

## Evaluation of Hypermedia Tools in Terms of Usability Heuristics for English Language Teaching

**Vikas Rao Naidu**(Corsspondent author)

Department of Computing  
Middle East College, Muscat, Oman  
Email: vikas@mec.edu.om

**Shyamala Srinivas**

Department of Management Studies  
Middle East College, Muscat, Oman

**Mahmood Al Raisi**

Department of Computing  
Middle East College, Muscat, Oman

**Vishal Dattana**

Department of Computing  
Middle East College, Muscat, Oman

### Abstract

The technology-assisted teaching and learning process has seen a spurt in growth in the last two decades. The education technology field has rapidly embraced new tools and techniques to enhance the student learning experience. With the evolution of multimedia elements such as digital images, audio, video, graphics, and animation, the learning supported by technology has made learning flexible and accessible in terms of time and place. With Wi-Fi enabled campuses, it is much easier for students to learn using their smart devices enabled by hypermedia content. Hypermedia, also known as active media, is the multimedia content that brings in interactivity, where the user can interact with the system, rather than viewing the content in passive mode. This helps in generating a dialogue between the system and user, sustaining user interest. Some examples of hypermedia are interactive quizzes, games, interactive videos, etc. This study aims to investigate and evaluate four interactive tools, namely FluentU, Duolingo, Livemocha, and Hello English, which are designed for language learning. A qualitative assessment of the applications, including a review of past literature on language learning using tools, was undertaken. The expert evaluation or assessment was done using Jakob Nielsen's ten heuristics or design guidelines. The objective was to compare the applications by measuring their usability against the standard heuristics. The goal of any usability study is user satisfaction. Through this interface evaluation, the researchers have concluded for designers that could be considered during future development of hypermedia-based tools.

**Keywords:** language learning, HCI, interactive, usability, evaluation, and heuristics

**Cite as:** Naidu, V. R., Srinivas, S., Al Raisi, M., & Dattana, V. (2020). Evaluation of Hypermedia Tools in Terms of Usability Heuristics for English Language Teaching. *Arab World English Journal(AWEJ)*. Proceedings of 2<sup>nd</sup> MEC TESOLConference 2020:133-149.  
DOI: <https://dx.doi.org/10.24093/awej/MEC2.10>

## Introduction

Learning has moved from the brick and mortar model to a brick and click or click and mortar mode in the current digitally enabled world. At the turn of the 20th century, with the advent of the first generation of computers came the prospect of using devices to support all humans' processes were involved in as part of their life. This also extended to learning and education. As the speed of processing and the hardware and software powers improved, computers became more and more part of daily operational life at the professional and personal levels. The multi-disciplinary domain of Human-Computer Interaction (HCI) became an avid area of research and development. The focus moved from the mere use of technology to speed up operations to the usability aspects of keeping the user satisfied and controlling their interactions. Today, learners do not depend only on the teacher for learning, but also on scores of resources that are available openly and freely on the web. Language learning has seen an upsurge in interactive websites, virtual environments, and Artificial Intelligence (AI) (Wang & Petrina, 2013). Latest advancements, such as the involvement of machine learning with the Learning Management Systems (LMS), have opened new dimensions. Learning analytics generated as a result of interactivity helps predict student progress (Naidu, Singh, Hasan, & Al Hadrami, 2017). One of the essential stages of interface development in HCI is the evaluation of the interfaces not only by experts but also by users to ensure the needs of the user are getting met. A designer's satisfaction with creating a beautiful graphical interface may become useless if the user's psychological shortfalls and dialogues are ignored (Dix, Finlay, Abowd, & Beale, 2004).

There are many interactive multimedia-based tools available for almost every domain these days. And still, many software industries and developers are continuously working towards developing such solutions for the future. For an interactive application designer, the user interface plays a vital role, with the ultimate goal being user satisfaction.

The purpose of this study is to investigate the interfaces, and the interactive aspects of four chosen English language learning applications or apps from the perspective of usability. The aim is to apply Nielsen's heuristics, which are considered quintessential even today after 25 years after their release in 1994. The heuristics will be applied or checked on those interfaces, and a comparative analysis would be presented.

The research seeks to address questions such as:

- Do the applications or apps adhere to the basic principles of usability, leading to user satisfaction?
- Are the goals of interaction (language learning) suitably met by these tools?

The researchers used a qualitative evaluation method supported by a literature review to undertake the study. As part of the heuristic evaluation, the researchers, as design experts, tested the applications or apps against the principles and compared the compliance level with each heuristic. This method is more of an expert inspection method, and here, the regular interface users are not included as part of evaluators. Each user has a different and distinct learning need and style. The study highlights the features and interfaces layout of the tools, which may also help learners choose their preferred software tool.

## Literature Review

Human-Computer Interaction had come a long way from its roots in the decades before the millennium turn when computers became a device used for non-scientific purposes. Still, usability is the major or core element to date. Humans handling computers were increasingly less trained and did not possess much technical knowledge. Initially, users of computers experienced lots of frustrations and felt the use of computers as challenging. The term ‘User-friendly applications’ started gaining momentum among application developers, and usability became their goal (Cockton, 2020).

Usability can be indicated as a qualitative measurement of how easy or challenging the interface is when used by a user (Nielsen, 2012). It also encompasses the techniques or methods used by a designer in the development process to make the interface easy to use. Nielsen also defined usability of five primary attributes like learnability, efficiency, memorability, errors, and satisfaction. The focus was not only on the interface but also on the response the interface gives during the interaction with different users (Nielsen, 1994).

CALL or Computer Assisted Language Learning is a domain or area which interlinks language learning and computing. Being interdisciplinary nature, it is connected to HCI, psychology, instructional design, computational linguistics, Second Language Acquisition (SLA), and artificial intelligence (AI). CALL programs have not been favorably accepted and critiqued by language experts as they were found to be more leaning to the technological advantages than catering to the pedagogical aspects.

CALL was defined by Chapelle and Jamieson (2008) as “the area of applied linguistics concerned with the use of computers for teaching and learning a second language” (as cited in John, 2018, p. 1). But Kern (2006) felt that in the current times where mobile, tablets, and other technologies play a more significant role. The terminology of TELL or Technology Enhanced Language Learning brings in the feature of learning anywhere, anytime, giving flexibility to the learner and is more suitable for the current times, as observed by Garrett (2009).

