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ORIGINAL

# Keys of Japanese prosody and didactical - technical analysis of OJAD (Online Japanese Accent Dictionary)

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**ABSTRACT**

Most of the studies focus on the teaching of foreign languages indicate that little attention is paid to the prosodic features both didactic materials and teaching-learning processes (Martinsen, Avord and Tanner, 2014). In this context and throughout this article, an analysis of the didactical and technical dimensions of OJAD (Japanese Accent Online Dictionary) is performed, linked to a project of the National Institute for Japanese Language and Linguistics led by Minematsu (University of Tokyo). With the collection of data and information through an adaptation of the CEETP "Questionnaire for the Evaluation of Didactical, Technical and Pedagogical aspects of Educational Websites" by Cabello, Martinez-Segura and García Sánchez (2013) and supported by studies and researches of the responsible teams, it is performed an analysis of the web that allows us to highlight its positive and to be reviewed aspects from an educational point of view. OJAD is an accessible and systematic tool linked to the didactic of Japanese language, with a great potential regarding the searching criteria and adaptation to the user tool.

**KEYWORDS:** EDUCATIONAL TECHNOLOGY, LANGUAGE, JAPANESSE, INTONATION CONTOURS, ACCENT

## 1 INTRODUCTION

In almost all proposals to support the learning of a foreign language, the use of ICT and the implementation of activities carried out by them have an increasing importance. In other words, the role of ICT is becoming fundamental in the current and future educational worldwide processes. An example of this is reflected in the regional analysis of the NMC Horizon Report in which technological prospects for inclusion of ICT in the classroom are collected in three forecast periods from 2013 to 2018 (Johnson, Adams Becker, Gago, Garcia and Martin, 2013):

2013–2015: the ICT prospects, including flipped classroom, MOOCs, mobile apps and tablet computing, have already been presented.

2015–2017: we would be entering this phase, which includes learning based on games, augmented reality, learning of data analysis and "internet of things".

2017–2018: it corresponds to the relatively near future and it consist of new generation batteries, 3D printing, flexible displays and wearable technology would be used.

From a more specific point of view, in this article, it is carried out an analysis of the Website "OJAD: Online Japanese Accent Dictionary". OJAD is a database of Japanese accent aimed at teachers and students, used in programmes of language teaching around the world and which is linked to the project "Development of an Online Japanese Accent Dictionary using a Corpus for Japanese Language Education"; a project led by professor Minematsu and belonging to the National Institute for Japanese Language and Linguistics.

Regarding prosody, in Japanese, each word has its own pattern of intonation (High / Low) when they are pronounced in isolation, defining this way the type of accent (Figure 1). Prosody generation is based on a TTS (Text-to-Speech). However, frecuently, between written and spoken words, the lexical pattern (H / L) changes depending on the context (sandhi accent) for researchers in the field of speech synthesis. Therefore, to overcome these difficulties, and based on the emerging success and mistakes of a previous research about "sandhi accent", the aforementioned authors developed a model based on a corpus using Conditional Random Fields (CRF) for the prediction of the change (Minematsu, Kuroiwa, Hirose, Watanabe, 2007; Minematsu, Nakamura, Hashimoto, Hirose, 2013; Hashimoto, Minematsu, Hirose, 2014).

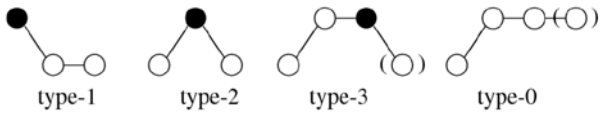


**Figure 1.** Kind of observable accent on 3 "mora" words of Japanese Language from Tokyo dialect (extracted from Minematsu, Kuroiwa, Hirose, Watanabe, 2007: 148)

As Minematsu (2014), exposes Japanese students have reached 4 million worldwide. Japanese is a language that has three kinds of writing: kanji, hiragana and katakana, which increases the difficulty in acquiring proper writing skills. However, regarding the teaching and learning of the Japanese pronunciation, as indicated by Nakamura et al (2013), one of the

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main problems is the prosody. As indicated Katsuo Tamaoka and Shogo Makioka (2009) and Nakamura et al (2013), Japanese prosody is based on the "mora", the accent and intonation (not on tone, because Japanese is not a tonal language); however, many students in schools and universities who are learning Japanese in Japan are unaware of this issue, because it is rarely taught in schools. This aspect acquires special significance if we consider researches as Nakamura and Kolinsky (2014), who, through a dichotic presentation without intentional sublexical analysis, conclude that units such as "mora", the syllable or the phoneme operate independently to orthographic knowledge. Indirectly, from this conclusion it can be interpreted that attending to written skills regarding analysis of accent or intonation are not improved. Following these authors, they suggest that the native citizenship uses mostly the dialect of Tokyo (considered as standard Japanese) and many of the Japanese students are from Asian countries whose native languages are tonal, such as Chinese (Braun, Galts and Kabak, 2014; Jin, Kates and Arehart, 2014). These and other aspects have been taken into consideration when developing of the OJAD project and, therefore, at the time to develop the OJAD website.

