

APPLICATION AND ANALYSIS OF LEARNING SANSKRIT THROUGH DIGITAL GAMES

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Abstract : Every human being has an interest in playing games. Educational games and activities are common in the area of mathematics, science, etc. Commercial off the shelf learning games (COTS) are available in the digital media that engage the learner in the subject. These digital games are available for Language learning also especially Sanskrit.

Having worked in the Sanskrit e-learning field and designing e-learning products and games; the author in this chapter tries to analyse the aspects of game based e- learning and their specific application for Sanskrit Language. The need and effectiveness for game based learning in a Sanskrit scenario is discussed. It also tries to cover the different types of games that could be designed effectively so that the learning happens. Examples of games from different e-learning Sanskrit products available in the market are illustrated & compared for learning aspects.

The paper also discusses elements of designing/ developing a good game for Sanskrit e-learning, technological aspects and instructional design aspects

The paper tries to discuss the future of game based learning in various specific areas of Sanskrit for children and adults.

In the end; the authors come up with a suggestive checklist in developing an e-learning game for Sanskrit.

IndexTerms - *Activity based e-learning for Sanskrit, Game based Learning, Gamification and Simulation for experiencing Sanskrit, Application*

I Introduction

A learning game is an activity inserted into any eLearning course with the goal of improving the learning process and motivating the learner to complete the course. Gamification is the application of game mechanics such as points, rewards, levels, etc. into the non -game course content or existing course content. Game based learning is slightly different as it uses games to enrich the learning experience. Learning content is woven into the game.

In the modern scenario the e- learning is shifting to creation of game based learning in order to avoid boring e-learning courses.

Game based e-learning can make the learning interesting and fun. Game based e-learning can be applied to children as well as adults. The games can be for simple topics such as basic language learning and complex grammar topics also. The courses have to be instructionally designed so that the learning outcomes are met.

II Why game based learning for Sanskrit?

Experts in Language Mastery across the world suggest that language mastery should be judged separately from knowledge, reasoning ability and personality traits. Recognition of intention and communication of intention are discussed as key factors in language mastery, and the skills of reading, speaking, writing and comprehension are described as independent skills.

Since Sanskrit has more spiritual texts which learners want to master and the number of useable words in this texts are innumerable; memory and exposure to high frequency words in spiritual texts etc. seem inevitable for mastery.

Mastery of Sanskrit Language includes grammar basics such as mastery of noun forms, verb forms, rules of joining and splitting letters, rules for joining words, sentences, etc. All of this requires memory, adequate practice, feedback from the teacher, course correction, etc. If such a drill is practiced through application then one can even dream of scraping the surface of spiritual texts.

Also the learner has to be highly engaged with extreme determination and commitment with SMART (Specific, Measurable, Achievable, Realistic and Time bound) goals clearly identified and personalized. These goals must get converted to daily habits and systems which could be followed.

An extrinsic motivation has to be developed for the same. The resources that we choose for achieving our goals need to be highly engaging, the e-courses that we design must be compelling enough at every step to motivate the learner to complete the course.

Game based learning or gamification of existing courses have been found to be yielding results in the area of sanskrit e-learning. These can be applied for Asynchronous or synchronous learning.

In the case of asynchronous learning where products are designed games are found to be an attractive factor for all ages. Even pre-recorded MOOC courses in Sanskrit can be made attractive by giving assessments, scenario based games, quizzes, etc.

In the case of synchronous learning online, learning games can be used constructively and in built in the pedagogy of the course. It can also be used for assessments.

In the case of Blending learning in schools and universities; games are found to be one of the best methods of engaging students in a class.

Doney. I (2019) has reviewed forty-one case studies of serious games, game-based learning and gamification in learning from the last 10 years in order to identify the elements that contributed to their success.

III Benefits of having Games in Sanskrit e-learning products and courses

Having been involved in design of e-learning products and courses with games; the authors have found several benefits of game based learning. Samples of these games can be seen in the self- learning products and courses

General Benefits

- 1) Makes the course OR product interesting
- 2) Engages the learner better through active learning – seeing and doing something. Hence leads to better learning and retention.
- 3) Makes learning interactive and enjoyable.
- 4) Involvement of multiple intelligences – Kinesthetic, Logical, interpersonal skills apart from language learning.
- 5) Allows learners to experiment, explore, build on concepts, collect points, rewards, etc. and also learn.
- 6) Provides opportunities for self-expression
- 7) Opportunity to interact, trigger a process and obtain feedback on the learning (failure/ success, etc.). Instant & diagnostic feedback helps in immediate correction of mistakes and in achieving the learning outcome after the game is played (provided the game is designed in that manner).
- 8) Helps in real world application of their language, grammar skills. The real life testing is not possible in courses or products that do not have games. Helps in succeeding in real life also.
E.g.: A game which teaches reading skill and simulates reading of Ramayana can be very useful for a learner who wants to study the Ramayana in detail or do the parayana of the text. When there is a simulated game it helps the learner to simulate the real situation.
- 9) Promotes self – esteem and increases self-confidence and willingness to dive deep in the subject.
- 10) Adds to the motivation factor especially with respect to Sanskrit
- 11) In case of multiplayer games increases social interaction and makes the learners feel they are a part of a common experience. Experiential learning is extremely beneficial as it stays in the memory for a long time.
- 12) Certain multiplayer games improve team work, co-operation etc.
- 13) Simplifies complex subjects and helps learn them easily especially Sanskrit Grammar, Conversations, advanced Shastras etc.
- 14) Graded Learning & Scaffolding of Learning can happen through games. Hence they can be easily used as tools to measure the progress in learning.
- 15) Most important game based learning has been found useful for all ages in the case of Sanskrit. (as many people turn towards Sanskrit at a later point in their lives)

