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INTRODUCING DESIGN THINKING IN HINDI FOREIGN LANGUAGE EDUCATION: AN INNOVATIVE APPROACH FOR ENHANCING HOLISTIC PROFICIENCY

Abstract. The vast changes of the 21st century have greatly contributed to our life. Technological advancement, internet, instant information, globalization and wider connectivity have provided us better facilities on the one hand and created problems and challenges on the other hand that are different from the previous one. The traditional methods and approaches are no longer sufficient and adequately effective to solve the problems emerged out of the changed environment of 21st century which is moving fast towards the artificial intelligence revolution. Like other walks of our life, this changing paradigm has influenced the education also. Consequently, new insights have led to the discovery of new methods and new approaches to deal with the problems and challenges before us. *Design Thinking* is one of those approaches that originated in the field of architecture, but being effective for problem solving, it is found to be useful in education also.

Nowadays, students' preferences, their learning objectives and learning tools have entirely changed. In the wake of present circumstances, pedagogical mindset, teaching approach and method needs to be revolutionized through integrating innovative ideas in education. Due to its human-centered approach, Design Thinking can be an important tool in this direction towards solving complex learning problems. Design Thinking has been brought in school education and has yielded better results. It has also been introduced in foreign language education. I believe that the method and approach of design thinking should be introduced in Hindi foreign language education (HFLE) as well. This paper explores possibilities of introducing Design Thinking in HFLE for enhancing holistic proficiency of learners.

Key words: Design Thinking, Wicked problems, Analytic, Synthetic, Creativity, Innovation, Collaboration.

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Хинди тілін шет тілі ретінде оқытуға жобалық ойлауды енгізу: тұтас білімді кеңейтуге арналған инновациялық тәсіл

Аңдатпа. XXI ғасырда болып жатқан елеулі өзгерістер біздің өмірімізге әсер етті. Технологиялық прогресс, интернет, жылдам таратылатын ақпарат, жаһандандыру және қосылудың неғұрлым кең мүмкіндіктері бір жағынан бізге ең жақсы мүмкіндіктерді қамтамасыз етті және екінші жағынан, алдыңғы жағынан ерекшеленетін мәселелер мен сын-қатерлерді құрды. Дәстүрлі әдістер мен тәсілдер жасанды интеллект саласындағы революцияға тез жылжитын XXI ғасырдың өзгерген ортасында туындаған мәселелерді шешу үшін жеткіліксіз және тиімсіз болып шықты. Біздің өміріміздің басқа салалары сияқты бұл өзгермелі парадигма да білімге әсер етті. Тиісінше, жаңа идеялар алдымызда тұрған мәселелер мен міндеттерді шешу үшін жаңа әдістер мен жаңа тәсілдерді ашуға алып келді. Жобалық ойлау сәулет саласында пайда болған тәсілдердің бірі болып табылады, бірақ мәселелерді шешу үшін тиімді бола отырып, білім беруде де пайдалы болды.

Қазіргі уақытта студенттердің қалауы, олардың оқу мақсаттары мен оқу құралдары толығымен өзгерді. Қазіргі жағдайларға байланысты инновациялық идеяларды білім беруге біріктіру жолымен педагогикалық ойлауды, оқытудың тәсілі мен әдісін түбірімен өзгерту қажет. Өзінің адамға бағытталған тәсілінің арқасында жобалық ойлау оқытудың күрделі міндеттерін шешуде осы бағыттағы маңызды құрал бола алады. Жобалық ойлау мектепте білім алуға енгізілді және жақсы нәтиже берді. Ол сондай-ақ шет тілін оқытуға енгізілді. Менің ойымша, жобалық ойлау әдісі мен тәсілі шетел тілі (HFLE) ретінде хинди тілін оқытуға да енгізілуі тиіс.

Бұл мақалада оқушылардың тұтас білімін кеңейту үшін HFLE жобалық ойлауды енгізу мүмкін-діктері қарастырылады.

Түйін сөздер: жобалық ойлау, жағымсыз мәселелер, аналитикалық, синтетикалық, креатив-тік, инновациялар, ынтымақтастық.

