionality was strong, omegaUp.com lacked user-friendliness. To address this and attract new users, we conducted in-depth research with our three main user groups: students, teachers, and competitive programmers.

Identifying User Needs

Students: Struggled to find active contests and suitable practice problems due to usability issues.

- Teachers: Required a user-friendly interface (UI) for ease of access and content creation, considering some might not be tech-savvy.
- Competitive Programmers: Sought a modern UI in line with current online judge standards.

Prioritising Resources

Given resource limitations, we focused on these key projects:

- UI Stack Migration: Before making user-facing changes, we upgraded the technical foundation of the UI. This involved migrating from Javascript to Typescript, Smarty to Vue.js, and integrated Bootstrap for a more robust framework.

→ Redesigning Core Components: After the technical migration, a complete redesign of the main platform pages commenced. Usability and user-friendliness for all age groups (students and teachers) were the top priorities.

Homepage Redesign

The landing page was restructured for intuitive navigation and the navbar was updated to reflect current features with clearer and more descriptive names.

Contest List Redesign

The previous contest list, displayed as a table with confusing tabs, only showed contest names. The new design addresses user needs:

- Identifying current and past contests.
- Start dates and filtering by time frame.
- Upcoming contest visibility.
- Additional details like organiser, participant count, scoreboard access, and contest mode.

Problem List Redesign

OmegaUp allows users to create coding problems in a specific format. Initially, these problems were displayed in a simple table. However, as the number of problems grew, this approach became unwieldy. Filtering and searching for specific problems proved increasingly difficult.

To address this, we implemented a two-pronged solution:

- Problem Classification: Discussed in detail in the “Problem Classification” section, this initiative involved classifying existing problems and establishing a semi-automated system for classifying new ones.

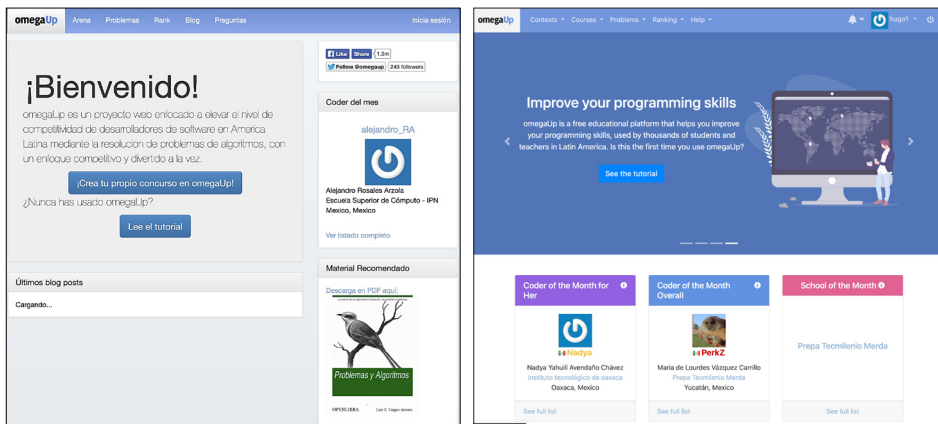


Fig. 4. omegaUp homepage in March 2019 (left) compared to January 2024 (right).

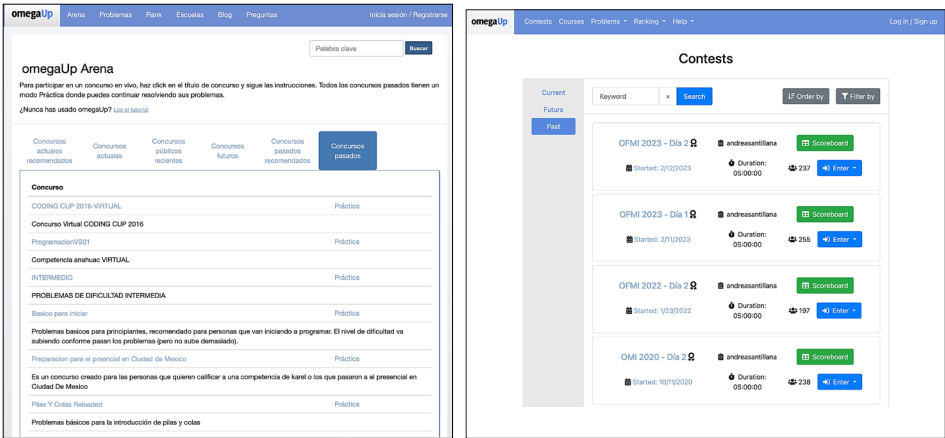


Fig. 5. omegaUp contest list in March 2019 (left) compared to January 2024 (right).