The use of technology in language acquisition has its pros and cons. Some of the advantages are: The anxiety or pressure felt like part of the learning process is much decreased (Hong, Huang, Hsu, & Shen, 2016) while Felix (2008), as cited in John (2018), feels that there is increased engagement with more fun interaction through activities like games, storytelling, role plays and mocks which stoke participant’s imagination. Kessler (2018) mentions that though the learning process adapted does not have any physical interaction, it still provides personalized learning with analytics that encourages the learner to be more participative and active. Their progress in learning can be easily tracked too through the analytics (Becker, Rodriguez, Estrada, & Davis, 2016). Recent trends in education technology such as usage of interactive multimedia-based authoring content, game-based learning, use of free and open-source tools, and other technologies such as machine learning, has revolutionized the teaching and learning process (Naidu, Singh, Al Farei, & Al Suqri, 2020; Mohammed, Naidu, Hasan, Mustafa, & Jesrani, 2019; Sharma & Naidu, 2020; Poloju & Naidu, 2020). AI applications have brought in adaptive or immersive learning. In their study, Wang and Petrina researched how learning analytics can define the design of intelligent language tutors. While they studied AI tools like Chatbot Lucy, other studies were done on online

language learning platforms like Busuu, Duolingo, or Memrise (Becker et al., 2016). These tools use a perceptive interface and take a step closer to achieve a human-human interaction (Gawande, 2010).

John (2018) concluded from different studies researched that technology-based language learning provides a self-paced learning experience giving the learner the freedom (Reinders & White, 2016; Kessler, 2018) with the learner in more control of their learning process that gives them a feeling of empowerment (Becker et al., 2016; Jones et al., 2017). Learners are exposed to multiple activities in a cohesive mode, which improves their reading, writing, speaking, and listening skills using visual, auditory, and kinesthetic cues that cater to different learning styles and strengths (Blake, 2016; Felix, 2008). Learning happens in virtual communities in which the learner has an individual online social identity that provides the confidence to interact with native experts (Godwin-Jones, 2015; Blake, 2016; Garrett, 2009; Kessler, 2018) while also providing a collaborative, cooperative knowledge building environment (Kessler, 2018; Reinders & White, 2016). A rich near-real immersive experience can be enabled using technologies like Virtual Reality (VR) example, virtual worlds like Second Life, Augmented reality (AR), videoconferencing. Online simulations and games allow teachers to get access to a massive body of knowledge (big data) which will aid them to construct more enhanced knowledge acquisition experiences (Blyth, 2018; Becker et al., 2016; Kessler, 2018; Godwin-Jones, 2017).

Moreover, learners can interact with their peers and get individual advising and support from teachers (Reinders & White, 2016), thus improving their language skills through a variety of support applications like discussion forums, chats, emails, blogs, and other web-based tools to provide opinions like Google Docs WhatsApp, Kaizala, etc. (Kessler, 2018). The online collaborative learning space defines a better and feasible environment for the community of learners to join and interact on various topics from different disciplines. However, a proper framework must be determined based upon the nature of the subject and content. (Al Mamari, Naidu, Agarwal, 2019; Al Kalbani, Rao Naidu, Rani Gupta, Al Sawafi, 2020; Mustafa, Naidu, Mohammed, Jesrani, Hasan, Hadrami, 2019; Agarwal, Naidu, Al Mamari, 2019). Chapelle and Voss (2016) felt that real-time feedback is possible and with the different feedbacks for written tasks can be provided through automated tools, including voice feedback (Golonka, Bowles, Frank, Richardson, & Freynik, 2014; Kessler, 2018), though apprehensions on the usage of chatbots for text chat practice is observed (Golonka et al., 2014; Blyth, 2018; Chapelle & Voss, 2016; Vogt, de Haas, de Jong, Baxter, & Krahmer, 2017). With the pandemic situation across most countries, continuity of learning can be enabled through the mobile apps, which support localization or situated teaching (Godwin-Jones, 2016), that is more important even from the cultural viewpoint of language acquisition as Lave and Wenger (1991) clarified that the social context is more significant than the conceptual knowledge per se.

There are some disadvantages or challenges, though, as suggested by Godwin-Jones (2016), that the language taught online may be more or less everyday or not as per the formal textbook prescription. This could become challenging as per Kern (2006) who felt that the students may not be able to differentiate between the formal and informal usage of the language as per context in Computer-Mediated Communication (CMC) and that “CMC language is often less correct, less complex, less coherent than other forms of language use” (p. 194). A teacher can add more value

and make more sense to learners involved in a dynamic online communication from a cultural viewpoint, stated Blyth (2018). A study by Haugh (2017) warned that a learner's dependence on translation tools could be even more of a problem, as the more delicate subtleties and cultural shades of the language are lost in translation.

Teachers need to adapt to and adopt technologies to use them effectively in their teaching or even to be able to evaluate the tool (Godwin-Jones, 2016; Brick & Cervi-Wilson, 2015). Additionally, teachers should be able to realize that to achieve the language learning objectives, they need to prescribe or use those tools which support in reducing the mental load and deliver recognize rather than recall as an aspect of usability (Chapelle & Jamieson, 2008; Felix, 2008; Garrett, 2009; Hubbard, 2013; Godwin-Jones, 2015, 2016; Sydorenko, Hsieh, Ahn, & Arnold, 2017). The process of learning is in the current times is becoming more user-centric, and therefore, teachers need to be more of facilitators and provide support and guidance (Becker et al., 2016; Blyth, 2018; Godwin-Jones, 2015; Kern, 2006; Kessler, 2018; Reinders & White, 2016). This can be an unsettling experience for some teachers, if they are not able to cope up with the technological changes and learner needs in a particular context (Kessler, 2018; Godwin-Jones, 2015). Teachers must research different tools and test them for synchronous and asynchronous teaching (Godwin-Jones, 2015, 2016). Here the role of the teacher as an active learner is suggested either through the use of online courses or being part of a community of practice, which will help the teacher gain the knowledge and make it easier to deliver (Godwin-Jones, 2015).

User interface evaluation is a necessary stage in the design of a product or prototype, which provides feedback on the fulfillment of the design goals from the user's perspective. The mental model of the user's expectation could be different from the visualization of the designer. The evaluation process helps in bridging the gaps. Though evaluation of any design is undertaken using an iterative approach right from the prototype design. The final product can also be tested using different evaluation techniques like cognitive walkthrough, behavioral analysis, GOMS (Goals, Operators, Methods, Selection rules), heuristic evaluation, and other qualitative methods like interviews, think-aloud or quantitative techniques like surveys or questionnaire. The aim is to understand the interaction efficiency and effectiveness and see how comfortable the user is in using the interface. The psychological aspect, which includes the cognitive processes involved, is analyzed and understood in depth during evaluation (Dix et al., 2004). In their research, Joyce, Lilley, Barker, and Jefferies (2019) empirically validated the use of heuristic evaluation for mobile applications. They felt that heuristic evaluation is not the routine testing, which is typically applied late in the development stage but is a holistic technique that can be used to the entire product life cycle from the design to the actual development stage.