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Внедрение проектного мышления в преподавание хинди как иностранного языка: инновационный подход для расширения целостного знания

Аннотация. Значительные изменения, происходящие в XXI веке, повлияли на нашу жизнь. Технологический прогресс, интернет, мгновенно распространяющаяся информация, глобализация и более широкие возможности подключения обеспечили нам лучшие возможности, с одной стороны, и создали проблемы и вызовы – с другой стороны, которые отличаются от предыдущих. Традиционные методы и подходы оказались недостаточными и неэффективными для решения проблем, возникших в изменившейся среде XXI века, который быстро движется к революции в области искусственного интеллекта. Как и другие сферы нашей жизни, эта изменяющаяся парадигма также повлияла на образование. Соответственно, новые идеи привели к открытию новых методов и новых подходов для решения стоящих перед нами проблем и задач. Проектное мышление является одним из тех подходов, который зародился в области архитектуры, но, будучи эффективным для решения проблем, оказался полезным и в образовании.

В настоящее время предпочтения студентов, их цели обучения и средства обучения полностью изменились. В свете нынешних обстоятельств необходимо революционизировать педагогическое мышление, подход и метод обучения путем интеграции инновационных идей в образование. Благодаря своему ориентированному на человека подходу проектное мышление может стать важным инструментом в этом направлении в решении сложных задач обучения. Проектное мышление было введено в школьное образование и дало хорошие результаты. Оно было также введено в преподавание иностранного языка. По мнению автора, метод и подход проектного мышления должны быть внедрены и в обучение языку хинди в качестве иностранного (HFLE). В этой статье рассматриваются возможности внедрения проектного мышления в HFLE для расширения целостного знания учащихся.

Ключевые слова: проектное мышление, неприятные проблемы, аналитический, синтетический, креативность, инновации, сотрудничество.

Design Thinking

Design Thinking is a creative process of doing things and bringing innovation to tackle challenges and create solution for problems. It is a mindset that breaks status quo and felicitates meaningful changes that could bring positive impact. Design Thinking is an objective-oriented and solution-focused process of experimenting to create an innovative solution to the complex and multi-dimensional problems. One of the important characteristics of Design Thinking is that it is a human-centered approach which empathizes with people to understand their needs and motivation. Design Thinking collaborates with the multiple views and perspectives because a collaborative effort with diverse creative minds to solve difficult problems is definitely more effective and lasting. Design Thinking makes our outlook optimistic – to the extent that we make every effort to bring desired change possible only by better utilization of available resources. Precisely, Design Thinking puts human at the center and understands his needs and problems, designs solution to the problems and brings meaningful change through continuous innovation.

Evolution of Design Thinking: An Overview

The seed of design thinking can be traced to the circumstances arising as a result of the Industrial Revolution and World War-II. Thinkers began to explore that the solution to the complex problems of human being is possible through technology and innovation. The changing socio-economic circumstances around the 1950s inspired engineers, architects, industrial designers, and cognitive scientists to collaborate their knowledge, ideas and experiences towards solving (material) problems of people. The creative process that design leaders introduced to solve complex problems became famous as Design Thinking. During the last fifty years, creative thinkers from different fields have added and re-defined not only what it was but where it could be applied to.

Design Thinking originated in 1956 when *Buckminster Fuller* started teaching *Comprehensive Anticipatory Design Science* (CADS) at MIT. Buckminster Fuller's study was an innovative idea based on the collaborative knowledge and experience of engineers, industrial designers, physicists and chemists. *Herbert A. Simon* (1969), a cognitive scientist and Nobel laureate was the first to refer design as a science and way of thinking. During 1960's, primarily, scientific methodologies and processes were applied to the design thinking discourse and attempts were made to keep the Design Thinking within the objective of rational sciences. Nigel Cross (2007), has well examined the struggle between *design discipline* and the *design science* during the above period. In the mid 1960's one major development happened when a design theorist, *Horst Rittel* coined the term *Wicked Problems*. *Wicked Problems* referred to the extremely complex or multi- dimensional problems. It was a significant achievement in the journey of Design Thinking which became a buzzword in this field, because this was the problem that Design thinkers wanted to tackle through creative approaches and collaborative methods and for which deep understanding of humans was required.

Herbert Simon (1969), in his study, proposed a number of creative ways related to Design Thinking that became established in 1970s as a theory of design thinking. The concept of *Prototyping* and *Testing* suggested by Simon is considered major stages of Design Thinking process even today. A large part of Simon's Design Thinking is focused on artificial intelligence. More importantly, he has deliberated whether human thoughts and artificial intelligence can be synthesized? His idea of *Visual Thinking Effect* and combining the left and right brain modes of thinking formed the very basis of Design Thinking methodology.

