

Hindi Shabdmitra: A Wordnet based E-Learning Tool for Language Learning and Teaching

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Abstract

In today's technology driven digital era, education domain is undergoing a transformation from traditional approaches to more learner controlled and flexible methods of learning. This transformation has opened the new avenues for interdisciplinary research in the field of educational technology and natural language processing in developing quality digital aids for learning and teaching. The tool presented here - *Hindi Shabhadamitra*, developed using Hindi Wordnet for Hindi language learning, is one such e-learning tool. It has been developed as a teaching and learning aid suitable for formal school based curriculum and informal setup for self learning users. Besides vocabulary, it also provides word based grammar along with images and pronunciation for better learning and retention. This aid demonstrates that how a rich lexical resource like wordnet can be systematically remodeled for practical usage in the educational domain.

1 Introduction

With technology expanding into every domain of society, its impact is visible in the education domain as well. And with improving infrastructure and better technologies the digitization in education is here to stay. Another important catalyst in this area is the receptiveness of the entities involved *viz.* students and teachers.

The technology has provided an edge by reducing the cost of delivering the education to volume of students. Due to its multi-sensory impact, the researchers have proved that, e-learning enhances the students' outcome (Shams and Seitz, 2008; Sankey et al., 2010). With all these benefits, the need for quality digital aids for learning becomes imminent.

As the trend of global citizen is becoming more prevalent, the knowledge of multiple language becomes preferable. For any language learning activity, vocabulary learning is considered central (Alqahtani et al., 2015). Besides this, the other directions of language learning include grammar learning, conversational usage, colloquial usage, literary usage, *etc.* Digital language learning aids are a big support in this direction.

Understanding a word involves - committing to memory its form, capturing its relationship with other words and finally knowing how and where to use it. Vocabulary learning methods (Nation and Newton, 1997; Dunlosky et al., 2013; Oxford, 2016) vary from –

- Directly learning the language without any intervention of the mother tongue.
- Translating the words from target language to mother tongue of the learner in order to convey the meaning.
- Highlighting the new words in a given text and finding out its meaning with the help of a glossary or synonyms.

Keeping vocabulary and grammar learning as pivotal to language learning, an e-learning tool, *Hindi Shabdmitra*, has been developed.

This paper presents a digital Hindi language teaching and learning aid, *Hindi Shabdmitra*, which is mainly a vocabulary and word specific grammar learning aid for formal and informal setups of language learning. It uses Hindi Wordnet¹ as a resource for vocabulary teaching.

The rest of the paper is organized as follows: section 2 gives information about the related work, section 3 introduces the *Hindi Shabdmitra*, section 4 provides the user field response, which is followed by conclusion and future work.

¹<http://www.cfilt.iitb.ac.in/wordnet/webhwn/wn.php>

2 Related Work

The literature about vocabulary learning strategies, language learning psychology and digital educational applications shows that multi-modal learning always result in better retention (Dale, 1969). Vocabulary is cited as the one of the primary reasons for learner's ability and confidence to communicate. Various mechanical strategies like repetition, context, usage and visual correlation have been tested by language experts for enhancing the vocabulary (Atasheneh and Naeimi, 2015; Butler et al., 2010). When the information enters the system through various senses, the brain tries to overcome the limited processing abilities of each individual senses, which results in better information processing (Clark and Paivio, 1991). The multi-modal learning environments have been studied in different settings (Mayer and Moreno, 2003; Moreno and Mayer, 2007; Shams and Seitz, 2008; Sankey et al., 2010) which shows its positive impact on learners. To enhance the willingness of the learner for self-directed technology (Lai et al., 2016), Mobile Assisted Language Learning (MALL) (Yang, 2013) and gamification is seen as an effective pedagogical strategy. These strategies help to engage and motivate the learner to learn in a relaxed environment (Werbach and Hunter, 2012; Figueroa Flores, 2015).

Semantic relations of words have shown to help in better understanding of new vocabulary (Lin, 1997). The wordnet², a rich lexical resource based on semantic relations, have been explored for vocabulary learning and other related language learning applications (Hu et al., 1998; Sun et al., 2011; Brumbaugh, 2015; Hiray, 2015).