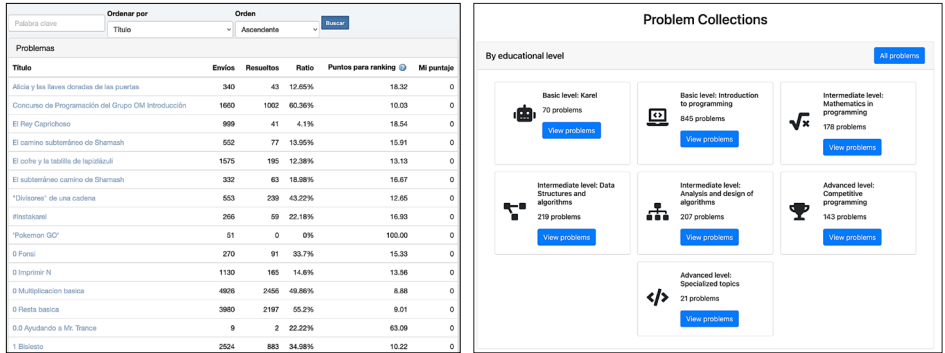


Fig. 6. omegaUp problem list in March 2019 (left) compared to January 2024 (right).

- Curated Collections: Instead of a single, overwhelming list, we now present problems in curated collections based on educational level and difficulty. This makes it easier for users to find problems that suit their needs.

Inclusive Language

A well-documented challenge in STEM education and careers is the lack of diversity (Verdugo-Castro *et al.*, 2022), (Card & Payne, 2020). The organisation recognizes that there are multiple ways to address this and create a more welcoming environment for all learners. One of the steps we followed was to review and modify the text used in our platform that can be interpreted as biased.

We undertook a comprehensive review process for the text used in the platform to identify text messages with gender bias. We identified about 150 such strings and started an effort to replace all of them with gender-free alternatives, which was a big challenge given that Spanish is a highly gendered language (Rosenblat, 1962), (Barrera Linares,

2019). An example string that we found frequently used was “profesor” (male teacher) when referring to any teacher, we replaced that with the gender-free alternative “docente”. Another example is “juez” (male judge), replaced with “jurado” (jury) which is gender-free.

Currently, 99% of existing platform text has been reviewed and revised to ensure gender neutrality, and all newly added texts are also required to adhere to these guidelines. In the future, we are also committed to expanding these efforts to include our Portuguese dictionary, ensuring a welcoming platform for all users regardless of language.

4. Problem Classification

In the past, our users struggled to find problems that matched their needs, both in difficulty and required knowledge. To address this challenge, we developed a robust system for problem classification:

- **Standardized Tags:**
 - Authors can assign relevant public tags to problems (e.g., “Binary Search,” “Shortest Paths,” “Dynamic Programming”).
- **Expert Review Process:**
 - A dedicated team of reviewers analyzes every public problem submitted to the platform.
 - Reviewers assess problem quality, promote suitable problems, and add/remove relevant tags for better searchability.
 - For problems requiring improvement, reviewers provide constructive feedback to the author.
- **Maintaining a Safe Platform:**
 - Reviewers also address reports of inappropriate content (offensive, spam, etc.).
 - If necessary, reviewers can mark problems as “banned” to ensure a positive user experience.

As of January 2024 we have 1678 promoted problems and have banned 137 problems due to being inappropriate.

5. Courses

Many omegaUp users who manage coding contests for students also leverage the platform for classroom instruction. Recognizing this need, we developed a comprehensive course management system with the following features:

- **Rich Content Delivery:**
 - **Lectures:** Create video-embedded lectures to explain course materials.
 - **Text and Multimedia:** Supplement lectures with text, images, and additional videos.

- Engaging Assessments:
 - Homework Assignments: Design problem sets with deadlines and point values.
 - Exams: Create timed exams to assess student understanding.
 - Automated Grading: Save time with automatic grading based on point values assigned to problems.
- Streamlined Collaboration:
 - Teaching Assistants: Assign TAs to address student questions and provide feedback.
 - Line-by-Line Code Reviews: Offer detailed feedback on student code submissions.
 - (Coming Soon) AI Teaching Assistant: We're developing an AI-powered teaching assistant to provide additional support for students.
- Prestigious Users:
 - Leading institutions like CIMAT, UAM, ITESM, and TecNM utilize omegaUp Courses.

Free MOOCs for Everyone

omegaUp, in collaboration with other organizations, offers a range of free Massive Open Online Courses (MOOCs) on the platform, including:

- Programming Languages: C++, Python, Java.
- Algorithmic Problem Solving: Introduction to Algorithms I & II.
- Olympiad Preparation: Mexican Olympiad in Informatics, Peruvian Olympiad in Informatics, Karel Programming (for beginners).

6. Important Contests Hosted

Over the past few years, omegaUp has become the go-to platform for managing coding contests in the Spanish-speaking world. Here are some of the high-profile events hosted on omegaUp:

- Regional Mexican Olympiads: Jalisco, Guanajuato, Veracruz, Nuevo Leon, Aguascalientes, and more.
- National and International Olympiads.
 - Mexican Olympiad in Informatics (OMI) since 2012.
 - Iberoamerican Olympiad in Informatics (CIIC) since 2015.
 - Peruvian Olympiad in Informatics since 2017.
 - Ecuadorian Olympiad in Informatics since 2020.
- Major Programming Competitions:
 - Coding Cup TecNM (flagship competition of the National Technological Institute of Mexico) since 2015. In 2019, it attracted over 500 teams of 3 students each.
 - Central American Programming Cup since 2020.

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