

CSEDU 2018

10TH INTERNATIONAL CONFERENCE ON COMPUTER SUPPORTED EDUCATION

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Orthographic Educational Game for Portuguese Language Countries

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Agenda

- New orthographic agreement
- Related work
- JOE
- Experimental evaluation
- Final remarks

New Orthographic Agreement

- First orthographic agreement was conceived in 1931
 - Initiative of Brazilian Academy of Letters with Lisbon Academy of Sciences
- New orthographic agreement
 - Comunidade dos Países de Língua Portuguesa (CPLP)
 - Brazil, Portugal, Angola, Mozambique, Guinea Bissau, Capa Verde, East Timor, Sao Tome, and Principe
 - <https://www.cplp.org/>
 - It was settled in 1990
 - It had a period of transition (2013)
 - It took many years to become mandatory
 - In Brazil since 2016

Impact of changes

- Changes in vocabulary below 2%
- It simplifies many aspects
 - Vôo -> voo
 - Circumflex accent was extinguished for tonic vowel for paroxytones that finishes in -oo
 - Cinqüenta -> cinquenta
 - umlaut was extinguished
- Some new rules are difficult to adapt
 - Too much exceptions in orthographic rules
 - Complexity of some rules

Concepts associated

- Accents
 - Relative emphasis or prominence given to a certain syllable in a word
- Hyphens
 - The general concept is that hyphen serves to connect elements forming words composed by juxtaposition and connect prefixes and suffixes to radical

Problem definition

- Challenges
 - Requires students to memorize
 - Traditional approach is no longer attracting students
- Intuition
 - Educational games are becoming a complementary option
- Research question
 - Can we create a game to support teaching of accents and hyphen rules?
 - Can we create a game to make students motivated and to enable them to learn the new orthographic rules?

Approach

- JOE – Educational Orthographic Game
 - Exercise the orthography in a ludic way
 - Focus on special cases of Accents and Hyphens
- JOE was designed for Android platform and is available for free at Google Play Store
- We have conducted an experimental evaluation with two sets of students (high-school and undergraduate students)
- Students filled a questionnaires both before and after JOE usage
- Game usage and results are collected by web service

Related work: approaches that explore game properties

- Education games should allow for students to gain the necessary skills for each new lesson (phase)
 - The presence of phases, ludic aspects, and reward are characteristics that define games
- Some classic games that involve orthography include Hangman, Word Search, Crosswords Puzzle, and Spell Up
 - Ludic properties are explored (rewards, badges, etc)
 - Limitations to support teaching (hints)