Additional benefits for Children

- 1) Generally attracts children if it is fun loving.
- 2) **Without explicitly telling the children to learn Sanskrit, through the process of playing the game children learn the language implicitly.**
- 3) **Through games, children can learn a variety of important skills such as LSRW skills, basics of grammar, etc.**
- 4) **While playing games, children develop a variety of connections with the content and can form positive memories of learning**
- 5) Children of certain age like to have challenges and hence introduction of such learning games shall be helpful.
- 6) Fosters analytical skills
- 7) Can transform a Sanskrit learner from explorative to interested to committed.
- 8) Builds healthy competitive spirit amongst learners.
- 9) For children can improve attention, focus and hand- eye co-ordination skills, computer skills etc.
- 10) Repetition when turned into a game becomes interesting, especially in Sanskrit where we need to remember a lot of things. **Games provide a context for engaging in practice or drill work which is very useful for improvement in tests and exams in a formal environment.**
- 11) Game based blended learning can help in assessments both pre-learning and post learning assessments in schools and universities.

Additional benefits for Adults

- 1) Can make mistakes in an exam free ecosystem and an informal learning environment.
- 2) More instant and personalized feedback – name and shame is with the digital device and not with people. Hence people learning Sanskrit at an older age feel comfortable.

IV For whom are the games in Sanskrit?

In view of diverse learning styles and preferences the children display, benefits from games seem to cater for children more. If games are properly designed, they may become an excellent and essential part of a children's learning programme.

Children have an amazing ability to absorb language through play and other activities which they find enjoyable. That is why games seem to be a challenging and exciting tool to make the young learners motivated and satisfied with making progress in acquiring a language.

It is essential to provide a clear and meaningful purpose for using language which capitalizes on young learners' desire to communicate, for example, activities which involve a game, puzzling something out, or getting missing information from another person. All these make sense and are meaningful to young learners.

There is a common misconception that game-based learning is more suitable for children than adults, and games being just fun and a distraction from work. However learning games when properly designed promote problem-solving abilities in adults and are effective in engaging them to learn.

Games can be created to cater to different learning styles for both adults and children – visual, auditory, or kinaesthetic. They can be designed and developed to cater to more than one learning style also.

Games can be designed for individual learning paths also, be personal, and speak at the learner's level while motivating him to complete the game. This will help the learner complete tasks, retain information, and apply what they have learned in their subject.

V Types of Games in Sanskrit E-learning

- ❖ Casual games
- ❖ Serious games
- ❖ Advergams
- ❖ Simulation games, and
- ❖ Assessment games

The purpose of Casual games to engage learners in a fun way. It reinforces the learning objectives through play. Some of the casual games include drag and drop, sequencing, and matching. These games can be easily created with a rapid eLearning tool and do not require any programming or technical skills.

Example of Casual games using Adobe Articulate for Sanskrit Learning is as below.



*Exhibit 1 - Drag and Drop Game to test the Listening Skill and Sound Script Mapping
Product: Learn Sanskrit Level 1, Vyoma Labs*



*Exhibit 2 - Drag and Drop Game to test the Cognitive Skills
Product: Learn Sanskrit Level 1, Vyoma Labs*

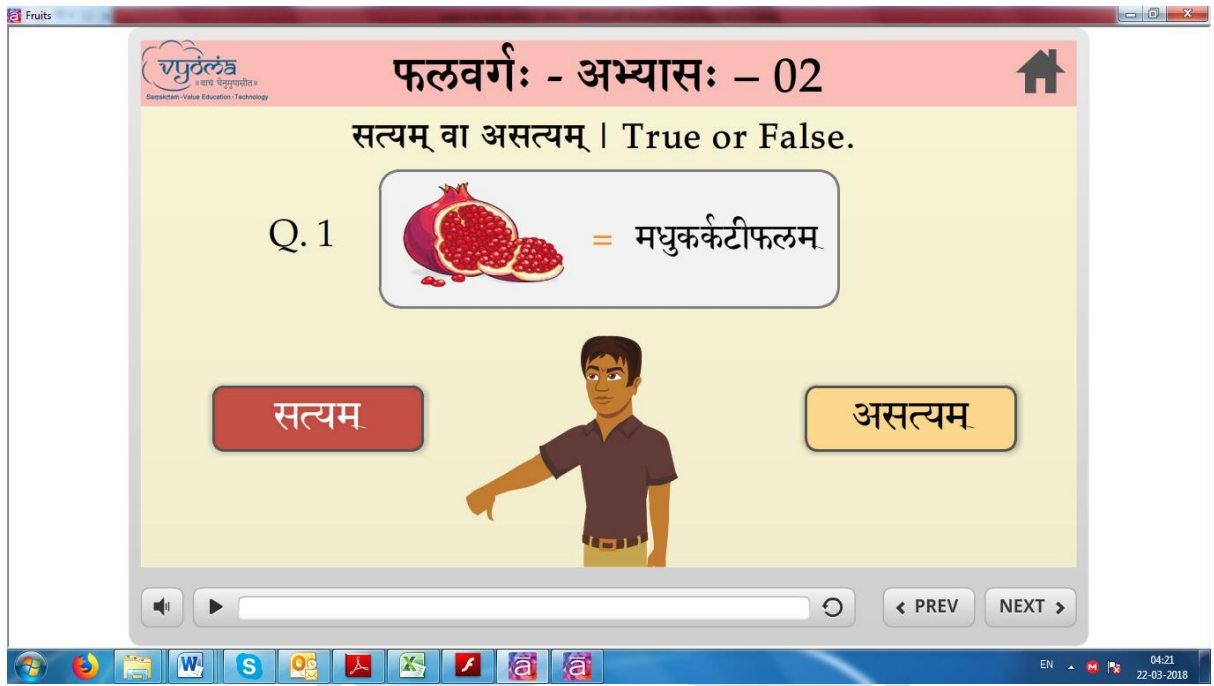


Exhibit 3 - True or False game to test the Vocabulary

Product: Learn Vocabulary Builder 1, Vyoma Labs

Serious games are intended to improve a specific aspect of learning. The main goal of serious games is to achieve measurable and sustainable changes in learners' performance or behaviour.