In a detailed study that comprised of a comprehensive set of checklist developed under each heuristic, Gómez, Caballero, & Sevillano (2014) experimentally used 158 sub-heuristics or checklist as a tool to evaluate mobile application interfaces and proved that evaluation using the adapted heuristics could be even undertaken by an individual not much aware about usability techniques.

Research done by Son and Park (2012) concluded, that though there are many websites providing language learning resources, they do not have the cultural interaction in mind, and are

more into presenting the material and activities. Their research brought out the lack of focus on the cultural and linguistic development of learners by learning through online tools. The study essentially looked at usability across the four dimensions of general, pedagogical, technical, and intercultural usability. They felt that designers should consider all these as part of design thinking, especially for language learning websites, while developing the content, interaction, and interface design.

## Methods

### *Evaluation of e-tools with Respect to Heuristics*

The evaluation of e-tools that are used for this study are based on the implementation or execution mode of the tools. These four tools are free-access tools which are available online and are free to use. However, the free usage is with limited features, and a full-fledged implementation needs the purchase of an educational license. On the other hand, there are some free and open-source tools, that can be used to author e-learning content. Game-based learning is one of the methods, that can be used for basic levels in English modules. Some free and open-source tools can facilitate this by supporting full-fledged content authoring without any restrictions (Naidu et al., 2017).

The implementation of the tools that are being studied here, should be done by following an appropriate method which measures features and functions. The process may involve analysis of subject area (Listening, Speaking, Reading, Writing skills), identification of proper tools, considering the HCI principles, and making use of e-tools (Al Mahdi et al., 2019). The tools that were evaluated concerning the ten heuristics of Jakob Neilson were as follows:

- FluentU
- Duolingo
- Live Mocha
- Hello English

The tools were evaluated based on broad rules of thumb, which are the criteria, and finally, the conclusions and recommendations were drawn based on the evaluation (Nielsen, 1994).

“These ten heuristics or principles are:

- a. Visibility of system status
- b. Match between system and the real world
- c. User control and freedom
- d. Consistency and standards
- e. Recognition rather than recall
- f. Flexibility and efficiency of use
- g. Aesthetic and minimalistic design
- h. Error prevention
- i. Help user recognize, diagnose, and recover from errors
- j. Help and documentation.”

### *FluentU*

The first tool to evaluate English language learning in terms of its user interface was FluentU. This tool can be used in online mode, and it has its corresponding mobile version available. As seen in Figure one, the most important user interface is designed to consider all necessary HCI

(Human-Computer Interaction) principles. The initial screen gives a clear indication, if the system is available for its usage, following the first heuristic of usability. This application depends on internet connectivity; it shows an error message if the internet connectivity is not found.

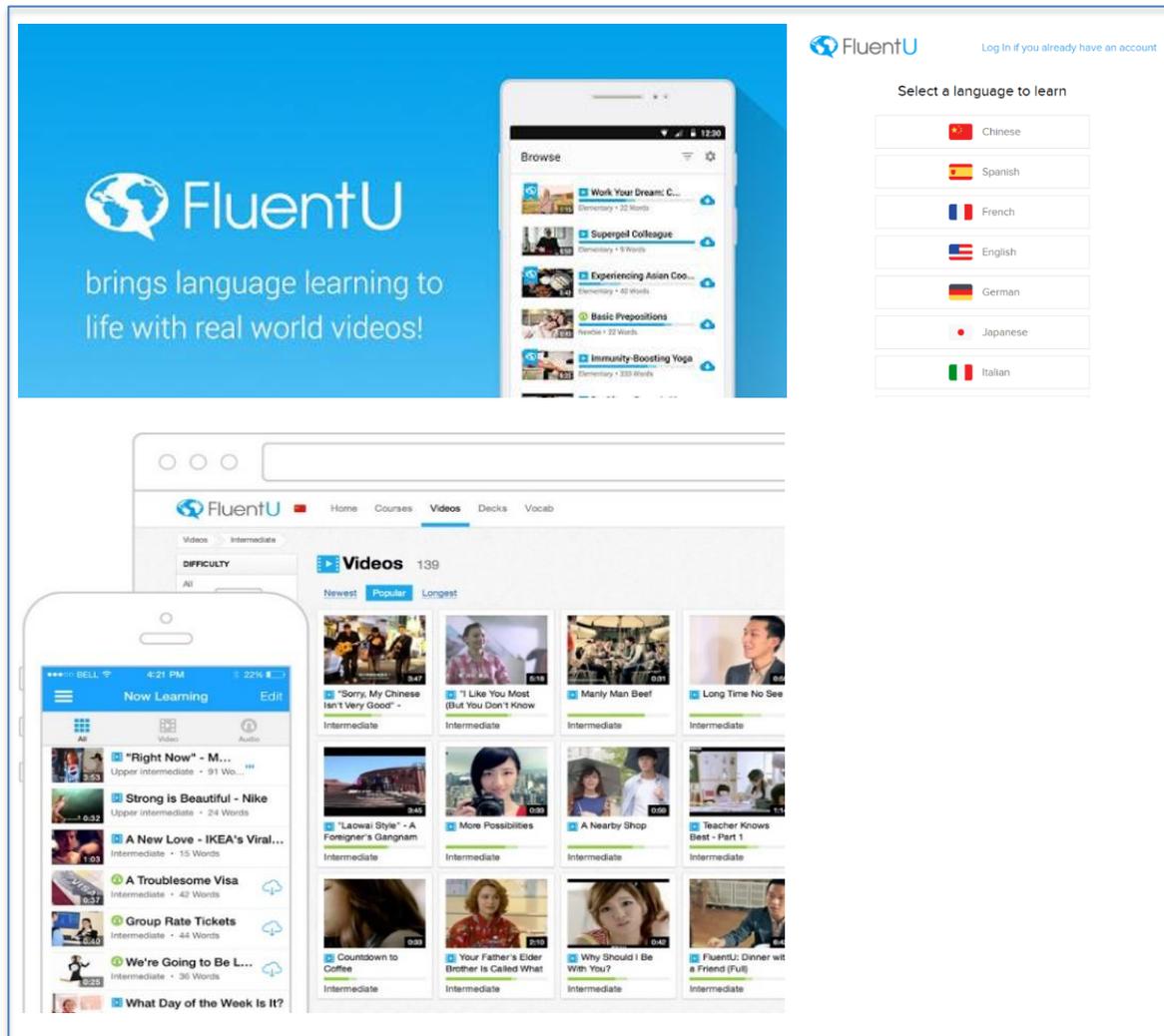


Figure 1. User interface of FluentU

The interface has easy to understand keywords, and language, which can be followed by a novice user as well as an expert user. The user interface provides easy navigation or flow by which the user can navigate from one screen to another with provision to exit at any point of time. Users can take the assistance of help and documentation at any screen if they get stuck at any step. The entire application is full of thumbnails of video clips, and hence it is easy for a user to identify the subject area. The mobile version of this tool is light on mobile devices. FluentU uses video tutorials for learning the language. Real-time captions for better understanding and providing the interaction for the users are observed. Quizzes used by this tool for improving the users' vocabulary, and the videos are also utilized for creating the quiz-based vocabulary development of the users. FluentU uses the audio dialogs for the users, and they are downloadable so that users can learn offline.