Language tools with collaborative learning

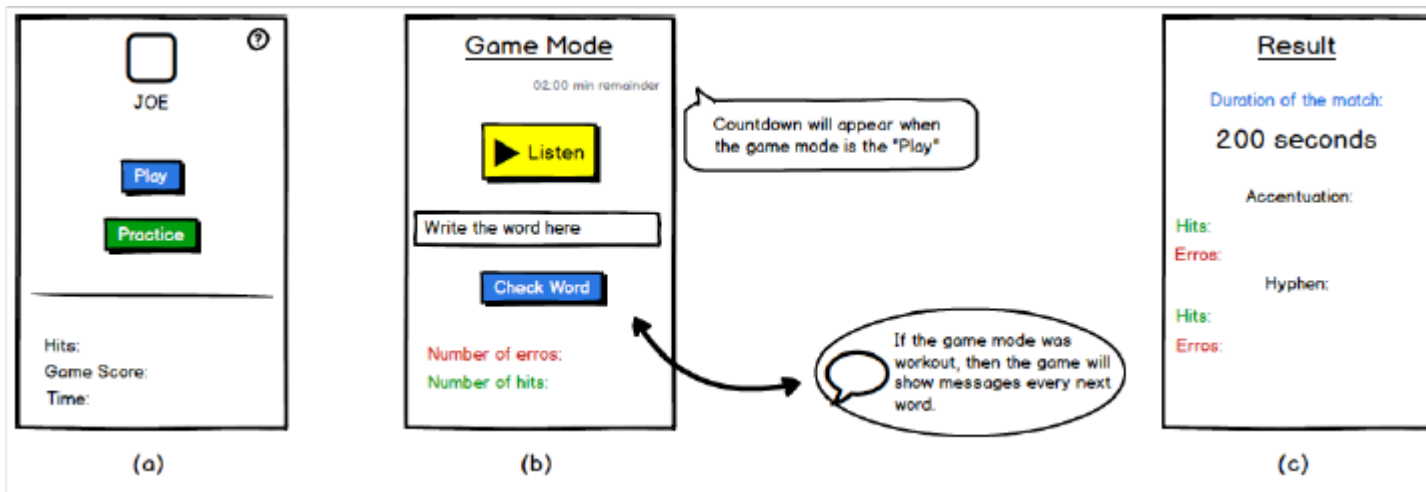
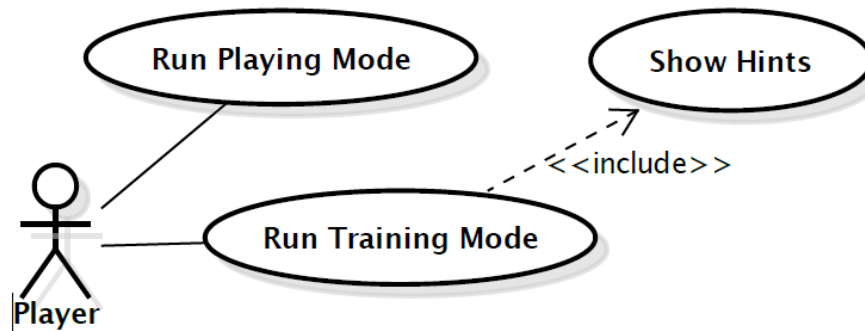
- Duolingo, Babbel, and Busuu are applications that enable users to learn a foreign language interactively
 - They apply game-play and interaction with social networks to encourage players to compete with each other and continue playing
- Novel is an educational game to aid in the autonomous learning of orthographic rules by improving the performance of students in social writing practices
 - Elements such as badges (medals or achievements), points, progress, and narrative are used to make users feel motivated to perform tasks