## 2 METHODOLOGY

To carry out the data and information collection scale adapted from the "*Questionnaire for the evaluation of teaching, technical and educational aspects of teaching sites*" (Hair, Martinez-Segura Sánchez and García, 2013) is used. In the adaptation, while maintaining the scale "Yes", "St" (sometimes) and "No", a section for observations for each item is included. This is considered as necessary because greater importance will be given to qualitative aspects. In addition, the instrument used for the collection is divided in dimensions, sections and sub-sections. For space reasons, we will focus on two of the three dimensions proposed in the original instrument:

Didactical dimension: it includes access to thematic, skills / goals, contents, methodology, timetable, evaluation and bibliography.

Technical dimension: it includes accessibility, functionality, graphic and information design, and interactive sections.

Observations will be directly reflected throughout the analysis (in results section). Furthermore, this analysis will be compared with the contributions of authors and researches linked to the development of OJAD project or who have developed studies related to its epistemological basis.

## 3 RESULTS

In this block of analysis, the didactical dimension and the technical dimension of OJAD are included, collecting evidence from the website itself and contrasting the results obtained with various inputs and studies. To carry out the analysis of these two dimensions and on the basis of Cabello Martinez-Segura and Sánchez García (2013), only data and information which are accessible directly from the web. In other words, data and information accessible only through attachments or downloadable such as PDF are not considered as valuable.

### 3.1 Didactical dimension

It refers to didactical characteristics of the website, so, in this block, the analysis is carried out through seven sections grouped in sixteen sub-sections.

**Table 1.** Data collection linked to the didactical dimension

| | Website OJAD | | | |
|---|---|---|---|---|
| | **Yes** | **St** | **No** | **Observations** |
| SECTION 1: Access to the topic | | | | |
| • Identification of the topic | X | | | |
| • Presentation of the team and contact | X | | | |
| • Introduction of content and purpose | X | | | |
| • Previous required knowledge | X | | | |
| SECTION 2: Skills / Goals | | | | |
| • Skills to be developed | | X | | |
| • Goals to be developed | X | | | |
| SECTION 3: Contents | | | | |
| • List of topics | X | | | |
| • List of subjects | | X | | |
| SECTION 4: Metodology | | | | |
| • Descripción of the teaching | | X | | |
| • Detail of student work volume | | X | | |
| SECTION 5: Timetable | | | | |
| • Detail of content development time | | X | | |
| • Detail of key dates (tutorials, tests, deadlines, etc.) | | X | | |
| SECTION 6: Evaluation | | | | |
| • How, when and why | | X | | |
| • Criteria of quality and importance of each instrument | | X | | |
| SECTION 7: Bibliography | | | | |
| • It contains a section of basic bibliography | X | | | |
| • It contains a section of complementary bibliography | X | | | |

SECTION 1: Access to the topic

The section **access to the topic** is quite complete. In this sense, the identification of the topic takes place on the link ご利用にあたって ("before using..."), which indicates that this dictionary is the result of collaborative efforts of individuals involved in the project "Development of an Online Japanese Accent Dictionary using a Corpus for Japanese Language Education" of the National Institute for Japanese Language and Linguistics; and which was developed with academic and educational research purposes. In the same space, there are two sub-sections: "Development Group" (開発メンバー) and "Localization Group" (翻訳メンバー), where the presentation of the team and contact would take place. As it can be observed in charts 1 and 2, they are multidisciplinary.