During 1980s, three great design thinkers have contributed to the study of Design Thinking. *Bryan Lawson (1980)* disseminated the result gathered from a series of tests he conducted that aimed at comparing the methods used by the scientists and architects when attempting to solve the same *wicked problems*. Lawson observed that the scientist were problem-focused problem solvers while the designers were solution-focused problem solvers who generated a large number of solutions and eliminated those which did not work. *Nigel Cross* (1982) compared designers' problem solving process to the general problem solving we do in our everyday life. *Peter Rowe* (1987) an architectural designer first used the term Design Thinking and displayed the way an architectural designer approaches to the problem solving through intense inquiry.

Indeed, thinkers of various disciplines dealt with cognitive processes within the scope of their area of study. Looking carefully, Design Thinking was gradually emerging and taking shape as an independent area of study throughout the discussions held during three decades of 1960s, 1970s and 1980s. Eventually, at the end of 1980s; Design Thinking emerged as an applied discipline encapsulating three fundamental objectives - human, technology and innovation.

The 1990s and thereafter marked a turning point in the field of Design Thinking when its application gained widespread acceptance. In 1990 IDEO was formed (inspired by the work developed at the Stanford Design School) as one of the companies which brought Design Thinking in the mainstream. In 1992, while re-defining Design Thinking, *Richard Buchanan* underlined that the Design Thinking has formed a means of integrating highly specialized fields of knowledge, so that they can be jointly applied with a holistic perspective to the new problems we are facing. One another major event added in the year 2005 to the formalization of Design Thinking, the Stanford School of Design (D. School) started teaching Design Thinking as an independent course.

As of today, when both the complexity in life and the application of technology are increasing rapidly; Design thinking has thus emerged as an effective way of problem solving. Apart from universities, business schools and companies, the practice of adopting this method is also increasing in various disciplines including education.
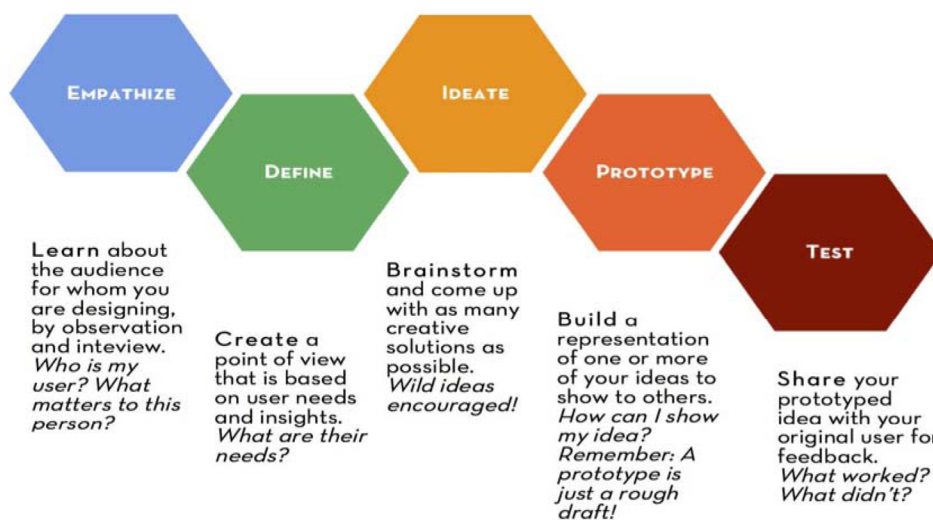
Design Thinking Process & Stages

There are two major phases of design thinking - analytic and synthetic. Both analytic and synthetic methods have been well discussed in mathematics as well as in other disciplines that corresponds to the cognitive stages in educational psychology. In Design Thinking, analytic phase refers to observing and understanding the learner's motivation and identifying problems by empathizing with him. It is also called discovery phase. In this phase, observations are made to identify problems in order to find solution for it. Synthetic phase is the phase of idea generation, developing the possible solution, prototyping, and testing. Both stages are aimed at making solution to the complex problems. Problem-solving process begins with observation and concludes with testing the alternatives and improving the developed solutions. Thus, analytic and synthetic both stages are interlinked and form an integrated process of problem-solving.

