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Nutrition Games: A Tool to Improve Nutritional Knowledge of Children

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Abstract: ***This study assessed the current nutrition knowledge among 50 students in 9th and 10th classes and used these findings to inform the development of a gamified nutrition learning website. A structured questionnaire on food groups was administered to evaluate the students. Results revealed substantial gaps, with 42% of the students scoring below 50% accuracy and none scoring above 79%. The findings highlight significant knowledge gaps among Indian adolescents and propose gamification as a promising strategy to strengthen nutrition knowledge. To address the gap, an interactive website incorporating core nutrition concepts was designed.***

Keywords: Nutrition Knowledge, Educational Tool, Gamification, Scoring Technique, Food-group Classification

1. Information

Adolescent malnutrition remains a critical public health issue in India, where preventable conditions continue to place a heavy burden on her people and the healthcare system [1]. Studies show that basic awareness and nutritional education go a long way in decreasing malnutrition amongst the population [2]. Despite understanding this, nutrition is undervalued in school education [1]. Schools provide an especially suitable environment for implementing nutrition interventions [3, 4]. Proper eating habits taught in schools often persist into students' lives outside of school, promoting better eating choices [4]. However, schools struggle to provide proper nutrition education due to inadequate training, lack of effective tools, and unwillingness to fund programs not fully aligned with education standards [5, 6, 7]. A low-cost, easy to implement and fully self-sustaining approach is thus necessary. Gamification–the use of game-based elements in non-game contexts–offers a possible solution for nutrition education [8, 9]. Research has shown that gamification can influence behaviors and habits across multiple domains, with a history of effectiveness spanning more than a century [10]. In educational settings, it has been found to enhance motivation and accelerate learning [11, 12]. The objective of this study is to understand the extent of nutrition knowledge among 9th and 10th class students in India and to design a gamified educational tool to fill the gaps identified.

2. Methodology

This study was designed to assess the current nutrition knowledge among adolescents. Findings from this preliminary evaluation were subsequently used to inform the design of a proposed gamified nutrition tool. Fifty students from 9th and 10th classes were randomly selected from government and private English-medium schools in Hyderabad, with both boys and girls represented.

To establish baseline knowledge, a structured questionnaire was designed using the nutrition content of the 9th and 10th class science textbooks. The questionnaire focused on knowledge of food groups. Students were asked to classify fifty food –spanning the four categories of cereals and millets, pulses and legumes, vegetables, and fruits–into their correct categories within a 10-minute time limit.

Structured Questionnaire:

	1	2	3	4	5
1	Black gram	Lentil	Bengal gram	Spinach	Cauliflower
2	Rice	Cowpea	Cabbage	Papaya	Sweet potato
3	Mango	Amla	Wheat	Beetroot	Maize
4	Banana	Seetha phal	Yam	Onion	Soyabean
5	Orange	Lime	Amaranth	Barley	Sapota
6	Mint	Grapes	Green gram	Watermelon	Red gram
7	Rajmah	Brinjal	Dry Peas	Bajra	Ragi
8	Guava	Vermicelli	Drumstick	Ladies fingers	Potato
9	Carrot	Sago	Capsicum	Cucumber	Radish
10	Tomato	Brocolli	Beans	Bottle gourd	Apple

1) Read the above listed 50 items in the five groups
2) Put them into four groups given in the five tables above within 10 minutes.

Cereals & Millets	Pulses & legumes	Vegetables	Fruits

3) Each correct response was awarded 2 points, with a maximum score of 100. Based on total score, performance was graded as follows:
4) Based on the total score, performance was graded as follows:
   a) Grade I: Very Good (90-100)
   b) Grade II: Good (80-89)

c) Grade III: Fair (70-79)
d) Grade IV: Poor (60-69)
e) Below 60% was considered inadequate knowledge

Based on the findings of the questionnaire, a gamified digital tool was conceptualized and developed as a low-cost, engaging solution to address the knowledge gaps. This tool incorporates core nutrition concepts from the textbooks and is designed with game-based elements such as instant feedback, progressive challenges, and reward mechanisms. At this stage, the tool remains a design proposal and has not yet been deployed for testing with students.

3. Results and Discussion

Fifty students from 9th and 10th classes were taken for the study. Scores on the structured food-group classification questionnaire revealed substantial knowledge gaps. Among participants, 42% scored between 40-49%, 24% scored between 50-59%, 16% scored between 60-69%, and 18% scored between 70-79 %. As shown in Table 1, the highest performance fell within the "Fair" grade while a majority were clustered in the "Poor" or "Inadequate" categories.

Table 1: Distribution of questionnaire scores among 9th and 10th class students (n=50)

Grade	Score range	% of students
Very Good	90-100	0
Good	80-89	0
Fair	70-79	18
Poor	60-69	16
Inadequate	Below 60	66

The baseline assessment demonstrates a significant deficiency in the nutrition knowledge of the schoolchildren tested. These findings align with the previous research that adolescent nutritional literacy in India is limited despite the substantial burden of nutrition-related conditions [1]. Schools remain a critical venue for addressing these gaps; however, traditional teaching approaches may be insufficient to engage students and reinforce retention [5, 6, 7].

To address the identified gaps, a gamified nutrition website was designed to be used as an educational tool in class settings. The tool draws on curriculum-aligned content and incorporates interactive game elements tailored to students. The tool's interface is built to be intuitive. It is designed to be low-cost, scalable, and compatible with desktops and mobile devices to facilitate broad implementation.

Figure 1: Screenshot of the minigame.

Figure 1 shows one iteration of the game. It provides instant feedback to the user, immediately marking the right and wrong answers. The instant feedback allows the students to correct their understanding, ensuring that they learn as they play. The reward system encourages students to improve their score through repetition and motivates them to keep playing.

This game is designed to target the knowledge gaps observed in the questionnaire. This gamified solution has the potential to complement traditional education and enhance the students' nutrition knowledge. While prior studies suggest that gamification can enhance engagement, knowledge retention, and learning outcomes [2, 5], the effectiveness of online educational games in Indian schools remains untested.

4. Conclusion

The baseline assessment demonstrates a significant deficiency in the nutrition knowledge of schoolchildren. It suggests that the traditional methods of teaching students' nutrition knowledge is not sufficient. Gamification of this subject matter could be a promising solution to ensure this nutrition knowledge becomes engrained and leads to healthier personal nutrition choices. The sample size being small, reduces generalizability to broader adolescent populations across the nation. Further studies will be necessary to evaluate usability and impact of nutrition games.

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