3 Hindi Shabdmitra: An E-Learning Teaching Aid

3.1 Background

Hindi written in Devanagari script is the official language of the Republic of India. It is one of the widely spoken languages in India. For learning Hindi, a lot of digital content is available online in the form of games, stories, poems and theme based conversation, along with basic knowledge of grammar and vocabulary. The content delivered to learners *via* subscribed Youtube videos, subscribed web interfaces, social media websites, live skype lectures, purchasable DVDs, *etc.* Some of

²<https://wordnet.princeton.edu/>

the applications for language learning which offer Hindi learning are - Duolingo³, Hindipod⁴, Rocket Language⁵, Italki⁶, *etc.* Some applications meant specifically for children are dinolingo⁷, akhlesh⁸, galligallisimsim⁹, *etc.* Other online resources for Hindi language are bilingual dictionaries which provide only the meanings of the words, such as Shabdkosh¹⁰, Collins dictionary¹¹, *etc.* The commonality among all the above resources is their inability of customization for formal school setups. They are more focused for individual learning.

As per renowned teaching methodology and vocabulary acquisition researcher, Prof. Paul Nation, vocabulary teaching should be done in a structured way (Nation and Newton, 1997; Carter, 1987; Lin, 1997). The aim should be to improve the passive knowledge and make the learner able to use the words in their day-to-day communication.

A study of current digital resources used by various educational institution was also done as part of the background study. The outcome showed a big gap of quality resources which can cover all aspects of language learning like grammar, concepts, usage and pronunciations in an effective manner.

This motivation led to the development of a digital aid that would fill this gap for Hindi language learning. Through the e-learning tool presented here *Hindi Shabdmitra*, an attempt has been made to teach and learn Hindi language in both formal and informal settings, along with learning of the word based grammatical features. Further, this tool facilitates learning with the help of illustrations and pronunciation for multi-sensory impact.

3.2 Hindi Shabdmitra

Hindi Shabdmitra (हिंदी शब्दमित्र)¹² is a digital aid designed for assisting in learning and teaching of Hindi language. It is developed in correlation with school curriculum, which is considered here as a formal setup of learning. Along with schools, it can also be used by individuals or organizations not following any specific curriculum *viz.* NGOs, for-

³<https://www.duolingo.com/>

⁴<https://www.hindipod101.com/>

⁵<https://www.rocketlanguages.com>

⁶<https://www.italki.com>

⁷<https://dinolingo.com>

⁸<http://www.akhlesh.com/>

⁹<http://www.galligallisimsim.com/>

¹⁰www.shabdkosh.com/

¹¹<https://www.collinsdictionary.com>

¹²<http://www.cfilt.iitb.ac.in/hindishabdmitra/>

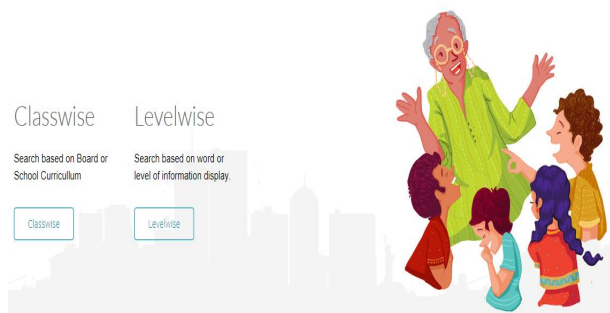


Figure 1: Class wise and Level wise search interface selection

ign Universities teaching Hindi, self learners, *etc.*, which is considered as a non formal setup of learning. It uses Hindi Wordnet as a base resource that has been remodeled for this aid by incorporating the multi-modal features. Further, The concepts are grammatically enriched and simplified depending upon the understanding level of the learner.

As small children learn easily and effortlessly if a picture is provided rather than a text content. Hence, for the initial phase, concepts are pictorially depicted by providing illustrations for level 1 and 2, so that a given concept can be easily captured by these kids. The illustrations are digitally drawn by the in-house illustrators keeping the sense of a concept in mind. Most of the illustrations are simple and shows positivity and happiness, and conveys the right information.

Also, search-words are provided with the audio pronunciation. These words are recorded by native speakers of the language in the standard Hindi format.