Related work: good game-play

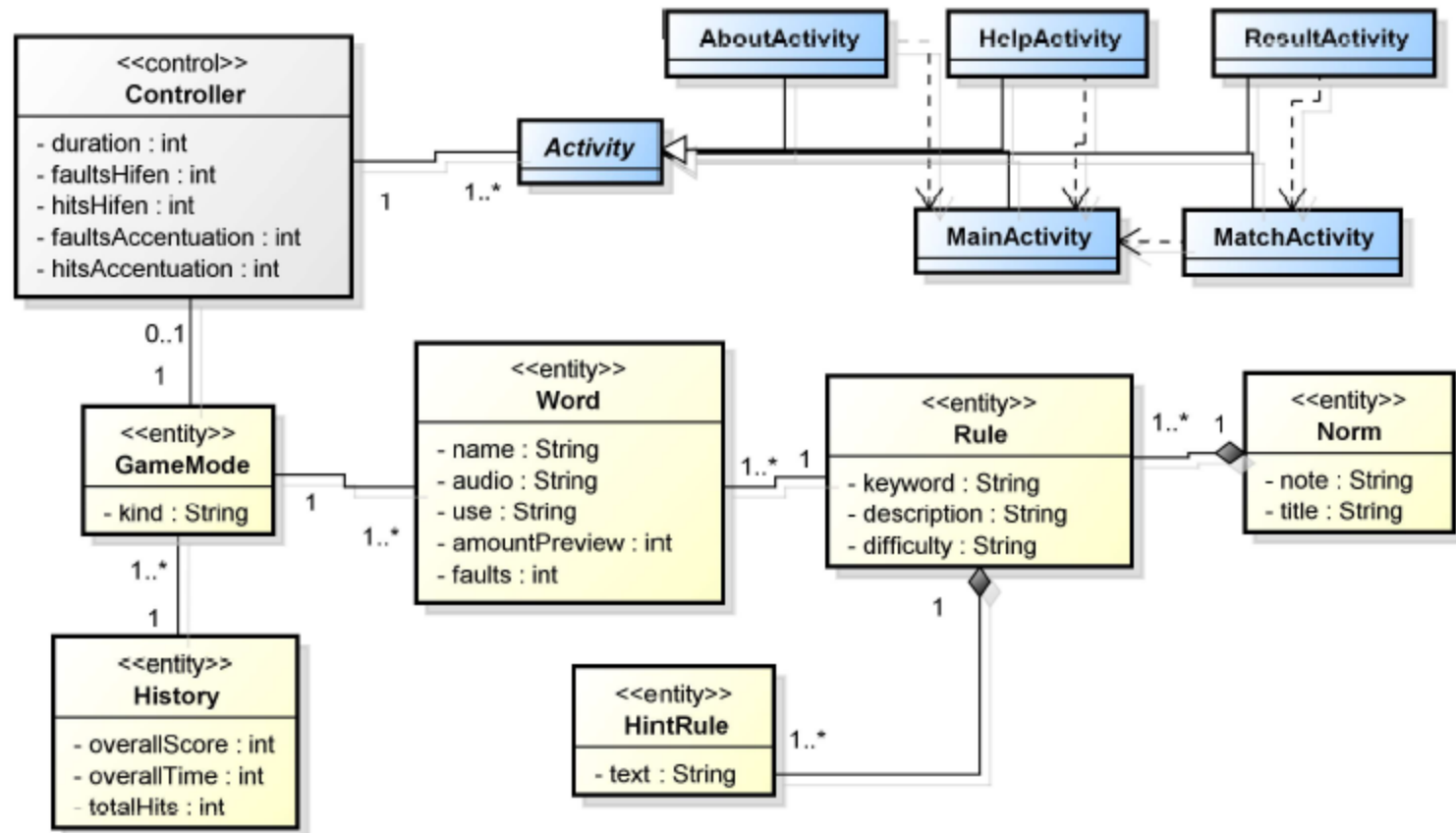
- Soletrandomob shows the sound of a word and the player must spell it
 - Users may ask for tips, like the use of the word in a sentence
- OrthograFixe is a game where features words move up and down at different speeds. The user must press the word that is spelled correctly
 - The game treats hyphen rules based on prefixing and recompositing
 - Whenever the user makes a mistake, pops up an error message indicating the wrong orthographic rule
- AmarganA is a game designed for mobile phones and tablets that aim to practice orthography
 - Letters are shuffled and the player should change their position until the desired word is correctly written
- Grapphia was designed to aid students in spelling words that have digraphs that correspond to the same sound
- Na Ponta da Lingua is an open source tool to help students in orthography in a ludic way letting students play with the origin of words