At first, Simon (1969) devised seven stages of Design Thinking process: (1) Define; (2) Research; (3) Ideate; (4) Prototype; (5) Choose; (6) Implement; (7) Learn. Simon's Design Thinking Process & stages revolutionized the whole idea of problems-solving which needs to be explained. It advocates that at the first stage it is crucial to define the problem to be resolved and the user/audience/learner. Then research should be conducted by analyzing history, existing practice, limitations, challenges, opportunities, various views, stakeholders etc. At the idea stage the brainstorming needs to be exercised. It is the stage of idea generation based on the identification of needs and motivation of users. Next, it necessitates combining and extracting ideas and giving it shape in the form of possible drafts (prototypes). This stage is known as Prototyping. In this stage it is essential to get feedback from the users on the prototype. The stage *chooses* goes into reviewing the idea and the draft and selecting the useful ideas and feedbacks. The *implementation* stage is

about executing the solution and making the final product. Finally, the Design process ends at the *learning* stage which means collecting feedback from the users in order to improve and keep making the solution/product user friendly.

Inspired by Simon's Design Thinking process and stages, a number of models (Owen: 1998; Brown: 2008; Razzouk & Shute: 2012) have been introduced which were broadly almost around Simon's Design Thinking stages. The most prominent is the one designed by the Institute of Design at Stanford University. Earlier, the Institute of Design categorized the Design Thinking process in six stages; however in 2009 it revised its previous adaption and created five stages in place of six. The reworked and revised five stages of Design Thinking process are: (1) Empathize; (2) Define; (3) Ideate; (4) Prototype; (5) Test. These five stages of the design thinking process have now been established and are applied in different disciplines. Look at the objectives of the Design Thinking process explained by Hasso Planter:

Five Stages in the Design Thinking Process (Hasso Plantter Institute NYC)
https://twitter.com/hpi_nyc/status/1019599322726436868

Design Thinking in Education

In education, Design Thinking aims to be incorporated in the curriculum design process and teaching-learning method to resolve complex learning problems, manage anxiety of the learners and enhance their learning ability that may be called Design-based learning. Design-based education enables learners to identify their needs and learn successfully using multi-disciplinary material and educational tools. To focus

on change and innovation for achieving 21st century skills, the relevance of bringing Design Thinking in education has become imminent. The challenges and opportunities resulting from the globalization and technological advancement can be better exploited if the teaching-learning process becomes innovative and human-centric.

Stanford University and Global design firm IDEO, have developed creative models for school

education. Based on the above models, significant work has been done to apply Design Thinking in primary and secondary education at both the levels of curriculum design and teaching-learning methods (Rex lor: 2017). However, the scope of application of design thinking mindset and process in higher education is yet to be studied and experimented on a broader scale. Its application and approach may differ at university level due to the varying context, characteristics and challenges of different disciplines of higher education.

Design Thinking in Foreign language Education (FLE)

Due to growing trend of globalization, mobility, cultural exchange, trade ties and strategic relations between nations; foreign language learning has become an important part of interpersonal and inter-cultural skills nowadays. Earlier, foreign language education was confined mostly to the academic inquiry within the periphery of linguistics, however in today's time it is emerged as a gateway of opportunity to work for the global leaders in the field of trade & business, government and diplomatic establishments.

Unlike the past, 21st century foreign language learner's motivation is driven mostly by acquiring inert-cultural skills to expand their career horizon. Since the motivation and objectives of the learners have changed, the teaching-learning process and curriculum design approach also need to be revolutionized. I believe Design Thinking; a solution-oriented, learner-centered, collaborative approach can help us to come out of the box of traditional approach to meet the 21st century foreign language learner's needs.

Difference between the Traditional Methods and the Design Thinking Approach in FLE

Here, it is required to understand that how the Design Thinking process is different from the traditional educational models and approaches in foreign language education? First of all, Design Thinking is a human-centered approach. It means that in Design Thinking approach human experience sets the direction of the solution. Traditional foreign language curriculum design and teaching-learning method is completely based on learning grammatical sequence while the Design Thinking process puts deeper focus on needs, wants, objectives and motivation of learners. The teaching and learning objectives of traditional approach functions around the prescribed curriculum goals, however on the other hand the objective of the Design Thinking approach is to deeply understand the human experience during the learning process. Design mindset is primarily

focuses on creating learner-friendly desired solution to the complex learning problems in FLE.