A team of lexicographers, illustrators and native language speakers have contributed to build this multi-modal resource which has formed the base of *Hindi Shabdmitra*. The tool has an online web-based and app-based interface for wider reachability. Also, this tool can be made available offline for anytime anywhere learning. The interface allows the search navigation in two ways – level wise (हिंदी ज्ञान स्तर के अनुसार, *hiMdii GYaana stara ke anusaara*) and class wise (कक्षा के अनुसार, *kaxaa ke anusaara*). This can be seen in figure 1.

The unique features of this E-learning tool are –

- It is meant for Hindi language learning, in

sync with school curriculum

- It allows vocabulary and word related grammatical feature learning
- It can be used for formal *i.e.*, school curriculum based setup and informal *i.e.*, individual based setup of learning and teaching
- It has a multifaceted design having pictures and audio pronunciation
- It provides learning through layered interface for wider audience
- It allows student and teacher participation and engagement
- It has a learner friendly interface for ease of learning
- It is accessible on mobiles, smart devices, computers, *etc.*
- It is available in online and off-line mode.

This tool can assist the teachers in better classroom management and make learning Hindi an interesting activity. Also, this tool can assist self learners using the layered approach.

3.3 Resource used: Hindi Wordnet

Hindi Wordnet, a digital language resource, is an online lexical repository having synonymy set called as synset. Synset contains a gloss (definition) and an example sentence. Wordnet is linked by semantic relations like hypernymy (*is-a*), meronymy (*part-of*), troponymy (*manner-of*), *etc.* and by lexical relations like antonymy, gradation, *etc.* (Bhattacharyya, 2010). It was originally developed for the research in the area of Natural Language Processing. Hindi wordnet, being a rich lexical resource, which is a dictionary cum thesaurus, have been used as a resource for the development of this digital aid. In particular, the tool uses Hindi wordnet's gloss, examples, synonyms, ontological information, lexico-semantic relations. Some of the above information is modified as per the level of the learner.

3.4 A Layered Interface

Hindi Shabdmitra has been designed for a wider range of target audience. Keeping in sight the level of the learners, the interface has a layered architecture. It has the following five layers:



Figure 2: Class wise search in *Hindi Shabdmitra*

- Level 1 (for classes 1 and 2)
- Level 2 (for classes 3, 4 and 5)
- Level 3 (for classes 6, 7, 8, 9 and 10)
- Level 4 (for classes 11 and 12)
- Level 5 (for classes above 12, researchers, language learners, *etc.*)

The same search-word can be studied by the learners of all 5 levels. At each level incremental information is displayed. The depth of content displayed in terms of synonyms, grammatical information, ontological information will vary from level to level.

3.4.1 Class-wise Search Selection

The tool has been devised keeping in mind the different school curriculum based on the affiliations to various governing bodies responsible for standardization of school education, *i.e.*, CBSE¹³, ICSE¹⁴, state boards, *etc.* In class-wise search, a 'board' is selected followed by 'class number' and 'lesson number'. This selection allows the teacher to choose the words from the syllabus which she/he is going to teach in class to students. The major advantage here is that the tool covers all the vocabulary in a given class as these words were manually collected from the school curriculum. This will assist teacher in teaching all possible words available in a given lesson. At the same time, the word related grammatical features like gender, countability, *etc.* and lexico-semantic relations like antonyms, synonyms, *etc.* can be taught to students. Figure 2 shows an instance of class wise search explaining the concept of a word 'माँ' (*maa*,

¹³<http://cbse.nic.in/newsite/index.html>

¹⁴<http://www.cisce.org/>

a mother). In this example only परिभाषा (*paribhaasha*, a gloss or concept definition), वाक्य में प्रयोग (*vaakya meM prayoga*, usage in an example), बहुवचन (*bahuvachana*, plural) and समानार्थी शब्द (*samaanaarthii shabda*, synonyms) has been selectively displayed. Here, for class 1 to class 5 the gloss and example sentence from original Hindi Wordnet is further simplified by providing the simple words in the definition so that the students at these levels can easily pick-up and learn concept comfortably. At the higher classes the more information like lexico-semantic relations like hypernymy, holonymy, *etc.* along with grammatical features like transitivity, kind of noun or verb, *etc.*, is provided.