JOE focuses on accent and hyphens
Contains a training phase
Different game-play

- Focus on accentuation and hyphen
- Training and playing mode



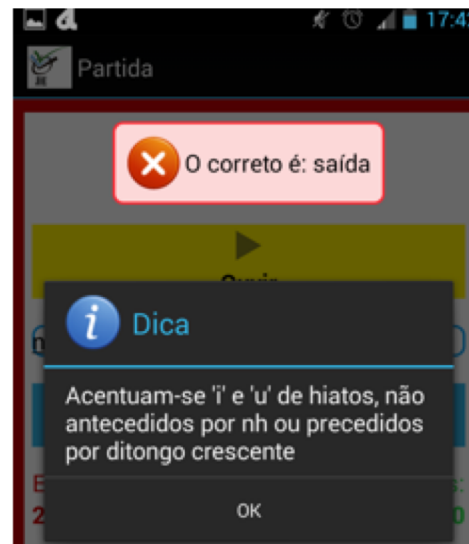
Class diagram



Accent and hyphen Support

Keyword	Rule
Juxtaposed	The hyphen is used on words composed per juxtaposition whose elements (nouns, adjectives, verbs or numerals) constituting a syntagmatic or semantic unit and with own accent, even if the first element is reduced.
Toponyms	The hyphen is used with compounds toponyms started by the adjective <i>grão/grã</i> , or by a verb, or when exists an article between its constituent elements.
Botanical and zoological	The hyphen is used with compound words that designate species botanical and zoological.
<i>Bem, mal</i> , and vowel	The hyphen is employed in compounds formed by adverbs <i>bem</i> or <i>mal</i> (first element) and any word beginning with a vowel.
<i>Além, aquém, recém</i> , and <i>sem</i>	The hyphen is used in compounds with the elements <i>além</i> , <i>aquém</i> , <i>recém</i> , and <i>sem</i> .
Locutions	The hyphen is not used with locutions of any kind.
Occasional and Historicals	The hyphen is used in occasional vocabulary dazzle or the historical combinations.
<i>êi</i> and <i>ói</i>	Open diphthongs <i>êi</i> and <i>ói</i> followed by vowel paroxytones lose the accent. Note: When oxytone, these, along with <i>êi</i> , remain with the accent, followed or not by 's'.
'i' and 'u' on hiatus	The acute accent is used on the 'i' and 'u' tonics of oxytones or paroxytones if they are hiatuses and are alone in the syllable or accompanied by 's'. Note: When before 'nh' or after diphthong decreasing, they are not accented.
Paroxytones homographs	The acute accent is used to differentiate a few pairs of paroxytones homographs.
Second element 'h'	The hyphen is used in prefixed or recomposed words whose second element is started by 'h'.
The shock of vowels	The hyphen is used if the first element ends with the same vowel that begins the second element.
<i>circum</i> and <i>pan</i>	The hyphen is used if the prefix is <i>circum</i> or <i>pan</i> and the second element starting with a vowel, 'h', 'm', and 'n'.
<i>hiper</i> , <i>inter</i> and <i>super</i>	The hyphen is used when the prefix is <i>hyper</i> , <i>inter</i> or <i>super</i> and the second element begins with 'r'.
<i>ex</i> , <i>sota</i> , <i>soto</i> , <i>vice</i> , or <i>vizo</i>	The hyphen is used when the prefix is <i>ex</i> , <i>sota</i> , <i>soto</i> , <i>vice</i> , or <i>vizo</i> .
<i>pós</i> , <i>pré</i> , and <i>pró</i>	The hyphen is used when the prefixes <i>pós</i> , <i>pré</i> , and <i>pró</i> are tonics and graphically accented.
vowel + 'r' or 's'	The hyphen is not used when the prefix (or false prefix) ends in a vowel and the second element begins with 'r' or 's' and should be duplicated.
Elements with different vowels	The hyphen is not used when the prefix (or false prefix) ends with a vowel and the second element begins with a different vowel.
Enclisis and mesoclis	The hyphen is used in pronominal forms linked to the verb by enclisis or mesoclis.
'co'	The hyphen is not used in 'co' + word beginning with "o".