### *Duolingo*

This tool allows multi-language learning i.e., it can be used to learn any language by keeping any primary language as the base. Here the primary language means the native language, such as Arabic, Hindi, etc. It has a very simple user interface, and anyone can learn the English language at their own pace. It has limited features in the free version while extended features in the paid version.

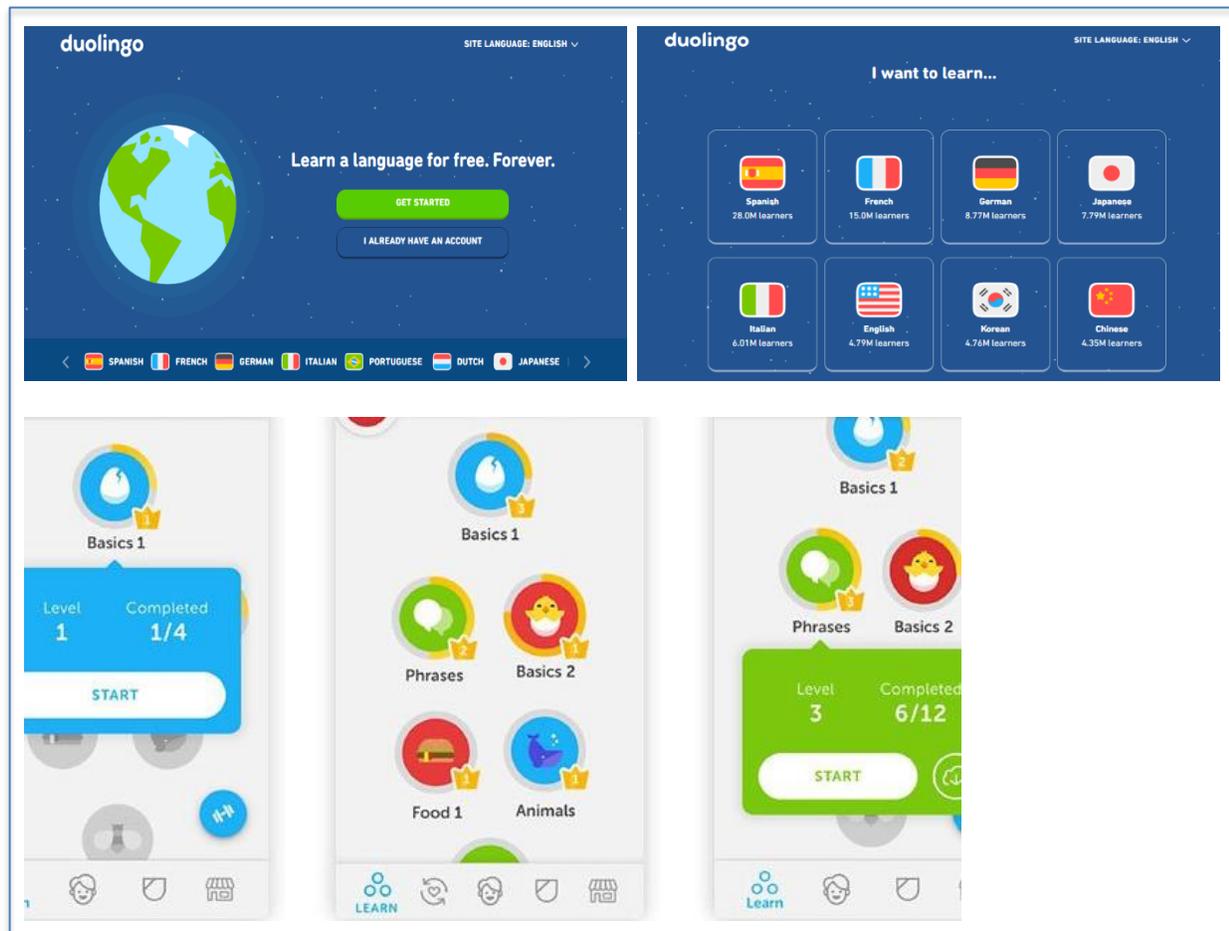


Figure 2. User interface of Duolingo

In terms of the user interface, as shown in Figure two, Duolingo has a very easy to understand and flexible user interface. It is available on both desktop and mobile versions. Unlike FluentU, the interface consists of easy to recognize icons, which adhere to the heuristic ‘match between system and the real world.’ The aesthetic elements in the user interface are well placed and planned with a minimalistic design. The system status online/offline can be found at the beginning during login. Apart from these, it also shows the status of level and completion stage. The interface allows easy navigation from one page to another and has an exit option available at any point in time. Duolingo provides users the possibility of personalizing their learning style. Exercises are tailored to help the users to learn and review the vocabulary effectively. It offers immediate grades as other tools,

and it encourages the users to learn more and get the rewards as virtual coins as it happens in gaming. Duolingo is also available for the classroom as a learning platform.

### *Livemocha*

The third tool assessed in this study was Livemocha. This tool can also be used to learn many commonly known languages from selected native languages. This tool works in the online mode that requires a free account registration on the Livemocha website. The interface is comparatively simple, and at the first screen itself, the user can select the language (English) that he/she wants to learn from the desired native language, as shown in Figure three.