**Table 2.** Development Group

| Members | |
|---|---|
| **Project leader** | Nobuaki Minematsu |
| **Pedagogy Team** | Hiroko Hirano |
| | Chieko Nakagawa |
| | Niriko Nakamura |
| | Yukinori Tagawa |
| **Engineering Team** | Ibuki Nakamura |
| | Kenichi Hirose |
| | Hiroya Hashimoto |
| | Tomoyuki Mizukami |
| **Former member** | Masayuki Suzuki |

**Table 3.** Localization group

| Members | |
|---|---|
| **English** | Short Greg |
| **Indonesian** | Heni |
| | Hernawati |
| **Korean** | Sonu Mee |
| **Chinese** | Lou Dean |
| **Vietnamese** | Nguyen Duc Duy |
| | Sai Thi May |
| **German** | Yamada Bochynek Yoriko |
| | Fromman Berthold |
| **Russian** | Ibrakhm Inga |
| **Thai** | Svetanant Chavalin |
| **Spanish** | Emilio José Delgado Algarra |
| **Sweedish** | Erik Tollin |
| **Portuguese** | Marco Fonseca |

Issues related to the introduction of content and purpose are reflected in the main screen of the web. In relation to the contents, it is indicated that "The words in the dictionary encompass over 9000 nouns and 3500 declinable words including verbs, i-adjectives, and na-adjectives, making it possible to search approximately 42,300 conjugations of words" all through 4 functions: "Word Search" (単語検索), "Verb Suffix Search" (動詞の後続語検索), "Text Search" (任意テキスト版) and Suzuki-kun: Prosody Tutor" (韻律読み上げチュータスズキクン). Regarding the purpose, within the main screen, it is noted that this tool aims to improve the understanding of the Japanese intonation. As Minematsu (2014) indicated the "*Online Japanese Accent Dictionary*" (OJAD) has been designed as part of a project to provide students with effective support materials about the Japanese pronunciation and instruction in prosody. However, there is a series of previous knowledge required to use this tool. Thanks to the work of the localization group members of the different languages, non-Japanese users that start learning Japanese can use OJAD. In addition, teachers can use it in classes without modifying their study plan (Hirano, 2014). In other words, if we review the features of the tool, it is found that, for a better use of them, it is essential to have acquired the competence to read hiragana and katakana syllabary; besides, you should know the uses of different declensions and some verb tenses (dictionary form, ～masu [～ます], ～te [～て], ～ta [～た], ～nai [～ない], ～nakatta [～なかった], ～ba [～ば], causative, passive, imperative, potential and volitional), without forgetting some basic vocabulary. Audio samples, meanwhile, involve extra support so that students of Japanese starting from the ground can use this tool.

SECTION 2: Skills / Goals

Many students of Japanese wish to become skilled to speak the language in a "natural" way; however, according Minematsu (2014), the main difficulties they have to that skill are:

Limited time to pronunciation and prosody in the classroom.

Frequent lack of teacher training in these aspects.

Lack of good textbooks to teach Japanese accent and their variability depending on the context.

OJAD is a significant resource in terms of overcoming these obstacles due to the fact that it supports both visual and audio. Although there is a detailed description of the instructions for use and access to textual, visual and sound effects, in relation to the skills / goals section, there is not a detailed description of the skills to be developed. Regarding the goals to develop, in the home screen, it is indicated that "the goal of this tool is to enhance the awareness and understanding of the Japanese pitch accent with a suite of four features". These aspects are more detailed in the scientific production related to the project, some of which are referenced throughout this article. However, it should be clarified that, in line with the criteria set out in the methodology section, PDF files have not been considered in the collection of data and information because its contents have not got direct access. In the web section "let's try OJAD" (使ってみようOJAD), it is indicated that "you can view the proficiency test levels as goals for your Japanese language study", establishing a point of general convergence between skills and goals.

SECTION 3: Contents

In the section of **contents**, list of subjects is not relevant, so, it is explicit on the web that this resource is for students, teachers and researchers of Japanese language. In other words, it is obvious to think that this tool could be linked with any material related to the teaching of the Japanese language. Regarding the list of topics, the degree of organization of contents and variety of searching criteria to access them according to user needs are highlighted, an issue we will look deeper during the analysis of a technical dimension.

From the main screen, you can access the contents by textbooks (教科書別) and parts of speech (品詞別). This last option of access is subdivided into: all verbs, verbs of Group 1, 2, or 3, i-adjectives,na- adjectives and noun; However, despite appearing options: demonstrative, pre-name adjetive, adverb and conjunction, they have no hyperlink. We must clarify that, focused exclusively on the contents, as shown Kawamura et al (2012) and Sunakawa, Lee and Takahara (2012), there are alternatives such as "The Reading Tutor Web Dictionary", a project that serves as supporting system for students of intermediate and advanced level of Japanese, in addition to presenting 20 languages.