Implementation



Audio recording

Table 2: Recording of Audio

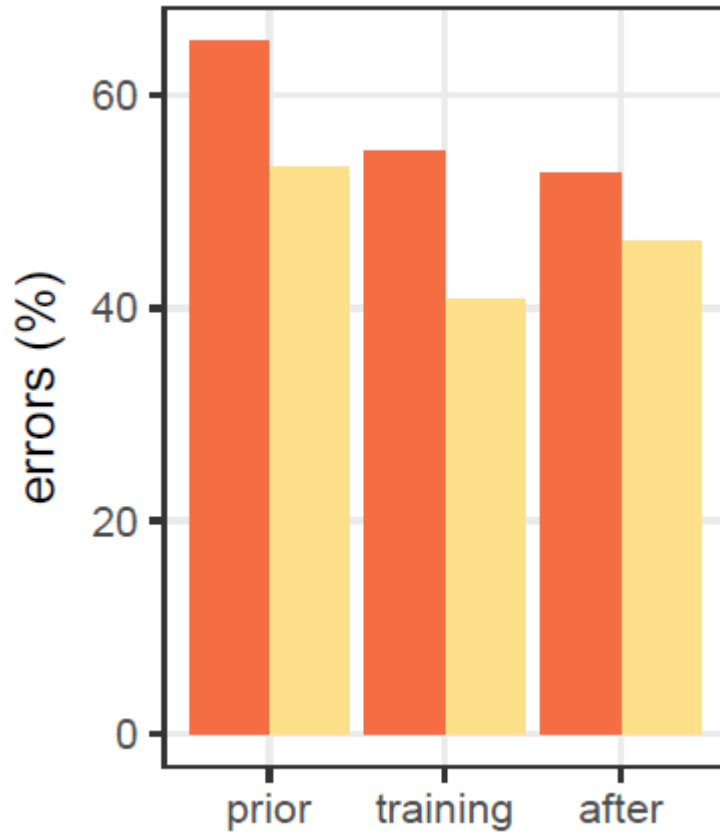
Correct Writing	Incorrect sound	Phonetic correction
Coreia	Corêia	Coréia
A fim de	Afindi	A fim dê
Abaixo de	Abaixo di	Abaixo dê
Acerca de	Acerca di	Acerca dê
Ao passo que	Ao passo qui	Ao passo quê
Baiuca	Baiucá	Baiúca
Boiuno	Booiunô	Boiúno
Circum-escolar	Circúm-escolar	Círcum-escolar
Circum-hospitalar	Circúm-hospitalar	Círcum-hospitalar
Circum-murado	Circúm-murado	Círcum-murado
Cobra-capelo	Cobra-capélo	Cobra-capelo
Eletrossiderúrgica	Elêtrossiderurgica	Eletrossiderúrgica
Geo-história	Gêo-historia	Geo-história
Micro-onda	Mícro-onda	Microonda
Para	Parâ	Pára
Sota-piloto	Sota-pilôto	Sota-pilôto
Turma-piloto	Turma-pilôto	Turma-pilôto

Evaluation

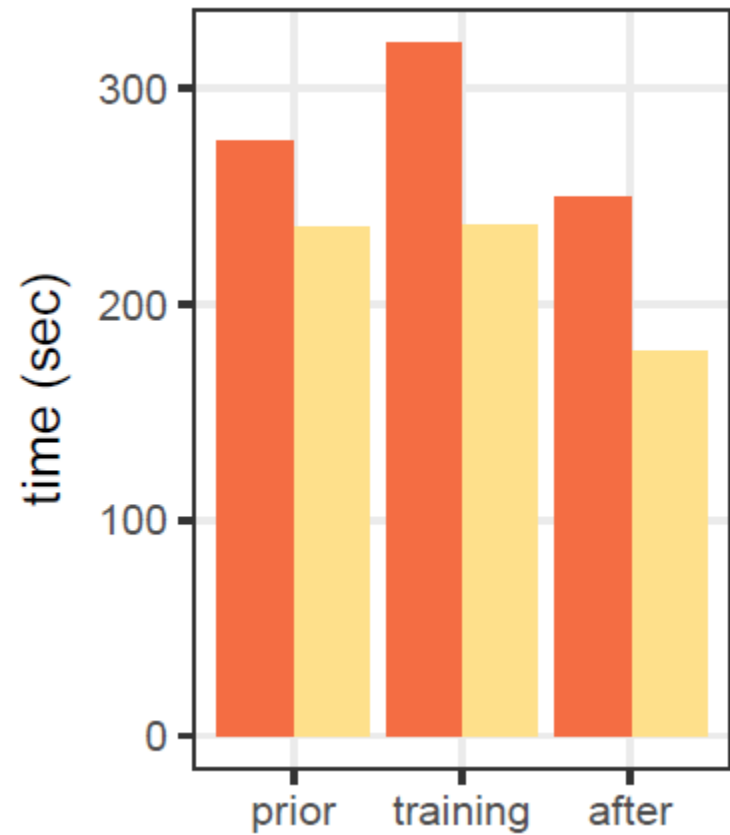
- The experiment addresses two central research questions:
 - Q1: didactics and learning
 - Q2: impressions of students
- Evaluation for composed of experimental procedure and evaluation form (41 questions)
 - 62 volunteers students invited by Facebook
 - 29 of high-school
 - 33 undergraduate
 - They were evaluated prior and after using JOE
- Experimental procedure, data, and evaluation form are available
 - <http://eic.cefet-rj.br/~eogasawara/joe/>