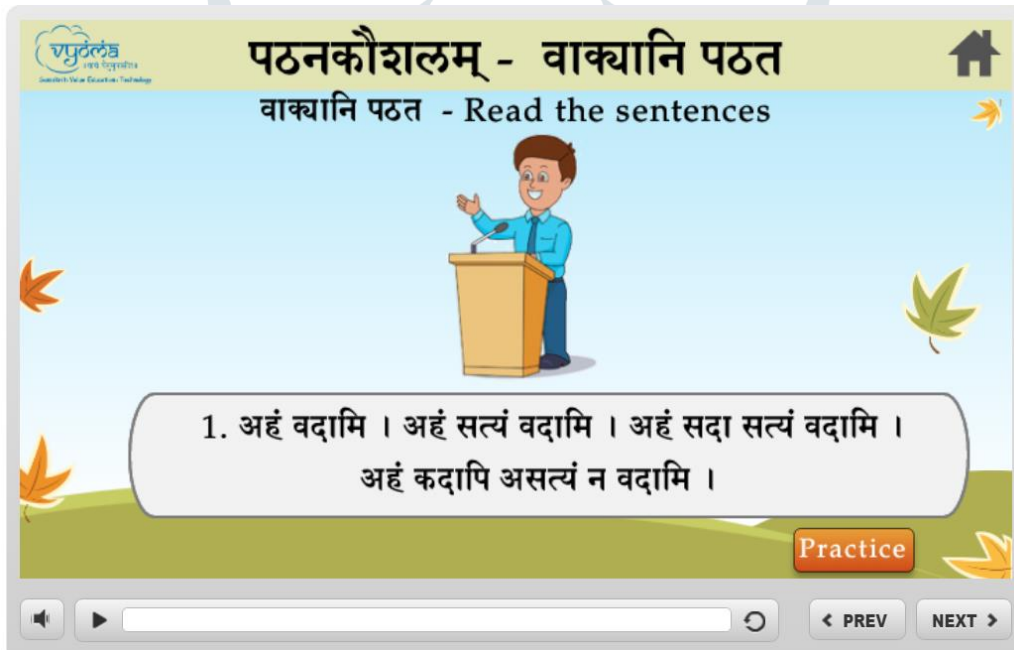


Exhibit 4 - Karoke game to test & practice reading skills.

The learner has to read from two word sentences to 5 word sentences.

Product: Learn Sanskrit Level 1, Vyoma Labs



Exhibit 5 - Karoke game to practice sentence construction.

The learner has to build a bridge with only the bricks that have the correct sentences.

Product: Learn Sanskrit Level 1, Vyoma Labs

Advergams include elements of both casual and serious games. These games are often used and designed in such a way that players do not even realize there is a deep learning involved.



Exhibit 6 - A unique game to test the spelling skills in Sanskrit. The game is to make the Rabbit reach near the cabbage while the spelling is also learnt. The activity has inbuilt feedback mechanism which allows learners to make mistakes, unlearn and learn. Very useful in ensuring the learning happens

Product: Learn Sanskrit Level 1, Vyoma Labs

Note: The above game provides the learner a Unique Experience. This ties up with the learner's need to take decisions that will determine the course of the game. This will make the experience attractive to the learner. To make it useful, feedback should be provided at the right time so that learners know what is right, and the reasons for it. This should help in reinforcing learning.

Simulations or branching scenarios are typically scenarios that allow learners to go through situations they will most likely encounter in real life. Simulations often expose learners to many different choices they have to make and continue to the next step based on the decisions that learners make. Simulations can either be a part of a serious game or a standalone activity in the eLearning course. Most of the time, these games are linear whereas simulations are non-linear.

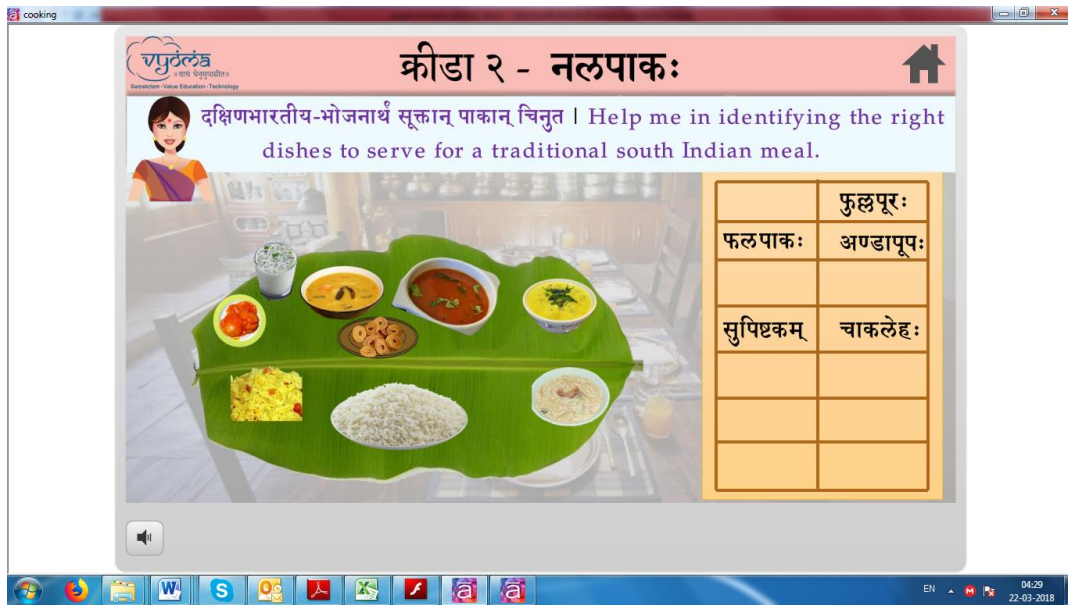


Exhibit 7 - Game which helps remember names of food items in Sanskrit.