SECTION 4: Methodology

In terms of **methodology**, there are few explicit references to the description of the teaching and detail of student work volume. In other words, in the links "*let's try Word Search*", "*let's try Verb Suffix Search*", "*let's try Suzuki-kun" and "OJAD Demo for a Tablet*", there is a detailed description of the usage of the tool mainly in the field of the technical dimension, with indirect benefits that this implies for the development of the autonomous work of students, teachers and researchers. In the aforementioned links, classroom situations are shown; an example of this is found in the following extract "In many cases it may not be possible to use the Internet in the classroom, so we have added this tool for preparing classroom materials which show word accents", regarding the option "Show Print-view".

Serving as a bridge between the methodological aspects, in the analysis of the didactical dimension and analysis of the pedagogical dimension, through an investigation with 36 Japanese students with a basic knowledge of accent Japanese words, Nakamura et al (2013) showed high pedagogical effectiveness of OJAD. This effectiveness was demonstrated when the performance of the 36 students in the sample (68.2%) was compared with 10 native college students (61.6%). According to these authors, this situation occurs because Japanese natives speak standard Japanese very fluently; however, they do not have the same skills regarding the explicit location of the kernel accent. There are similar difficulties to those of the location of the kernel accent by native Japanese language regarding their own language. They also appear when we refer to the prosody of second languages. In that sense, the research of Tsukada, Hirata and Toengpitya (2014) with Thai listeners, English-speaking Americans, Italians, and Japanese concluded that although the first language of a listener make them become familiarise with the vowel length contrasts, that does not ensure efficient processing of the same when the analysis is done in the case of Japanese as a second language. Finally, returning to the research of Nakamura et al (2013), it was found that the performance of the reading tutor and synthesizer OJAD were 93.2% and 95.9%, respectively; much higher than the efficiency of native Japanese values.

SECTION 5: Timetable

The contents shown on the web are perfectly classified by different criteria. In the searching criteria, in the section **timetable** for the data and information collection instrument, the most linked to the sub-section detail of content development time and, very indirectly, to the sub-section details of key dates (both) would be:

Difficulty: where you can access the contents regardless the difficulty (all [すべて]) or focus the criteria on one of the levels of language proficiency (lower beginner [初級前半], upper beginner [初級後半], lower intermediate [中級前半], upper intermediate [中級後半], lower advanced [上級前半], upper advanced [上級後半]).

Old JPLT (Japanese-Language Proficiency Test): related to the old system of classification levels from 4 [lowest] to 1 [highest].

SECTION 6: Evaluation

There are no significant references to the **evaluation** section on the web OJAD (in relation to how, when and why to evaluate and in relation to criteria of quality and importance of each instrument). However, it is highlighted the fact that there is a total transparency about the evaluation of the advantages and aspects to be improved of the four functions of OJAD, offering alternatives to correct to the user. We can find an example of this when there is an error in the prediction of the accent of the prosody tutor Suzuki-kun. In that case, as Nakamura et al (2013) indicated, clicking on the "mora" of the results offered in hiragana, you can change the pitch contour.

SECTION 7: Bibliography

There is a specific space called "*academic presentations*" accessible by hyperlink from the home page. This link directly corresponds to the **bibliography** section of our instrument collection of data and information, where the "presentations that have been given related to the development of OJAD and its application to language classrooms" are grouped. Also, in searching criteria, we have access to the data sheet of the textbooks of Japanese to serve as a source of vocabulary for the Web; books such as "Minna no Nihongo" or "Marugoto" collection. It should clarify that no distinction is made between basic bibliography and additional bibliography; however, in both sub-sections "yes" has been marked given the amount of references in the web.

## 3.2 Technical dimension

It refers to the technical characteristics of the website, so that, in this block, the analysis is conducted through four sections grouped in fourteen sub-sections.