Q1: Didactics of JOE

Relative errors

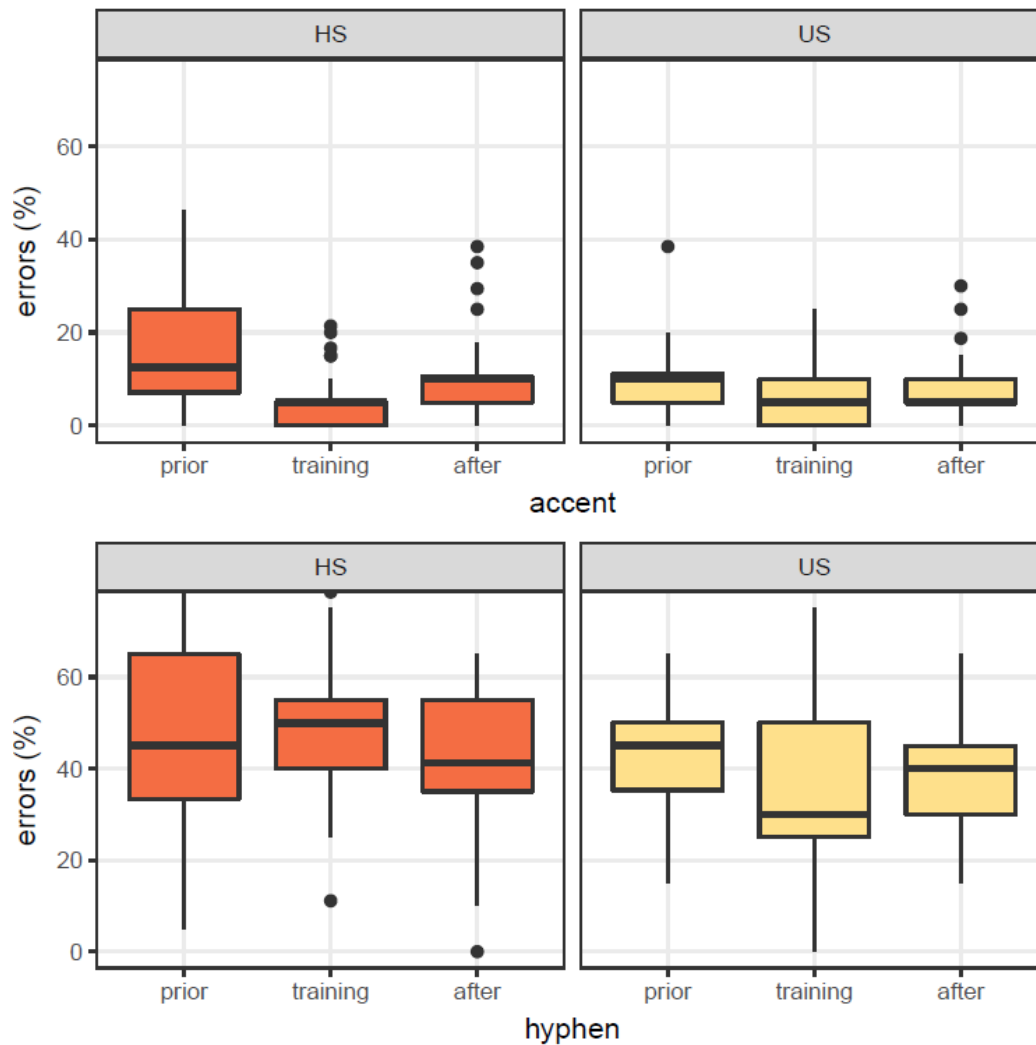


Time spent



context ■ HS ■ US

Characterization of errors



Wilcoxon rank sum test: accent p-value = 0.01 and hyphen p-value = 0.15