The presentation is a real life situation which a learner encounters in daily life. There is a greater chance that the retention & learning in such a game is high and the learner implements the same in his daily life. Product: Vocabulary Builder 1, Vyoma Labs

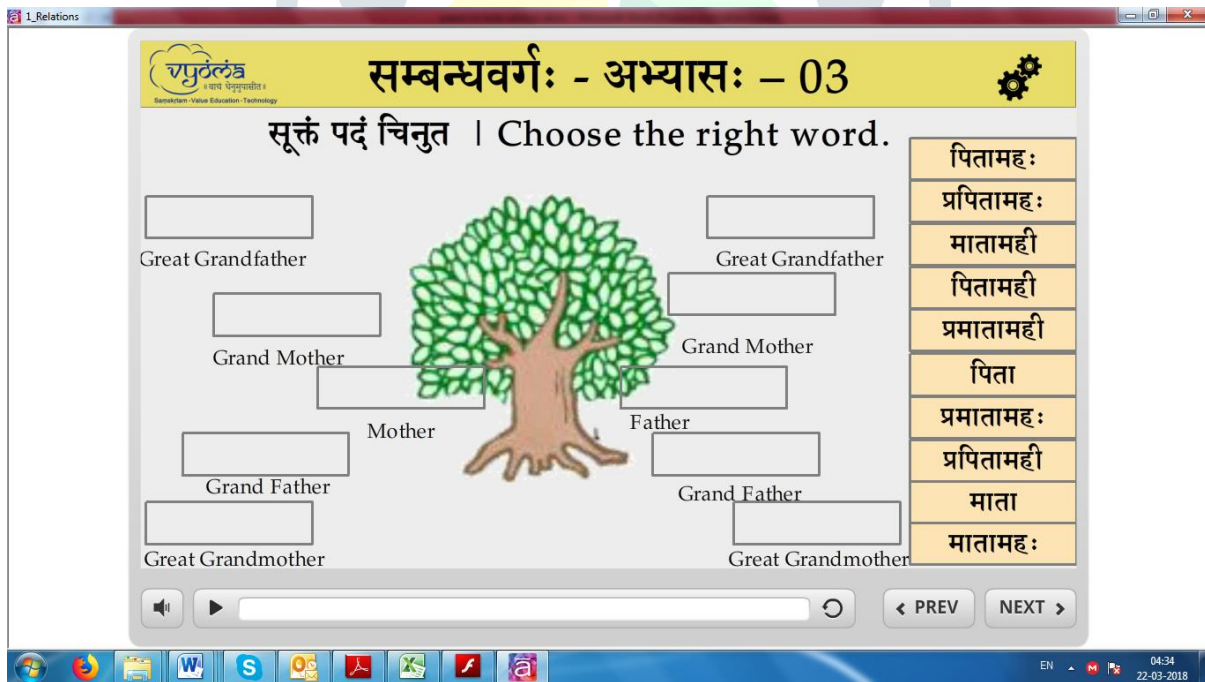


Exhibit 8 - Game which helps remember names of relations in Sanskrit.

The presentation is a real life situation which a learner encounters in daily life. There is a greater chance that the retention & learning in such a game is high and the learner implements the same in his daily life.

Product: Vocabulary Builder 1, Vyoma Labs

रेखाङ्कित पदानां समस्तपदम् चिनुत ।

श्रीमद्भगवद्गीता

श्रीमद्भगवद्गीता

1. अपर्याप्तं तदस्माकं बलं भीष्माभिरक्षितम् ।
पर्याप्तं त्विदमेतेषां बलं भीमाभिरक्षितम् ॥
2. अयनेषु च सर्वेषु यथाभागम् अवस्थिताः ।
भीष्ममेवाभिरक्षन्तु भवन्तः सर्व एव हि ॥
3. तस्य सञ्जनयन्दर्शं कुरुवृद्धः पितामहः ।

1. तदस्माकं बलं ।
पर्याप्तं त्विदमेतेषां बलं ॥
2. अयनेषु च सर्वेषु अवस्थिताः ।
भीष्ममेवाभिरक्षन्तु भवन्तः सर्व एव हि ॥

Exhibit 9 - Game which helps simulate splitting of Compound Words while reading Bhagavad Gita. The text on the left in red is the Compound word and the text on the right within the pull down menu has the possible answers. The game here is to choose the right answer amongst the possible answers.

The correct answer turns green or turns red depending on whether the answer is correct or not.

The presentation is a simulation of a real life situation. Instant feedback, course correction is available in this method.

Assessment Games – These are games can be used for pre-learning or post learning situation. Pre-learning assessments help measure the level of knowledge so that the learner can be steered toward a personalized path in his learning, Post assessments help determine how much he has actually learned through the course. Again the post learning assessments can be formative or summative in a curricula based learning. Sometimes the assessment games are actually tests and exams behind a game skin.

Pre-assessments can be at different levels also. Post assessments follow the levels and structure of the course. With respect to Sanskrit periodic formative assessments that help build the building blocks have proven to be more useful. They help reinforce the foundation blocks of learning.

Summative assessments for syllabi based learning can be through games and makes the process challenging and interesting.

Typical pre- assessments include MCQ, True or False, quizzes, etc.

Some examples of games used purely for assessment purposes are snakes and ladders, hangman, and popular game show variations. While these games are fun to play, they are neither engaging nor task-oriented. The sole purpose of such games is to test the content using a different approach.

Feedback should be provided to learner responses for both pre and post assessment games. It is important to explain the correct or incorrect choices made by them. This will help them understand the implications of their choice.