**Table 4.** Data collection linked to the technical dimension

| | Website OJAD | | | Observations |
|---|---|---|---|---|
| | **Yes** | **St** | **No** | |
| SECTION 1: Accessibility | | | | |
| • Plugin or codex is required | | | X | |
| • Content is accessible es accesible from any browser | | X | | |
| • Guaranteed access to multimedia content | X | | | |
| SECTION 2: Functionality | | | | |
| • It has elements of help to navigation | X | | | |
| • Toolbar with links | X | | | |
| • It has a content browser | X | | | |
| • It has a help system or FAQ | X | | | |
| • Links and hypertext are easily recognizable | X | | | |
| • Visible interface and easily navegation | X | | | |
| • Readable text (source contrast / background and size) | X | | | |
| SECTION 3: Graphic and Information design | | | | |
| • Coherent and uniform design | X | | | |
| • Proper use of visual space and ordered scheme | X | | | |
| SECTION 4: Interactivity | | | | |
| • It has tools for cooperative work | | | X | |
| • It facilities comunication between teach /S and S/S | | | X | |

SECTION 1: Accessibility

Regarding the **accessibility**, plugin or codex is not required and content is accessible from any browser, at least the most famous one (chart 5). Relative to the latter, on this web there is a specific section called "supported browsers" (利用できるブラウザー) where it is recommended that the browser allows HTML5 audio tags to ensure the playback of audio samples (which is independent of downloading audio files in MP3 format)

**Table 5.** Browser that allows audio tags (extracted from OJAD website, 2015)

| | | |
|---|---|---|
| **Windows** | **Internet Explorar** | **Ver.9 or above** |
| | Firefox | Ver. 3.6 or above |
| | Chrome | Ver. 3 or above |
| | Opera | Ver. 10.5 or above |
| **Mac OS** | Safari | Versión 4 or above |
| | Firefox | Ver. 3.6 or above |
| | Chrome | Ver. 5 or above |

In the same section it is recommended to consult a computer technician to determine the compatibility of other browsers in relation to the ability to support audio tags. In addition, row playback, columns and page do not work properly on iOS and Android. In other words, we can talk about guaranteed access to multimedia content, However, its reproduction depends on the fact that the browser can support HTML5 audio tags.

SECTION 2: Functionality

In the section of **functionality**, the website responds satisfactorily in all sub-sections encountered in the data and information collection instrument. In this way, there are elements which help you surf the web and allow you to go forward and back easily the web, using easily recognizable links and hypertexts and a toolbar with links on the left of the page. In addition, it has a help system or FAQ in the space "Let's try OJAD" in the form of guides and possible errors; telling the user how to rectify some of them. On the other hand, it is included a guided tutorial where the active intervention of the user who wants to understand and harness the potential of OJAD at 100% is required.

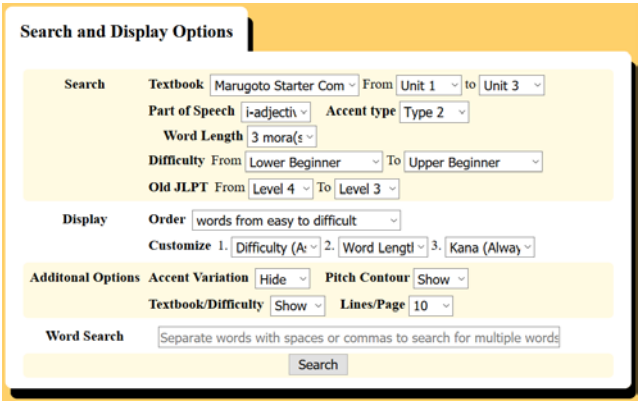


**Figure 2.** search and display options in "Word Search" feature (extracted from OJAD website, 2015)

Regarding the colors of the frame of the page, salmon and orange tones are presented and they turn lighter considerably in the space of the page where the text appears. In other words, the contrast between background and letters is appropriate, which makes the text readable (source contrast / background and size). This is accompanied by a visible interface and an easy navigation supported by all the aforementioned elements.

Finally, note that the web has a content browser with a high level of systematization and numerous searching criteria that can be done simultaneously. As proof of this, we will focus on reviewing "search and display options" in "Word Search" feature (figure 2). It contains the following sections:

Search: it provides the tools to narrow your search to the interests and skills of the user options. It can be performed simultaneously so that you can specify the following issues:

- Textbook: In addition to selecting the textbook, you can define intervals for teaching units.
- Part of speech: We can search all declinable words, all verbs, group 1 verbs, group 2 verbs, group 3 verbs, i-adjetives, na-adjetives and nouns.
- Accent type: It is based on the aspects included in the study of Minematsu, Kuroiwa, Hirose, Watanabe (2007) and we can search not accent and accented, and by type of accentuation.
- Word length: We can define the number of "*mora*".
- Difficulty: Intervals located from "*lower beginner*" to "*upper advanced*" can be defined. Those levels have been established from the Database to Support the Compilation of Japanese Learners' Dictionaries made by *Sunakawa, Lee y Takahara (2012).*
- Old JPLT: in this space, we can select all levels or you can establish an interval between minimum [4] and maximum [1] level of the old nomenclature of the "*Japanese Language Proficiency test*".