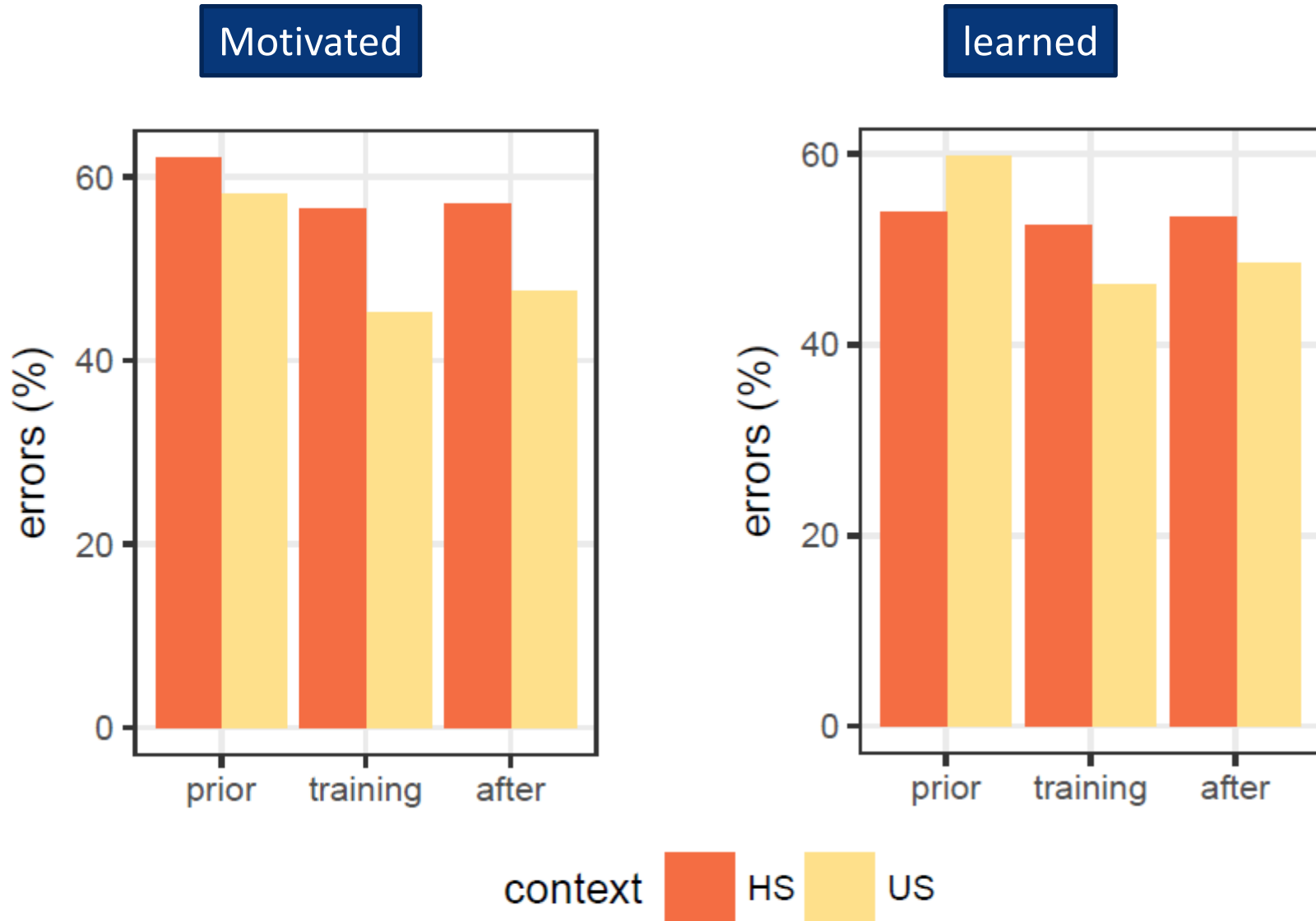
Self-claim prior knowledge on subject








Q2: Impression of students

- Usefulness: 82%
- Easy to comprehend: 77%
- Motivation: 82%
- Learned using JOE: 84%
- Usability test using SUS: 79 points (almost good)