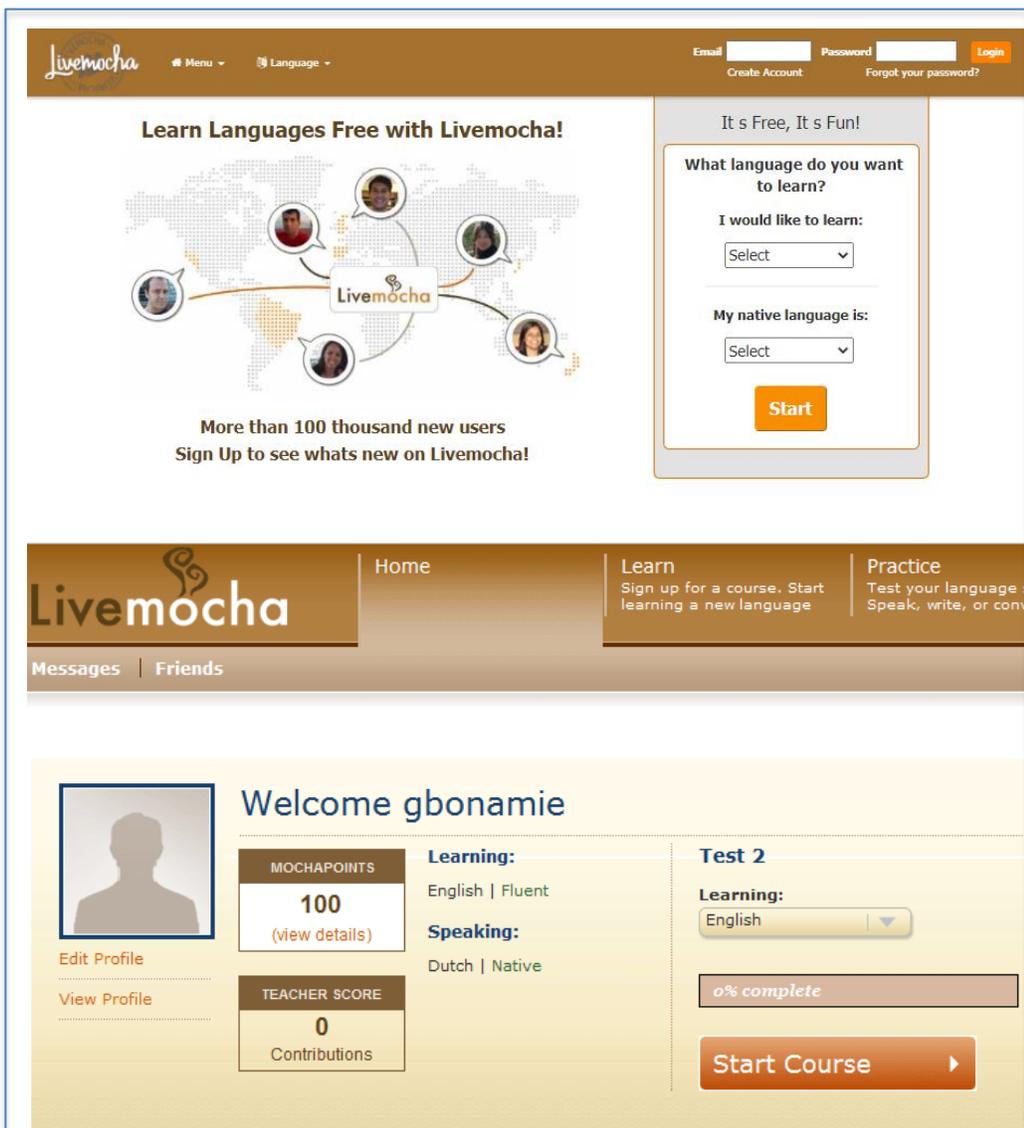


Figure 3. User Interface of Livemocha

Livemocha and its user interface design is designed with minimalistic design elements and hence aesthetically simpler compared to other tools. After signing in, the user can take up the complete

course to learn English through a self-paced course. It also involves an assessment at the end to assess the knowledge learned. The user interface has easy to understand language, which is good enough for a self-paced learning process by a novice user and an expert user. Livemocha fuses conventional learning methods with online practice and interaction with speakers of native languages from all over the world. The internet is the most open, socially relevant forum for language learning due to growing broadband penetration and VOIP adoption. Livemocha utilized the latest trends in social networking to connect to people and learn languages from native speakers. Livemocha works similar to the social networking site where you can interact and learn from the speakers from any part of the world. The main benefit of this approach is that you learn the language from the specialist or experts or native speakers or people who use the vocabulary in their routine life, not only for communicating with specific users or to learn technical stuff.

### Hello English

The final tool evaluated in this study was Hello English. This tool also works online with a free user account to be created before using it. It is available only for mobile devices (Android and Windows). If we consider the user interface, it appears like a typical layered based mobile interface with very simple text-based buttons. On the first screen itself, we can select the native language such as 'English from Arabic.'