Why Design Thinking should be applied in Hindi Foreign Language Education?

Answering this question, as first part of my response I would reiterate whatever I have stated above about the application of Design Thinking in Foreign Language Education. Secondly, there are some complex problems and challenges in HFLE which need creative and innovative solution in collaboration with the technology and supplementary tools. Thirdly, *speaking* and *listening* being most important strands for acquiring proficiency in a foreign language, needs proper attention and priority in HFLE. Despite this fact the HFLE is presently based and focused entirely on grammatical sequence with traditional approach. Consequently, listening and speaking, the major part of the foreign language proficiency goes unpracticed. Apart from this, learner-friendly solution to the problems in HFLE is yet to be worked out. Unfortunately, there is a dearth of quality material available online in HFLE especially for listening purpose. It is my considered view that introducing Design Thinking in HFLE will bring qualitative change and desired result to meet the needs of 21st century learners.

Introducing Design Thinking process in HFLE: Some insights

Let's explore possibilities and think how Design Thinking process can be applied in HFLE.

Empathize: The very first step in designing and developing the Hindi foreign language curricula and teaching plan is observing, engaging and watching the learner's in order to understand their goals and motivations. Why learners want to learn Hindi? What they expect from it? Are they eager in speaking Hindi right from the beginning? In which areas related to Hindi or India are they interested? Knowing learner's motivation needs and goals will enable us to design a teaching method that helps them efficiently acquire language skills in Hindi.

Define: After understanding the goals and needs of learners, it is time to identify learning gaps and problems that might create obstacles in efficient Hindi learning. What are those areas of Hindi language which students consider complicated affecting their learning ability (some common problems have been listed on further pages for example)? The level of difficulty and ability to deal with linguistic complexities will not be the same among Hindi learners everywhere in the world. For example, a native Arabian or Persian may face less difficulty in memorizing vocabulary than an East Asian or African learner due to some lexical

similarity and cultural interactions. Remember that problems should be identified and analyzed keeping the learners (human) in the center. We should also closely look at each learner to know that how they visualize their learning success in Hindi? Defining these core issues will help and lead teachers to design appropriate path of learning.

Ideate: Once the process of understanding the space and identifying the problems of learners is done, it is time to generate idea for creating solution. *Ideate* is the process in which teachers have to imagine and brainstorm multiple ways and paths to solve problems and choose one of the most suitable ideas out of them. In other words ideation in this context would mean what should the Hindi learning curriculum and content be and how should it be delivered to address a specific problem.

Prototyping: Prototyping is nothing but putting our idea of solution into practice and creating a draft for final solution. While creating prototype we must always keep learners in mind. If learners prefer audio-visual content over written material then classroom delivery should be prepared accordingly – include online cultural content in Hindi in lecture/tutorial (such as short films/clips from Bollywood movies/ conversations from TV programs etc.). It is all about assessing whether curriculum design, content creation and classroom delivery methods are getting favor from new age learners and bringing desired results.

Testing: For making curriculum and content final, draft curriculum and content (prototype) need to be tested to know learner's experience and response. Testing makes innovation possible and gives opportunity to engage with learners yielding useful feedbacks. Once we know learner's preferences through testing, we can keep that information in mind while creating new draft content for next learning objective. Hence, it is a continuous process in any language learning program intended to design truly focused curriculum and creating effective solutions for learners.

Unique Problems in learning Hindi as foreign language

It has been my observation that there are some unique problems in learning Hindi as a foreign language which needs creative solution for motivating new age learners and enriching their proficiency:

Arbitrary gender pattern: Hindi has two genders- masculine and feminine. In Hindi sentence structure, verb conjugation agrees with Number and Gender of the Subject or Object according to the tense. Therefore, knowledge of gender is important for using correct verb conjugation. Identifying masculine and feminine nouns in Hindi is not very easy due to its arbitrary gender pattern. It is interesting to know that some nouns which generally look like masculine such as – सेना (army), पुलिस (police) and संसद (parliament) etc. and inanimate words like गेंद (ball), चाय (tea), शराब (liquor) etc. are feminine in Hindi. Till now, it is been advised to make it habit to memorize gender of the noun along with learning the meaning of the word.