Q2: Impression of students



Educational applications developed by our research group

▲ App name	Active / Total installs ⓘ	Avg. rating / Total #	Last update	Status
 Amê - Hanafuda br.gpca.hanafuda.android	37 / 753	★ 4.00 / 15	Jul 5, 2016	Published
 Hanafuda (obsolete) hanafuda.cefet	3 / 525	★ 3.50 / 2	Jan 5, 2016	Unpublished
 Jogo Ortográfico Educacional br.rj.cefet.joe.app	488 / 15,635	★ 3.42 / 86	Jan 5, 2016	Published
 LabVetor appinventor.ai_eduardosh_cefe...	8 / 726	★ 4.42 / 12	Feb 13, 2017	Unpublished
 MathGame appinventor.ai_projetofinalbata...	0 / 56	★ 4.50 / 2	Feb 13, 2017	Unpublished
 Sim-Evolution usuario.app.sim_evolution	6 / 157	★ 4.27 / 11	Feb 26, 2017	Published

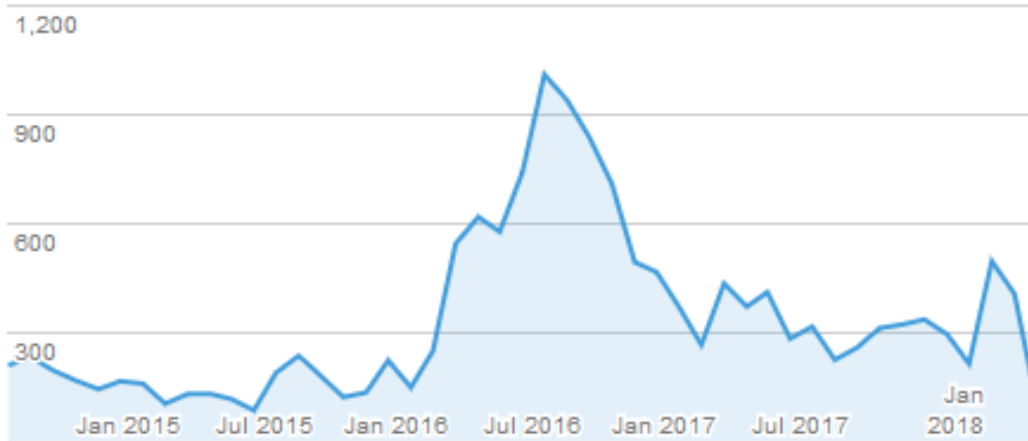
JOE usage

Installs by user ?

[VIEW DETAILS](#)

15,753

Lifetime



Uninstalls by user ?

[VIEW DETAILS](#)

14,499

Lifetime



Countries and Rating

Installs by user ?

[VIEW DETAILS](#)

Top countries

Brazil	<div><div></div></div>	14.8K
Angola	<div><div></div></div>	280
Portugal	<div><div></div></div>	144
Mozambique	<div><div></div></div>	113

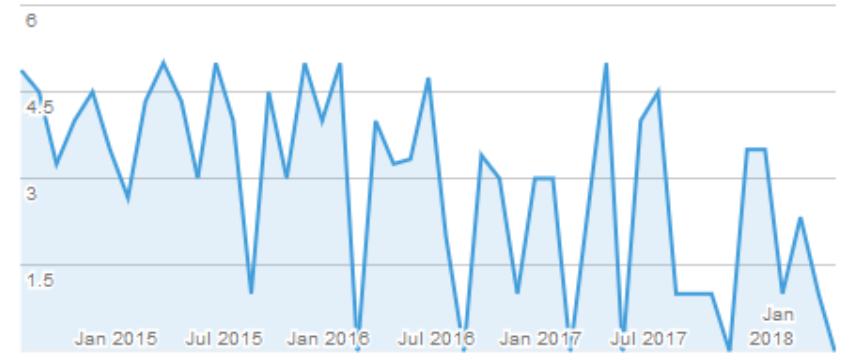


Average Rating ?

[VIEW DETAILS](#)

3.419

Lifetime



Final Remarks

- 80% of engagement of students
 - How to attract the other 20%
- The game was considered difficult
 - Our game-play was not as good as related work
 - Design problem in writing the words (autocorrection)
- Improve design
 - Research questions
 - Evaluation form
 - Game play
- International collaboration

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