Exhibit 10 - Post Assessment to test Samyuktakshara knowledge
Product: Learn Sanskrit Level 1, Vyoma Labs



Exhibit 11 - Pre-assessment to test Parts of the body. Visual game. Drag and drop.
Product: Learn Sanskrit Level 1, Vyoma Labs

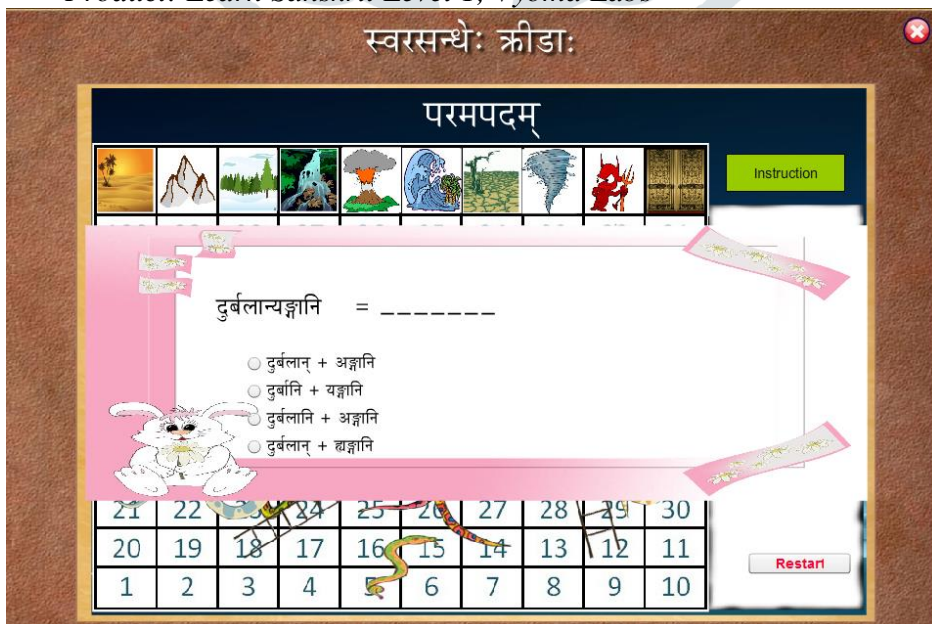


Exhibit 12 - Example of a test behind a game skin.
This snake and ladder game is primarily to test the knowledge of Svara Sandhis.

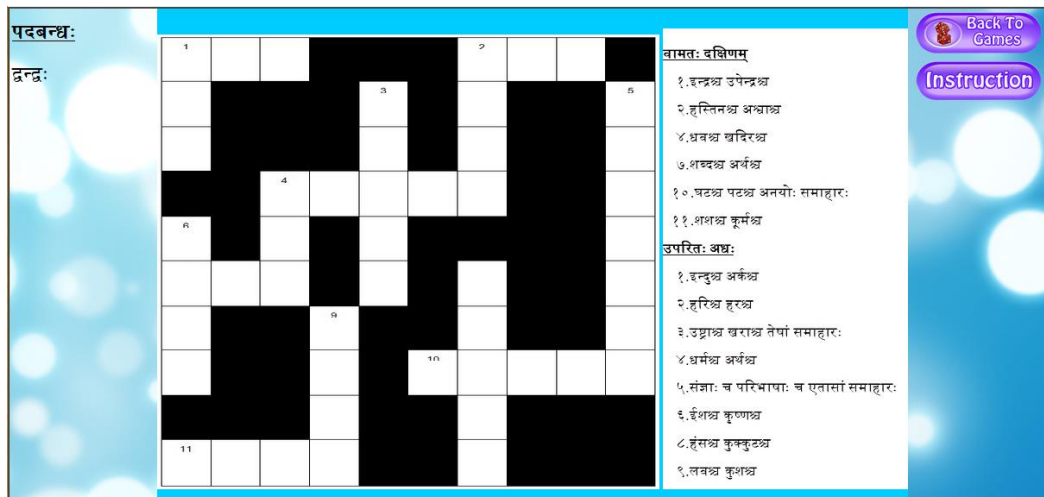


Exhibit 13 - Example of a test behind a game skin. This a typical CROSSWORD game.

VI Components of an effective game.

When choosing game-based learning for the different training needs in your organization, remember that a balance between fun and learning should be maintained while the content should be combined with strong game mechanics. This will ensure that the content sticks with the learner.

Points to consider while choosing activities & games for Sanskrit learning through technology:

1. Know your objective
2. Keep the learner in mind
3. Make the game relevant
4. Provide a unique experience
5. Focus should be on learning
6. Wherever possible give variety - variety of activity, variety of pace, variety of organisation
7. Challenge the learners and make them think so that they are more engaged and so process the language more deeply. There is sometimes a danger that activities are used because they work well or because learners enjoy them. What is important and should matter most is the language-learning value an activity has.
8. Another very significant point is providing activities which are enjoyable and interesting and which make learners want to continue doing them so they get more practice, however, it is important that these all have a clear language-learning purpose so that learners are practising and they are not done just for entertainment.
9. Finally, it is meaningful to provide activities which allow learner to be creative with the language and give them opportunity to experiment with it. This will help the young learners to test out their hypotheses about the language and assist the development of their internal language system.

It is necessary to remember that no activity can fulfil all the above criteria simultaneously. Therefore, it is always vital to decide what the priorities are before choosing the activity.

Doney. I (2019) states that the factors that seemed to have the most impact included the following: challenge, competition, control, feedback, interaction representation, the use of visuals and media; rules and/or goals, which allow learners to understand how to play the game and what they need to achieve; and finally, reflection.

The elements of an effective game include (1) rules, (2)goals and objectives, (3) score & rewards, (4) Message, (5)Competition /challenge, (6) strategy, control, levels and titles, (7) Interaction (8) Outcomes /feedback/ Reflection. (9) Representation or story

Let's us look into some examples in Sanskrit E-learning.