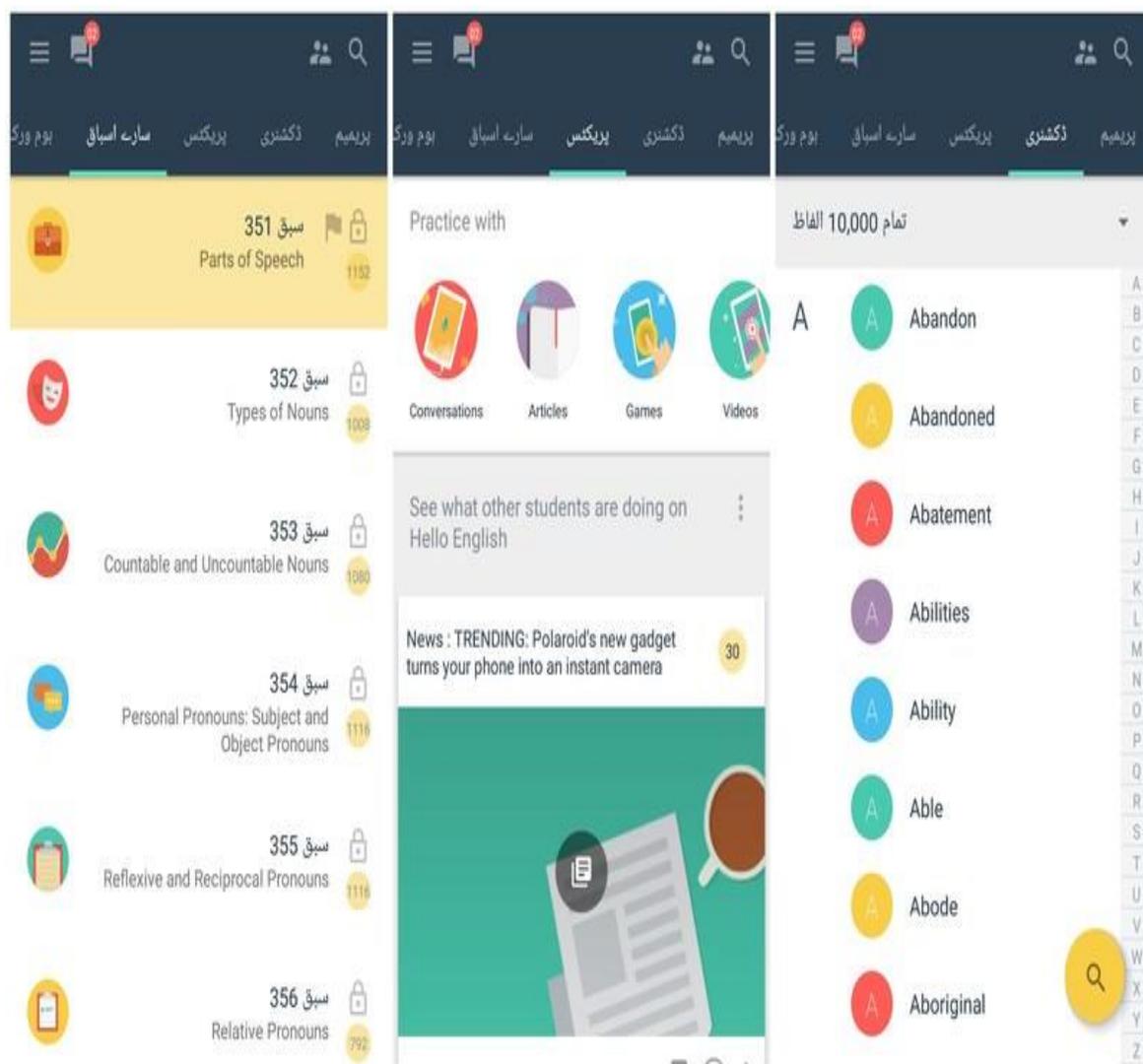


Figure 4. User interface of Hello English

As seen in Figure four, the user interface of Hello English has very simple icons and buttons in simple English language. The interface is easy to navigate from one page to another through the menu present at the top. As it is a mobile application, it provides the freedom to exit the application at any time. The icons are easy to recognize, and the user doesn't have to stress their memory to recall them. It also has help and documentation. Thus allowing the end users to refer to tutorials or guidelines to use this application. The app encompasses all four facets of language acquisition: reading, writing, listening, and speaking, with advanced technology for voice recognition that enables learners to talk in the app and have useful conversations in real life. For a full learning experience, the Hello English app pair immersive lectures with enjoyable games and speaking practice. The app provides innovative and engaging contextual learning resources that help learners develop their English vocabulary by leveraging news, sports, and entertainment. The majority of the Hello English features work offline to make learning seamless and save user's internet data.

**Evaluation and Findings**

The table 1. indicates the comparison of the above tools with respect to the corresponding heuristics.

Table 1. Comparison of User Interface with respect to the Heuristics (H)

Tools →	FluentU			Duolingo			Livemocha			Hello English		
	Met	Partially Met	Not met	Met	Partially met	Not met	Met	Partially met	Not met	Met	Partially met	Not met
↓ Heuristics / Compliance												
H1 – Visibility of system status	√			√			√			√		
H2 – Match between system and the real world	√			√			√			√		
H3 – User control and freedom	√			√			√			√		
H4 – Consistency and standards	√			√			√			√		
H5 – Recognition rather than recall	√			√			√			√		
H6 – Flexibility and efficiency of use	√			√				√		√		
H7 – Aesthetic and minimalistic design	√			√				√		√		
H8 – Error prevention	√			√				√		√		
H9 - Help user recognize, diagnose, and recover from errors	√			√			√			√		
H10 - Help and documentation	√			√				√		√		

After assessing all the four e-tools based on interactive media (hypermedia) content, it was found that the user interface of all these tools adheres to most of the usability heuristics. Considering the minimalistic design principle, Livemocha could be selected. On the other hand, Duolingo has a very user-friendly and colorful interface with very well-organized icons and buttons. This is applicable for its both version – desktop as well as mobile. FluentU also has a user-

friendly interface based on thumbnails. It has many video clips, and hence the internet bandwidth required for this is comparatively more for seamless usage of this application. All the tools have easy navigation from one page to another page and provision to exit at any point in time. The languages used in the user interface is easy to understand by anyone and hence enable any user to use these applications with basic knowledge of computers and mobile devices. Help and documentation are provided in all the applications that allows the user to explore more usage options. All these help files are available in online mode, and some tutorials are also available in video format, allowing end-user to learn the use of these applications very quickly. It is recommended that Hello English tools should also be made available on desktop mode.

Moreover, all these tools need user registration at the beginning stage. However, FluentU requires user registration. Even for the trial period, it needs credit card details to be registered with the website, which some of the end-users may not prefer, although they will not be charged during this period. Making a trial period, completely free to use without any limitations, will allow users to explore more about these tools. They will be able to decide better which software tool they should prefer to learn the English language. For the TESOL users, while taking assistance of any IT tool, ease of usage and implementation becomes the prime factor. User interface plays a vital role in the selection of such hypermedia-based tools. Hence, the developers need to consider this critical aspect during the design and development of these e-learning tools.

The approach adopted in this study was based on observation or inspection and comparison concerning the pre-defined heuristics. However, real-time implementation and students' feedback will elaborate this further to provide actual results.

## Conclusion

This study indicates that the tools for language learning that have a user interface designed on the principle of What You See Is What You Get (WYSIWYG), adhere to most of the heuristics of usability and HCI principles. There are many GUI based tools available these days for English language learning; however their usage and good review solely depends upon their user interface. The four software tools selected for the inspection purpose in this study are meant to be used online and based on internet connectivity. User interaction with these tools also depends on the device on which the tools are being accessed. For some tools, the user interface automatically adjusts to a minimalistic version when accessed through mobile devices, whereas their full-fledged version is available on desktop for complete access with all details given on each page. The heuristics which are considered here for evaluation purposes cannot be termed as broad HCI principles. They are rather seen as broad rules of thumb. Complying with them would mean that the designer has taken into consideration the user focus. User satisfaction is relative, based on the level of current language understanding and the tool chosen. But, the user interface designs for these tools could be modified according to usage and application. The user interface designers must consider one important aspect while designing the user interface, flexibility of use. This means, any user interface of e-learning based application / software tool, should be easy to understand by both novice as well as expert user. There will be a greater understanding, if the evaluation could also involve users and their perspective when using the tools and to gauge the language prowess before and after the use of tool. This the researchers see as future research scope.

### Acknowledgement

Authors would like to acknowledge the websites and mobile applications of all the four applications (FluentU, DuoLingo, Live Mocha and Hello English), whose user interfaces were studied and evaluated in this research. Copyright of all the screenshots (figures) furnished in this paper lies with their respective websites in which they are published.