Display:

- Order: This allows us to organize the results by the type of accent, accent position (from initial to final) or words from easy to difficult.
- Customize: We can combine three display criteria.

Additional options: this allows us to select the variables "hide" or "show" regarding the following criteria: "Accent Variation", "Pitch Contour" y "Textbook/Difficulty". Also, it allows us to define the number of results per page (from 10 to 100).

Word Search: This space supports performing a search for specific words.


**Figure 3.** visual support to accent pattern of conjugated forms regarding "Word Search" criteria (from OJAD website, 2015).

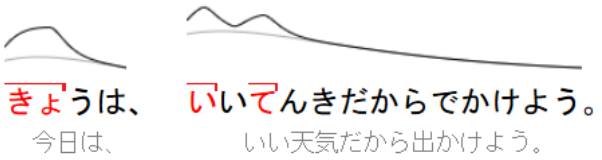


**Figure 4.** Visual support of intonation pattern (H / L) of sentences in "Prosody tutor: Suzuki-kun" (adapted from OJAD website, 2015)

SECTION 3: Graphic and Information design

Regarding the **Graphic and Information design**, it is observed a coherent and uniform design and an ordered scheme through blocks and sub-blocks properly systematized, where both the position of the elements and the intensity of the colours have an organising function; all supported with audio samples from seiyū (or professional voice actors): Masako Ueda (Woman) and Hiroki Kato (Man). In essence, this section, consistent with what it is indicated by Nakamura et al (2013), includes the following visual aspects:

- Complete visual aid for patterns of change of accent in verbs and adjectives.
- Visual accent pattern of verb forms (auxiliary verb + postpositional words) (Figure 3).
- Intonation pattern (high / low) of any sentence together with the positions of kernel accent (Figure 4).

SECTION 4: Interactivity

There are not significant references to **interactivity** in OJAD website based on the terms set in the instrument. That is, tools for cooperative work are not provided nor it is systematically promoted the communication between teacher-student and student-student. Researches of Martinsen, Avord and Tanner (2014) have shown the benefits of interaction for improving the pronunciation of foreign languages. However, despite this limitation, the user can set changes in the accent of the searches by clicking the "mora" of the results provided by the "Prosody Tutor Suzuki-kun" function. The relevance of this issue is that there are variations in the range of intonation of languages (Mennen, Scobbie, Leeuw, Schaeffer and Schaeffer, 2010) and, in response to this situation, OJAD offers to users the opportunity to make changes.

## 4 DISCUSSION OF RESULTS

ICT are adapted to the needs of students whose growth has occurred in the digital age offering an individualized teaching and self-regulated and significant learning (Martín, 2011). We start from the idea that you should exploit the potential offered by ICT to approach the reading model based on hyperlinks, with interventions beyond the barriers of the classroom (Delgado Algarra and Estepa, 2012, Delgado Algarra, 2014). This non-linear reading model, associated with teacher and learner autonomy in the use of tools for the teaching - learning, is present in OJAD. Some of the biggest advantages of this tool for students of Japanese were highlighted by Nakamura et al (2013): complete visual aid of patterns of change of accent in verbs and adjectives, visual accent pattern of verb forms (auxiliary verb + postpositional words) and intonation pattern (high / low) of any sentence together with the positions of kernel accent.

These and other issues have been covered in our analysis. Thus, regarding didactical dimension, OJAD is an accessible tool where the objectives and contents are clear. Even though methodological and evaluation issues are not particularly developed, the references are specific and with high scientific quality. Looking at the technical dimension, OJAD is a platform that does not require plugins and it is accessible from different browsers; it also shows high values in matters related to functionality and the design of graphics and information. As for interactivity, it does not include issues related to cooperative learning or student-student and student-teacher relationship; however, it allows combined searching criteria.

As we have observed, studies conducted by the OJAD team show that assignment of accent nucleus to the texts proposed in the framework of this website is much more accurate than native speakers. We have add its educations and technical strengths too. Although there are some limitations in the field of teaching guidelines (methodological and evaluative, especially), overall, OJAD is a tool linked to the teaching of the Japanese language which, from an educational dimension, is accessible, systematic, with defined objectives and which make easier user's autonomy in relation to the learning of prosody. Finally, from a technical dimension, it includes support for its use, it is highly functional and with great potential in terms of searching criteria and user's adaptation.

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