Rules. This is an important element of any game. Rules add structure as well as a sense of expectation. If learners do not know the rules, they will not know how to play the game and will soon become frustrated and disinterested.

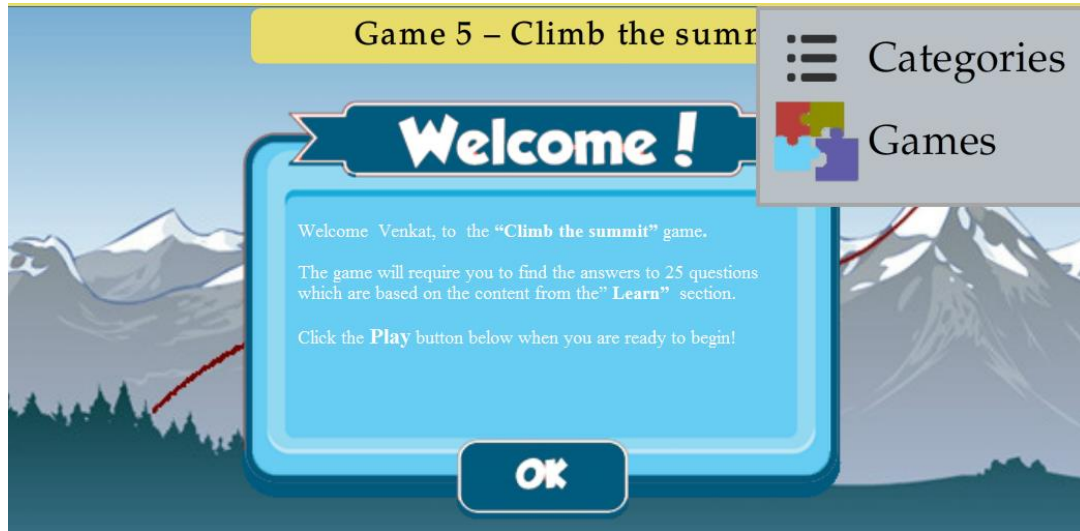


Exhibit 14 – Rules of the game

Goals and Objectives/ Messages: This element is responsible for communicating the objectives and goals of a lesson. Hide your messages in the game and allow players to discover them as they go.

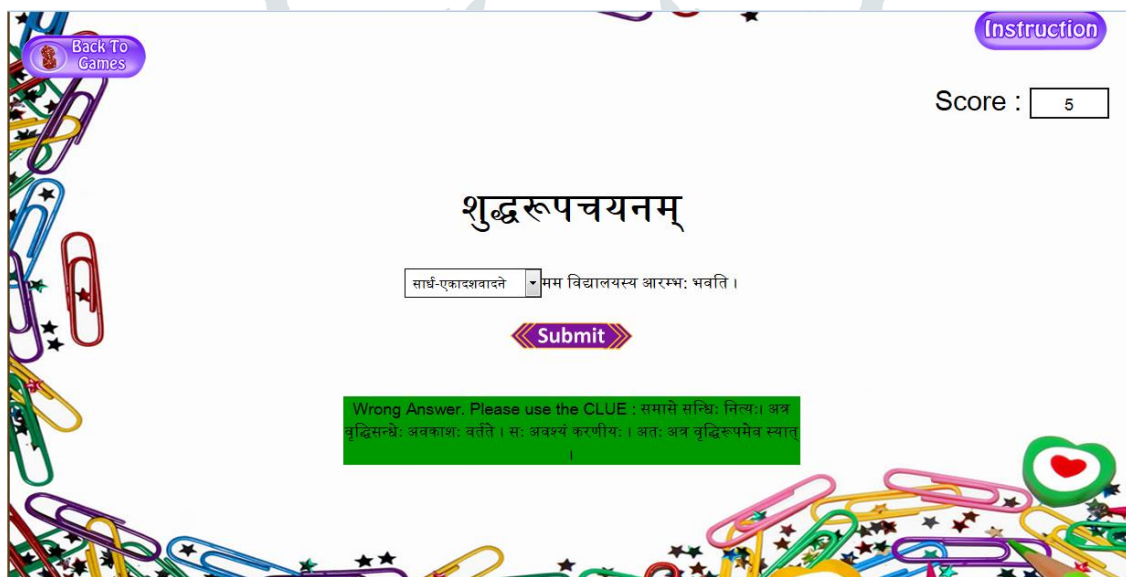


Exhibit 15 - The objective of the game is to master the rules in joining words in Sanskrit. A sentence is given with a drop down menu. The drop down menu has the compound word with the correct answer. The user is asked to select the correct answer. Here when the user does not select the correct answer there is a message which tells the grammar rule that he has to remember.

Scores/ Rewards. This element adds excitement and forces learners to continue with the game. Players want to know if they are winning or losing. Medals, badges, and points are some examples of rewards that can be given to learners as they complete each level of the game or provide correct responses to questions



Exhibit 16 - Reward game for children: As the correct answers are provided; Gold coins get collected.

Competition or Challenge or Goals. Challenge indicates the level of difficulty and ability to stretch the learner; an instructional designer should aim to provide clear goals and feedback to engage learners in the game. Additionally, it is important to make sure the goals are immediate. In addition to clear goals and appropriate feedback, learners should experience a certain degree of curiosity or surprise. One should give learners control by providing enough but not too many options. If exposed to too many choices, learners may become frustrated and refuse to continue exploring the game.

A sense of risk in the game is also good. Games can be designed to make the failure possible but avoidable and ensure that, regardless of how players move, failure is not their final result.



Exhibit 17 - A timed game to test different concepts in Sanskrit Vocabulary.