### About the Authors:

**Vikas Rao Naidu** has attained the status of Senior Fellow of Higher Education Academy of UK. He has completed Masters in Computer Science & Engineering from Anna University India. Apart from these, he is also a PG Certificate holder in Higher Education Professional Practices from Coventry University, UK. Currently, he is pursuing his PhD in Computer Science & Engineering and the domain of his research is “Education Technology”. His research area includes E-Learning, Interactive media authoring in education, Learning analytics and Business Intelligence.

**Orcid ID:** <https://orcid.org/0000-0001-7354-172X>

**Shyamala Srinivas**, is a member of faculty of Management Studies and Computing at Middle East College. A Senior Fellow of the Higher Education Academy, UK, she is also a certified E-Business Professional and member of EC- Council. With a strong foundation in Information Technology and computer applications her work experience of more than 26 years spans across corporate and higher education in India and Oman. Her core expertise and research interests lies in the areas of Knowledge Management and Business Intelligence, Usability studies and Human Computer Interaction, Software Engineering and Project Management.

**Orcid ID:** <https://orcid.org/0000-0002-5890-3910>

**Mahmood Al Raisi** is a final year student of B.Sc. (Hons) in Multimedia Technology at Middle East College. His area of specialization is 3D Modeling and Animation and game development using 2D and 3D technology. He has successfully completed his training from ITA (SAS) in Virtual Reality, after which his major area of interest is Virtual reality and Augmented Reality based application development. His final year bachelors project is also based on gaming, in which he is developing a vocabulary game for Foundation students of Middle East College.

**Orcid ID:** <https://orcid.org/0000-0002-0030-0586>

**Vishal Dattana** is the Moodle Administrator in Computing Department at Middle East College (MEC), Oman. He achieved his Bachelors in computer application from Kurukshetra University (KUK), Kurukshetra, Master’s degree (MCA) from Kurukshetra University (KUK), Master’s degree (M.Tech) from MMU, and completed his PhD. in Optimization of stability and security in wireless networks from Monad University in 2009. His research interests and teaching are in the areas of MANETS, Linux, Network security, M-Commerce, IoT and AI applications. He is actively engaged in research and publication areas of Networking and Higher Education.

**Orcid ID:** <https://orcid.org/0000-0002-0661-1174>

### References

Agarwal, A., Naidu, V. R., & Al Mamari, R. (2019). a Framework To Enhance Learning Experience in Flipped Classroom Based on Student Accountability Towards Active

- Participation. *EDULEARN19 Proceedings, 1*(July), 1569–1577. <https://doi.org/10.21125/edulearn.2019.0464>
- Al Kalbani, B., Rao Naidu, V., Rani Gupta, R., & Al Sawafi, A. (2020). Teaching Mathematics Through Online Collaborative Environment In The Higher Education Context. In *IJAEDU-International E-Journal of Advances in Education: Vol. VI* (Issue 17). <https://doi.org/10.18768/IJAEDU.789432>
- Al Mahdi, Z., Rao Naidu, V., & Kurian, P. (2019). *Analyzing the Role of Human Computer Interaction Principles for E-Learning Solution Design* (pp. 41–44). Springer, Cham. [https://doi.org/10.1007/978-3-030-01659-3\\_6](https://doi.org/10.1007/978-3-030-01659-3_6)
- Al Mamari, R., Naidu, V. R., & Agarwal, A. (2019). a Proposed Framework for Effective Usage of Social Media in Higher Education Establishments. *EDULEARN19 Proceedings, 1*(July), 7337–7341. <https://doi.org/10.21125/edulearn.2019.1755>
- Becker, A. S., Rodriguez, J.C., Estrada, V., & Davis, A. (2016). *Innovating Language Education: An NMC Horizon Project Strategic Brief* (Vol. 3.1). Austin, Texas: The New Media Consortium. Available at [http://cdn.nmc.org/media/2016-nmc-strategic-brief-language\\_ed.pdf](http://cdn.nmc.org/media/2016-nmc-strategic-brief-language_ed.pdf)
- Blake, R. (2016). Technology and the four skills. *Language Learning & Technology, 20*(2), 129–142. Retrieved from <http://dx.doi.org/10.125/44465>
- Blyth C. (2018). Immersive technologies and language learning. *Foreign Language Annals, 51*(1), 225–232. Available at <https://doi.org/10.1111/flan.12327>
- Brick, B., & Cervi-Wilson, T. (2015). Technological diversity: A case study into language learners' mobile technology use inside and outside the classroom. In K. Borthwick, E. Corradini, & A. Dickens (Eds.), *10 years of the LLAS elearning symposium: Case studies in good practice* (pp. 21-30). Dublin: Research-publishing.net. doi: 10.14705/rpnet.2015.000264
- Chapelle, C.A., & Jamieson, J. (2008). *Tips for Teaching with CALL: Practical Approaches to Computer-Assisted Language Learning*. White Plains, NY: Pearson-Longman.
- Chapelle, C. A., & Voss, E. (2016). 20 years of technology and language assessment in Language Learning & Technology. *Language Learning & Technology, 20*(2), 116–128. Available at <http://dx.doi.org/10.125/44464>
- Cockton, G. (2020). *Usability Evaluation / The Encyclopedia of Human-Computer Interaction, 2nd Ed.* Interaction Design Foundation. <https://www.interaction-design.org/literature/book/the-encyclopedia-of-human-computer-interaction-2nd-ed/usability-evaluation>
- Dix, A., Finlay, J., Abowd, G., Beale, R. (2004). *Human-Computer Interaction* (3<sup>rd</sup>ed.). London: Pearson
- Felix, U. (2008). The unreasonable effectiveness of CALL: What have we learned in two decades of research? *ReCALL, 20*(2), 141-161. doi: 10.1017/S0958344008000323
- Garrett, N. (2009). Computer-assisted language learning trends and issues revisited: Integrating innovation. *The Modern Language Journal, 93*(s1), 719-740. doi: 10.1111/j.1540-4781.2009.00969.x
- Godwin-Jones, R. (2015). The evolving roles of language teachers: Trained coders, local researchers, global citizens. *Language Learning & Technology, 19*(1), 10–22. Available at <http://dx.doi.org/10.125/44395>
- Gawande, V. (2010). Effective Use of HCI in ELearning. *The Sixth International Conference on eLearning for Knowledge-Based Society*, Thailand