3.4.2 Level-wise Search Selection

Level wise search interface is designed for the informal non-curriculum based scenario where any person can learn a given word and understand it at his/her own pace. In this interface, the search is not restricted to the vocabulary of a given class and lesson. Here the learner has two options to follow. One, where the learner is not sure of his/her expertise of knowledge. In such case, the information can be accessed in small portions so that the learner is able to grasp it better. Once comfortable with the low level content, the learner can opt for more detailed information about the search-word. The other flow, where the learner is aware and can choose the level based on his/her knowledge.

Level 1 is for beginners, level 2 is for intermediate learners, level 3 for proficient, level 4 for advanced and level 5 for experts. The amount of information displayed is varied based on the level selected. In each level the information is rendered based on its part-of-speech category and grammatical properties.

Figure 3 shows the level wise search for level 2. In this figure, the information rendered in Hindi is परिभाषा (*paribhaasha*, a gloss or concept definition), वाक्य में प्रयोग (*vaakya meM prayoga*, usage in an example), बहुवचन (*bahuvachana*, plural), समानार्थी शब्द (*samaanaarthii shabda*, synonyms), लिंग (*liMga*, gender), संज्ञा के प्रकार (*saMGYaa ke prakaara*, kind of noun) and गणनीयता (*gaNaniiyataa*, countability). Like Class-wise, there can be more information at each levels depending upon the part-of-speech category and the grammatical features of a search-word.

Since, this is an era of smart devices such as mobiles, tablets, *etc.*, the android based mobile app



Figure 3: Level wise search in *Hindi Shabdmitra* for *Intermediate learner* (Level 2)

have been developed. Figure 4 shows the developed mobile interface for *Hindi Shabdmitra*.

4 Field Response

As part of testing the tool, the field trial of the *Hindi Shabdmitra*'s web and app interface was done at 3 local schools with around 400 students and 10 teachers participating in the exercise. The feedback was sought for the content, ease of handling the application, classroom impact and overall experience by teachers and students. Our observation and feedback from the teachers clearly indicate that it helped teachers in explaining concepts clearly with the help of illustrations and simplified concepts. Audio clips helped in understanding the pronunciation of a given word. The aid assisted the teacher in better classroom management, reduced effort of reiterating the concepts for better retention and having the standardized pronunciation by the native Hindi speaker. The application has been

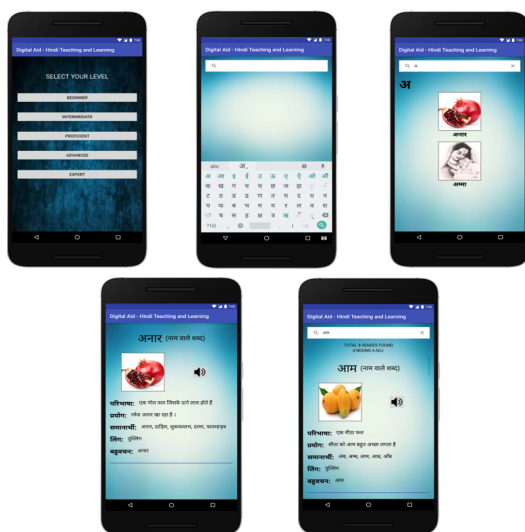


Figure 4: Mobile App for *Hindi Shabdmitra*

improved based on the feedback received by students and teachers.

5 Conclusion and Future Work

With technological advancement, education domain is shifting from a traditional knowledge-transfer model to a collaborative, multi-sensory, self-paced, engaging model with the flexibility of anywhere anytime learning. Based on Hindi Wordnet, *Hindi Shabdmitra* is one such comprehensive e-learning tool which helps in learning Hindi language, pronunciation, grammar and understanding the concepts through illustrations, definition and examples. It caters to a wide range of audience and is available in both web based and app based formats for flexibility of usage. It is well received by the learners in the initial phase of launch. This aid shows how a semantically rich lexical resource like Wordnet, originally developed for research purpose, can be modeled for practical usage in education domain.

In future, the authors intend to include interactive assessment module for evaluations and other game based assessment modules for fun learning. It can be extended for learning other Indian languages. Further, the illustrations, audio, grammatical features, simplified gloss, etc. of *Hindi Shabdmitra* can act as an enriched resource.

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¹⁵<http://www.cfilt.iitb.ac.in>

¹⁶http://www.tatacentre.iitb.ac.in/digital_aid.php

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