Strategy/ Levels and Titles. This element gives you an opportunity to split the course into sections providing learners with the opportunity to move on to Level 2 after completing Level 1. As learners move through the levels, their titles can change from Novice to Expert. Assigning levels and titles will motivate learners to complete the course. This element allows players to manipulate the game to maximize their score. Giving learners rewards and bonus points for completing a level or achieving certain milestones are ways to add strategy to the game design.

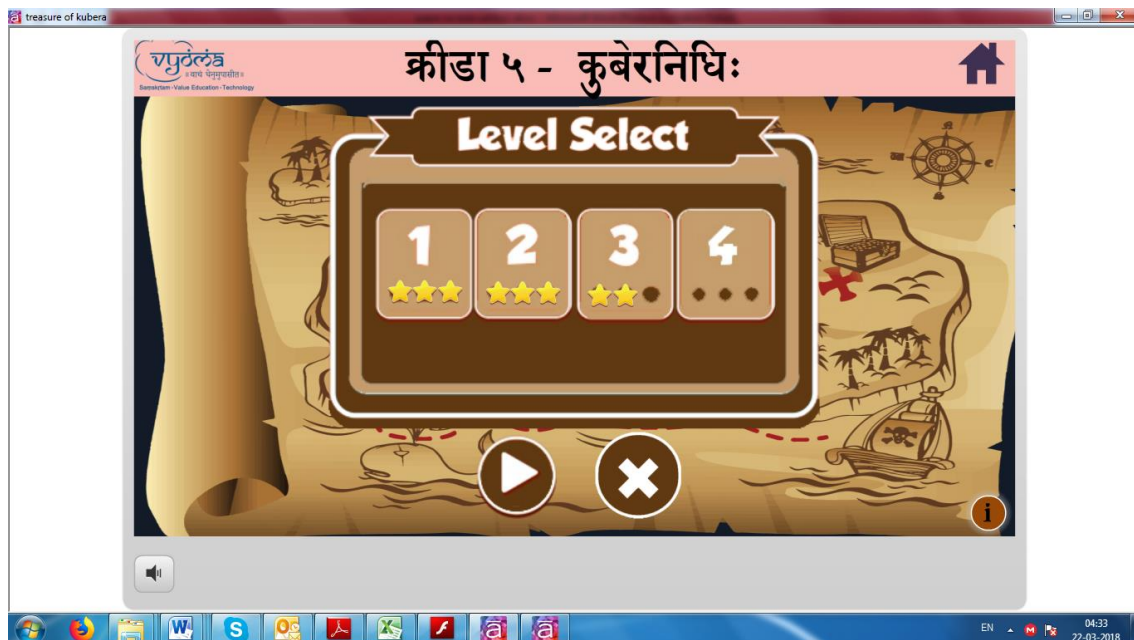


Exhibit 18 - Interaction: In certain games we can make the learner interact or do some activity with the computer. Interaction fosters more engagement.



Exhibit 19 - Sample Wheel of questions game: The Learner is supposed to click the spin button upon which the wheel spins and stops. When the wheel stops the learner should once again click on the audio symbol wherein an audio question is highlighted with different answers on the wheel. When the correct answer is selected on the wheel the computer gives an instant feedback whether the same is correct or not.

Outcome/ Feedback/ Reflection. The outcome of learning must be clear at the end of the game. As learners progress through the course, they expect appropriate motivational feedback. Corrective feedback can be either direct or indirect. “Great job! You have done well” is an example of a direct type of feedback; claps can be a type of feedback for children; while assigning scores is an indirect type of feedback. Regardless of the type of feedback provided, it should not interrupt the flow of the game. Providing opportunities for learners to reflect on the reasons for choices and think about the knowledge obtained from the game experience is termed as reflection.



Exhibit 20 - Sample Feedback in audio and visual mode.

Representation Or Story; Sometimes the game can be a part of the story which the learner is aware of.

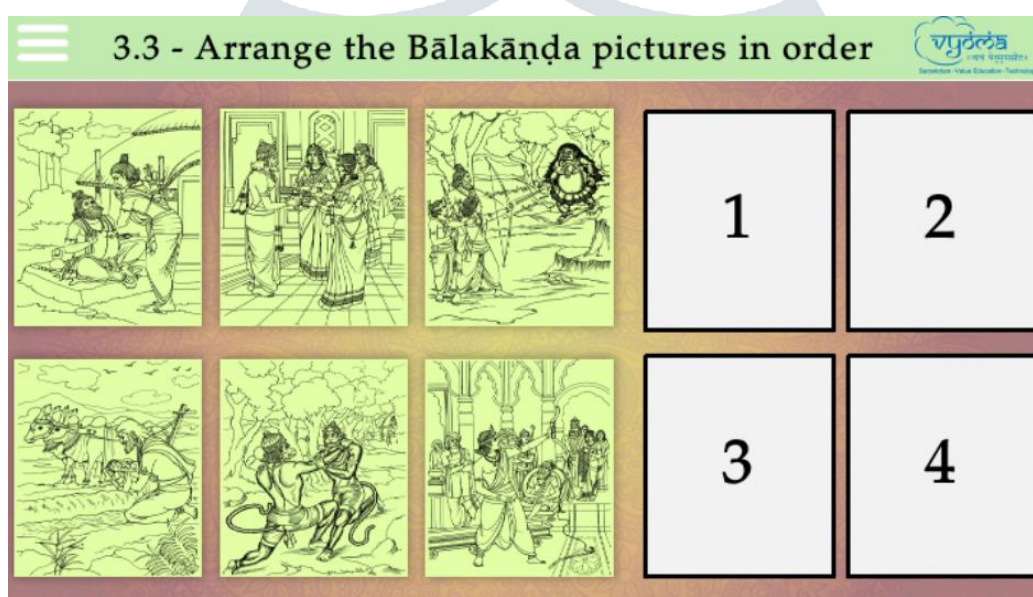


Exhibit 21 - Sample Ramayana story game. The user is supposed to drag and drop events according to the sequence in which they occurred in the Ramayana.