Multiple verbs constructions: There are five types of verbs used in Hindi language – simple verbs, compound verbs, continuative compound, conjunct verbs, and causative verbs. In comparison to the rest of verb forms, using simple verb is not very difficult if a learner has knowledge of agreement of verb conjugation with Gender, Number and Tense. However, using other forms of verbs becomes difficult for foreign learners. For instance, Hindi compound verbs are frequently used by the native speakers. There are three such prominent verbs which make a number of compound verbs – जाना, लेना, and देना. Other verbs which make compound verb construction are उठना, चुकना, डालना, पड़ना, पाना and बैठना. In all compound verbs the meaning is given by the root of main verb and the compounded verb has zero value but conjugated with subject or object according to the grammatical requirement. Using compound verbs is one of the most complex problems for foreign learners.

In parallel, continuative compound construction is also a complex problem. In Hindi, there are different ways of using compound verbs for ongoing activities and ongoing state. To illustrate, for ongoing activity we may say, रात भर बारिश होती रही (It rained all night), however for ongoing state we can say, रात को बारिश होती रहती है (it used to rain at night).

Similarly, there are a number of nouns and adjectives which combined with verbs making an independent verb construction commonly known as conjunct verb e.g. पसंद आना, पसंद करना, पसंद होना; गरमी पड़ना, गरमी लगना, गरमी होना; धूप आना, धूप पड़ना, धूप होना, धूप निकलना etc. Apart from this, a verb in Hindi may also be constructed with the combination of conjunct and compound verbs e.g. पसंद आ जाना. For a foreign learner it becomes very difficult to decide that which verb should be combined with a noun or adjective for making conjunct verb.

Next complex problem related to verbs in Hindi is the use of causative construction which frequently

appears in native usage. In Hindi, causative-1 and causative-2 are discriminated, however in native use both sometimes overlap with each other. For example: मुझे आज बाल कटाना / कटवाना है (Today, I have to get a hair-cut). Causative verb construction is also bit confusing for foreign learners.

Multiple usages of postpositions: Hindi postposition is also an area that bothers foreign learners. Many a time grammatical information becomes insufficient to match with native usages of postpositions. Among other postpositions, diverse usage of को construction is the most challenging for foreign learners. Some postpositions such as को – में, से – पर are often alternatively used by native users. Look at these usage: मैं शाम में जाऊँगा / मैं शाम को जाऊँगा (I will go in the evening); मैं घर में हूँ / मैं घर पर हूँ (I am at home) etc.

Present & past perfect constructions: Practically, considering proficiency in speaking, using present & past perfect constructions are also a big problem for foreign learners. As far as grammatical information related to this is concerned, is not very difficult to understand if explained with clarity, but when it comes to using that information in routine conversation, it often creates anxiety in foreign learners.

Multiple sources of vocabulary: The largest class of words in Hindi is derived from Sanskrit and other cultural sources. The second large group of words is borrowed from Sanskrit. Borrowed words from Arabic/Persian are at third number. Therefore, most words in Hindi usually have two options, either borrowed from Sanskrit or Arabic/Persian (A/P) such as: प्रसिद्ध-मशहूर, प्रश्न-सवाल, उत्तर-जबाब etc. Both options are essentially in use. Yes, the thing is, in some areas borrowed words from Sanskrit are used extensively while in another fields Arabic/Persian words are used frequently. Knowledge of using both types of words is essential for proficiency. This situation generates problem for Hindi foreign learners.

Dealing with Socio-cultural diversity in Hindi language: India is one of the most diverse countries in the world. The socio-cultural diversity of the country is reflected in Hindi also. As the lingua-franca of the country, there are various forms of Hindi used in different provinces with regional touch. For example the Hindi which is used in Delhi is not the same in all respect as it is used in Mumbai or Chandigarh. In this context foreigner learners face one unique problem that is related to social stratification of the Indian society. Since language and society are interlinked with each other, social stratification in the structure of Hindi language exists in various forms. This situation creates problem in deciding verb conjugation, choosing appropriate pronoun and address form.

Conclusion

The above-mentioned unique problems in HFLE need creative solution for enhancing learning skills and desired proficiency. Keeping in mind the 21st century learner's needs, HFLE ought to be revolutionized with innovation introduced at all levels of education – mindset, approach, curriculum design and delivery etc. In my opinion, one of the effective ways to inculcate innovation is introducing Design Thinking in HFLE. Its applicability can diversify the curriculum, content, teaching-learning process, and learner's motivation resulting in catering meaningful change in the overall HFLE framework. Herbert A. Simon (1969) overviews the focal point of the Design Thinking – "…….. in short, with design….Everyone designs who devises a course of action aimed at changing the existing situations into preferred ones." Let's allow the change to happen.