- Godwin-Jones, R. (2016). Looking back and ahead: 20 years of technologies for language learning. *Language Learning & Technology*, 20(2), 5–12. Retrieved from <http://dx.doi.org/10125/44457>
- Godwin-Jones, R. (2017a). Data-informed language learning. *Language Learning & Technology*, 21(3), 9–27. doi: 10125/44629
- Godwin-Jones, R. (2017b). Smartphones and language learning. *Language Learning & Technology*, 21(2), 3–17. <https://dx.doi.org/10125/44607>
- Golonka, E. M., Bowles, A. R., Frank, V.M., Richardson, D. L., & Freynik, S. (2014). Technologies for foreign language learning: a review of technology types and their effectiveness. *Computer Assisted Language Learning*, 27(1), 70-105. doi: 10.1080/09588221.2012.700315
- Gómez, R. Y., Caballero, D.C., & Sevillano, J. L. (2014). Heuristic Evaluation on Mobile Interfaces: A New Checklist. *The Scientific World Journal*. 2014. 434326. 10.1155/2014/434326.
- Haugh, M. (2017). Translation technology is useful, but should not replace learning languages [Web log post]. Retrieved from <https://theconversation.com/translation-technology-is-useful-but-should-not-replace-learning-languages-85384>
- Hong, Z. W., Huang, Y. M., Hsu, M., & Shen, W. W. (2016). Authoring robot-assisted instructional materials for improving learning performance and motivation in EFL classrooms. *Educational Technology & Society*, 19(1), 337–349. Retrieved from [https://www.j-ets.net/ETS/journals/19\\_1/27.pdf](https://www.j-ets.net/ETS/journals/19_1/27.pdf)
- Hubbard, P. (2013). Making a case for learner training in technology enhanced language learning environments. *CALICO Journal*, 30(2), 163–178. doi: 10.11139/cj.30.2.163
- John, C. (2018). The Evolution and Impact of Technology in Language Education, *Technology and the Curriculum Summer 2018*. Retrieved from <https://techandcurriculum.pressbooks.com/chapter/technology-assisted-language-learning/>
- Jones, A., Kukulska-Hulme, A., Norris, L., Gaved, M., Scanlon, E., Jones, J., & Brasher, A. (2017). Supporting immigrant language learning on smartphones: A field trial. *Studies in the Education of Adults*, 49(2), 228-252. doi: 10.1080/02660830.2018.1463655
- Joyce, G., Lilley, M., Barker, T., & Jefferies, A. (2019). Heuristic Evaluation for Mobile Applications: Extending a Map of the Literature. 10.1007/978-3-319-94947-5\_2.
- Kern, R. (2006). Perspectives on technology in learning and teaching languages. *TESOL Quarterly*, 40(1), 183-210. doi: <https://doi.org/10.2307/40264516>
- Kessler, G. (2018). Technology and the future of language teaching. *Foreign Language Annals*, 51(1), 205–218. Available at <https://doi.org/10.1111/flan.12318>
- Lave, J., & Wenger, E. (1991). *Situated Learning, Legitimate peripheral participation*. Cambridge: University of Cambridge Press.
- Mohammed, Q. A., Naidu, V. R., Hasan, R., Mustafa, M., & Jesrani, K. A. (2019). Digital Education Using Free And Open Source Tools To Enhance Collaborative Learning. *IJAEDU- International E-Journal of Advances in Education*, 13, 50–57. <https://doi.org/10.18768/ijaedu.531636>
- Mustafa, M., Naidu, V. R., Mohammed, Q. A., Jesrani, K. A., Hasan, R., & Hadrami, G. Al. (2019). A Framework For Collaborative And Active Learning For Enhancing Student Engagement. *IJAEDU- International E-Journal of Advances in Education*, 83–93. <https://doi.org/10.18768/ijaedu.531644>

- Naidu, V. R., Al Balushi, H., & Bhatia, S. (2017). Effectiveness of Free & Open Source Tools To Enhance Game Based Learning Experience in School Education. *EDULEARN17 Proceedings, 1*(July), 6604–6609. <https://doi.org/10.21125/edulearn.2017.2505>
- Naidu, V. R., Singh, B., Farei, K. Al, & Suqri, N. Al. (2020). *Machine Learning for Flipped Teaching in Higher Education—A Reflection* (pp. 129–132). Springer, Cham. [https://doi.org/10.1007/978-3-030-32902-0\\_16](https://doi.org/10.1007/978-3-030-32902-0_16)
- Naidu, V. R., Singh, B., Hasan, R., & Al Hadrami, G. (2017). Learning Analytics For Smart Classrooms In Higher Education. In *IJAEDU-International E-Journal of Advances in Education* (Vol. 3). <http://ijaedu.ocerintjournals.org>
- Nielsen, J. (1994). *10 Heuristics for User Interface Design: Article by Jakob Nielsen*. Nielsen Norman Group. <https://www.nngroup.com/articles/ten-usability-heuristics/>
- Poloju, K. K., & Naidu, V. R. (2020). Impact of E-tools in Teaching and Learning for Undergraduate Students. In H. S. Saini, R. K. Singh, M. Tariq Beg, & J. S. Sahambi (Eds.), *Innovations in Electronics and Communication Engineering* (pp. 783–790). Springer Singapore.
- Reinders, H., & White, C. (2016). 20 years of autonomy and technology: How far have we come and where to next? *Language Learning & Technology, 20*(2), 143–154. <http://dx.doi.org/10125/44466>
- Sharma, A., & Naidu, V. R. (2020). a Study on Emerging Trends To Enhance Learning Experience in Higher Education Institutions. *INTED2020 Proceedings, 1*(March), 7391–7396. <https://doi.org/10.21125/inted.2020.1974>
- Son, J.B. & Park, J.Y. (2012). Intercultural usability of language learning websites. *International Journal of Pedagogies & Learning, 7*(2), 135–141. <https://doi.org/10.5172/ijpl.2012.7.2.135>
- Sydorenko, T., Hsieh, C., Ahn, S., & Arnold N. (2017). Foreign language learners' beliefs about CALL: The case of a U.S. Midwestern university. *CALICO Journal, 34*(2), 196–218. <https://doi.org/10.1558/cj.28226>
- Vogt, P., de Haas, M., de Jong, C., Baxter, P., & Krahmer, E. (2017). Child-robot interactions for second language tutoring to preschool children. *Frontiers in Human Neuroscience, Vol 11*. doi: 10.3389/fnhum.2017.00073
- Wain, J., Timpe, L. V., & Oh, S. (2019). Pedagogic Principles in Digital Pragmatics Learning Materials: Learner Experiences and Perceptions. *ETS Research Reports Series* (1), 1–21. <https://doi.org/10.1002/ets2.12270>
- Wang, Y. F., & Petrina, S. (2013). Using learning analytics to understand the design of an intelligent language tutor – Chatbot Lucy. (*IJACSA*) *International Journal of Advanced Computer Science and Applications, 4*(11), 124-131. doi: 10.14569/IJACSA.2013.041117