Focus should be on Learning

It is very easy to get carried away by the design of the game such as using more action, sounds, complex scoring methods, or background for your game that we miss the main objective – which is to help learners retain important information. Focusing on design elements too much turns the learner's attention away from the knowledge and skills he is supposed to acquire from the game. Hence it is better to always focus on the game.

VII How to Make Game-Based Learning Part of a Sanskrit curriculum – The way forward for schools and universities

At the school and the university level, games can be introduced as a part of the blended learning strategy. The teacher can use them in his classroom if structured with the pedagogy and curricula.

Games can work well as a reinforcement tool to reinforce concepts; can be used as a supplement to the teaching, the game can introduce the topic which will be covered later in the course. They can also be used as standalone assessments after a topic is covered.

Assessments in curriculum courses are important to help learners progress from one course to the next. Formative and summative assessments are an integral part of assessments in curriculum courses.

For **formative assessments**, a memory game can help learners recall what they have learned through matching of text, images, or even sounds. Games where the learner has to demonstrate his knowledge by dragging and dropping text or images in the relevant categories will reinforce his knowledge.

As for **summative assessments**, scored games can engage the learner in the assessment process.

Commercial off the shelf products (COTS) may be used for blended learning or slight customizations may be requested from the vendor who provides the same.

VIII Technological aspects in Game Design for Sanskrit.

Deciding the technology and designing the game is very important component in the e-learning course/ products. One can have the following strategies while creating games

1. Use an existing game template in an authoring tool
Adobe articulate, etc.
2. Customize and create a new game

Points to be borne in mind while choosing the technology

- 1) Idea of the game
- 2) Subject and Learning outcome
- 3) Time available
- 4) Cost available
- 5) Learner friendliness and ease
- 6) Availability in different modes – web, CD, videos, mobile platforms
- 7) Compatibility with operating systems – Windows, MAC, Linux, etc.

The inclusion of the TPACK (Technology, Pedagogy and Content Integrated) approach Mishra & Koehler, 2006 provides us with a framework for analysing the content of games and how they integrate with game genres, and through that provide us insight into how learning could occur and how that learning could be assessed

IX Combining Instructional Design and Game Design

The desired outcome of instructional game design is to combine the powerful attraction of games and the proven effectiveness of instructional system design (ISD). This combination would have the capacity to focus player concentration on game play and learning the planned content in order to successfully complete the game. Conjoining game design elements (e.g., rules, goals and objectives, outcomes and feedback, conflict and challenge, interaction, representation or story) with ISD elements (e.g., analysis, design, development, implementation, evaluation) may be the means of reaching the desired outcome. Applying findings (e.g., working memory capacity, mental models, memory consolidation) from cognitive psychology may provide further assistance.

Starting Point in Game Design and arriving at the Game Idea.

When designing an e-learning game; it is crucial to know your objective. We should know whether the learning objective of the game is to help your learners acquire a new skill, gain knowledge, or bring about a change in behaviour and attitude, or if it is a combination of the three. This will determine the content and design of the game.

Game designers do not have a standard design starting strategy to begin the development of games. Although initial steps such as the game idea, the game play and the technological environment in which to play the game will have to be addressed, adopting each of these steps as the starting point may produce different end results especially with respect to Sanskrit. A game project often starts with an idea and through

the brainstorming and development of the idea unfolds the needs and characteristics of the final product. Games can also start by the definition of the game play or the type of game (role play, treasure hunt...). The definition of the type of game to be designed is followed by the conceptualization of the game for the topic.

Games may also start by defining the technology with which the game will be played, in which case the features and attributes of technology will set the framework for the game. It may be played on hand held devices, personal computers, or device specific machines.

The starting point of games for education incorporates additional challenges. In the execution of the initial steps, the instructional nature of the product has to be considered and included. Under the systematic approach of designing instruction, the first step in a project is the needs analysis.

The needs analysis is a process of getting to know the learner and determining the current situation, the desired situation, and what changes need to be in place to move the learner to the desired state (Brown & Green, 2006).

The instruction to be developed is part of the intervention that will help the learner to bridge the gap and achieve its goal. The definition of the gap that the instruction should fill gives direction to the brainstorming process that defines the game idea. The instructional purpose for the game provides a framework for the brainstorm, focusing the search for the game idea.

X Future of Game Based learning for Sanskrit

Sanskrit Learning Game Development Checklist.

Based on experience in designing sanskrit learning games for learning the following checklist is suggested to ideate, design, develop and implement games in a game based learning scenario

- 1) Perform a needs analysis – Learner, current learning state, future learning state, learning outcome expected, etc.
- 2) Decide the starting point of game design
- 3) Come up with an Game idea for the learning topic
- 4) Come up with type of game, technology, topic
- 5) Put together the right design team
- 6) Conceptualize the game with the learner as the focus
- 7) Check for the flow in the game.
- 8) Check whether the gap in the needs analysis is addressed.
- 9) Prepare a game design document with technology, people, process, timelines and cost.
- 10) Incorporate game design components
- 11) Check for principles of instructional design that apply to learning games of Sanskrit
- 12) Design, Develop and perform quality checks
- 13) Testing the game – perform linguistic testing, instructional designer testing, technical testing, integrated testing in production and live environments
- 14) Release the game for UAT
- 15) Incorporate changes after UAT
- 16) Final release of Game for learner use

CONCLUSION

Game based learning is very important in Sanskrit e-learning to engage, motivate the learners of all ages. tries to analyse the digital game scenario with respect to

With the technological advancements in virtual reality and artificial intelligence areas; the future of e-games for Sanskrit are also bound to change. The learner would want to experience the games in 3D reality and enjoy a wholesome experience. Mobile based instant games such as Kahoot are gaining popularity in university based education. Analysis of Sanskrit Learning with respect to psychology of e- learners needs further research which can contribute for further effectiveness of learning through games.

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