References

An Introduction to Design Thinking PROCESS GUIDE, Accessed on November 01, 2019. https://dschool-old.stanford.edu/sandbox/groups/designresources/wiki/36873/attachments/74b3d/ModeGuideBOOTCAMP2010L.pdf

Brown, Tim, and Barry Kātz. (2009); Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation. New York: Harper Business

Buchanan, Richard (1992); Wicked Problems in Design Thinking. Design Issues 8, no. 2 (1992): pp 5-21. Accessed on November 01, 2019 http://web.mit.edu/jrankin/www/engin_as_lib_art/Design_thinking.pdf

Cross, Nigel (1982); Designerly Ways of Knowing. Design Studies, vol. 3, no, 4, October. 1982, pp 221-227

Cross, Nigel (2007); From a design science to a design discipline: understanding designerly ways of knowing and thinking. In: Michel, Ralf ed. Design Research Now: Essays and Selected Projects. Basel: Birkhauser, pp. 41–54.

De Russo, Stefanie (2012) "A Brief History of Design Thinking: How Design Thinking Came to 'Be'." I think □ I design. January 18, 2012. Accessed on November 01, 2019. https://ithinkidesign.wordpress.com/2012/01/18/a-brief-history-of-design-thinking-the-theory-p1/

De Russo, Stefanie (2016). Understanding the behaviour of design thinking in complex environments.(Doctoral thesis:2016). Accessed on November 01, 2019. https://researchbank.swinburne.edu.au/file/a312fc81-17d3-44b5-9cc7-7ceb48c7f277/1/Stefanie%20Di%20Russo%20Thesis.pdf

Dorst, Kees.(2011); The core of 'design thinking' and its application. Design Studies vol. 32 No. 6 November 2011. Accessed on November 02, 2019. file:///C:/Users/ADMIN/Downloads/design_thinking_core%20(1).pdf

Kelley, David, and Kelley Tom (2013); Creative Confidence: Unleashing the Creative Potential within Us All, Crown Business, New York.

Kolko, Jon (2015); Design Thinking Comes of Age. Harvard Business Review 7. 2015. Accessed on November 01, 2019. https://hbr.org/2015/09/design-thinking-comes-of-age

Lor, Rex R. (2017); Design Thinking in Education: A Critical Review of Literature. (Conference Paper). Accessed on November 01, 2019. https://www.researchgate.net/publication/324684320_Design_Thinking_in_Education_A_Critical_Review_of_Literature

Owen, Charles. (2007); Design Thinking: Notes on its Nature and Use. Design Research Quarterly vol 2, no 1, January, 2007. Pp 16-27. Accessed on November 02, https://www.id.iit.edu/wp-content/uploads/2015/03/Design-thinking-notes-on-its-nature-and-use-owen_desthink071.pdf

Razzouk, R., & Shute, V. (2012). What is design thinking and why is it important? Review of Educational Research, September 01, 2012. Vol. 82, no. 3. pp 330-348. Accessed on November 02. https://journals.sagepub.com/doi/abs/10.3102/0034654312457429

Rittel, Horst W. J., and Melvin M. Webber (1973); Dilemmas in a General Theory of Planning. Policy Sciences, vol 4, no. 2, June: 1973. pp 155–69. Accessed on November 01, 2019. https://doi.org/10.1007/BF01405730

Rowe, P. G. (1987); The Design Thinking. Cambridge MA: MIT Press. Accessed on November 02, 2019.http://www.egyptarch.gov.eg/sites/default/files/pdf/Books/Design%20%20Thinkng.pdf

Sharma, Aryendra. (1994); A basic Grammar of Modern Hindi (1994); Central Hindi Directorate, New Delhi.

Simon, Herbert A. (1969). The Sciences of the Artificial. Cambridge, MA, MIT Press.

Websites (Accessed between November 01 to 15, 2019)

https://dschool.stanford.edu/
https://www.ideo.com/
https://experience.sap.com/skillup/introduction-to-design-thinking/
https://hpi.de/en/school-of-design-thinking.html
https://medium.com/@szczpanks/design-thinking-where-it-came-from-and-the-type-of-people-who-made-it-all-happen-dc3a05411e53