

# DIGITAL STORYTELLING FOR FOOD SAFETY AND NUTRITION EDUCATION

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## **Annotation**

*This paper describes an educational narrative based approach for the learning of nutrition and food safety concepts by preprimary, primary and secondary educational level. Ten essential topics about Food Safety and Nutrition for children and adolescents have been identified which will be handled by 10 groups of educational digital stories. The design of the said digital stories takes advantage of the Ed-W model (Kordaki, 2014) which is presented in this paper while an example of a specific digital story referring to the first essential topic, "The Food Pyramid", is also demonstrated.*

**Key words:** digital storytelling, education, food safety, nutrition.

## **Introduction**

Stories are possibly among the oldest literary forms known to mankind. Actually, the history and cultural heritage of many societies has been preserved through stories (Stein, 1982). Prior to the advent of writing, in the earliest times, storytellers of mankind imparted their heritage through stories, thus, the continuity of experience from one generation to the next was ensured (Abrahamson, 1998). Great examples of storytelling from the Ancient Greek history are Homer's epics – the Iliad and the Odyssey. On the whole, storytelling can be seen as the effort to communicate events using words (prose or poetry), images, and sounds usually including improvisation or embellishment (Haigh, & Hardy, 2011). As a learning tool, it has a great potential when it is used in reflective and formal ways (Alterio, & McDrury, 2003). Actually, storytelling constitutes both an ideal teaching and learning tool by enabling learners to learn to listen, to participate in and comprehend narrative discourse and create an approach to more advanced use of language (Mallan, 1992).

Digital storytelling is the digital development of classical storytelling; actually computers and information technology constitute a perfect medium for storytelling. Digital storytelling differs from the conventional storytelling in terms of users' role. Specifically, users are being viewed both as listeners and as people who have the potential to interact and shape the story (Dörner, Grimm, & Abawi, 2002). Moreover, it enables computer users to turn into creative storytellers through the traditional processes of selecting a topic, carrying out some research, writing a script, and finally, developing a compelling story. Next this material is being combined with various types of multimedia, including computer-based Fig.ics, recorded audio, computer-generated text, video clips, and music so that it can be played on a computer, uploaded on a web site, or burned on a DVD (Robin, 2008). Diverse types of digital stories have been introduced; they could be classified into the following three major groups: (a) personal narratives; which are stories that contain some noteworthy incidents in one's life; (b) digital stories that discuss historical events; which are stories that present dramatic events that could help people comprehend the past, and (c) stories designed to inform or instruct the viewer on a specific topic (Robin, 2006). Moreover, four student-centered learning strategies: student engagement, reflection for deep learning, project-based learning, and the effective integration of technology into instruction are being met in the digital storytelling approach (Barrett, 2006). Thus, digital storytelling, utilizing the advancements in technology and instructional design, seems to be a promising transformative technology-supported approach for enhancing learning, encompassing subject matter content acquisition, critical thinking skills, motivation, and information literacy (Yang, & Wu, 2012).

In addition, digital storytelling is a versatile instructional tool that has the potential to fit in most purposes while it can also be used in the majority of disciplines (Signes, 2008). Hence, it could be used both from teachers and learners. Teachers have the opportunity to create their own digital stories in order students to be engaged in the content and discussion to be facilitated about the specific matter, thus, abstract or conceptual content to become more understandable. Hence, a captivating digital story can be used as a hook in order students' attention to be captured and their interest in exploring new ideas to be promoted (Robin, 2008). An interesting approach, from the learners' perspective, is that, apart from users of the digital story, they can be also developers of their own stories. Hence, they can develop various types of literacy such as: information, visual, technology, and media literacy. Actually, by enabling students to be involved in the design and creation of a digital narrative as well as to present

their own digital stories, students have the potential to augment an integrated group of literacy skills, including: (a) *Research Skills*: Documenting the story, finding and analyzing pertinent information; (b) *Writing Skills*: Formulating a point of view and developing a script; (c) *Organization Skills*: Managing the scope of the project, the materials used and the time it takes to complete the task; (d) *Technology Skills*: learning to use a variety of tools, such as digital cameras, scanners, microphones and multimedia authoring software; (e) *Presentation Skills*: Deciding how to best present the story to an audience; (f) *Interview Skills*: Finding sources to interview and determining questions to ask; (g) *Interpersonal Skills*: Working within a group and determining individual roles for group members; (h) *Problem-Solving Skills*: Learning to make decisions and overcome obstacles at all stages of the project; and (i) *Assessment Skills*: Gaining expertise critiquing their own and others' work (Robin, 2006).

Finally, several advantages of using digital storytelling in education have been reported, namely: (a) the variation provided compared with the traditional methods, (b) the personalization of the learning experience, (c) the fact that the explanation or the practicing of certain topics become more compelling supported by an interesting story, (d) the opportunity to create real life situations in an easy and cheap way, (e) the students' engagement, and (f) the reinforcement of active learning (van Gils, 2005).

On the whole, it seems that the digital storytelling approach supports the interaction between students and teachers, enables students to construct their own stories, and enables reflection, project-based learning and active learning while technology is meaningfully being integrated in this context. The abovementioned characteristics are aligned with the social and constructivist views of learning (Vygotsky, 1980; Jonassen, 1999), where knowledge is not directly transmitted, but it is being actively built up by learners who are based on their experiences and interact with their environment or culture. Thereby, knowledge construction can be promoted within constructive, collaborative, conversational, reflective, contextualized, complex, intentional and active contexts (Jonassen, 1994).

Digital storytelling has been used to supplement the learning of diverse subjects included in the curriculum, such as language, civics, mathematics, and computer science (Sadik, 2008). Taking into account the above mentioned issues, this article proposes a narrative approach on "Food Safety and Nutrition Education". This study is realized within the context of the "Let's make it better! Raising the awareness of the triad nutrition-health-food safety in school education (EduForHealth): 2014-1-RO01-KA200-002931" European Project. The general objective of the project is to restore the place of the life sciences (oriented on nutrition and food safety education) in the culture of the young people, encouraging their appetite for careers in science and in entrepreneurship, respectively to develop networks between various actors from the scientific world: universities, schools, research institutions, scientific laboratories, associations, centers of culture etc. Thus, in order to reinforce the importance of nutrition and food safety education insight school and after-school tasks, teaching and learning activities will be focused on motivation and ability of young people to make healthy choices and to develop a real culture for a healthy life.

Specifically, 10 essential topics will be initially distinguished – according to the literature of food safety and nutrition – for pre-primary, primary and secondary education level. Based on these essential topics, a game-based approach as well as a narrative approach using digital stories will be suggested in order students: (a) to be aware of their misconceptions and inappropriate behavior regarding nutrition, health and food safety and receive appropriate feedback, and (b) to acquire basic knowledge about nutrition, health and food safety, and verify conclusions previously presented by textbooks and teachers. Virtual laboratories in the form of intelligent digital card games and intelligent digital stories will aid students to verify their knowledge about the abovementioned matters through active game play and appropriate feedback will be provided to students to correct their misconceptions.

To this end, this paper suggests the design of educational digital stories about the said essential topics, to support pre-primary, primary and secondary education pupils and students in terms of food safety and nutrition awareness. In the following sections the design of educational digital stories will be explored; in section 2 the significance of food education will be discussed while in section 3 the modeling methodology (Ed-W methodology) used for the design of the digital stories will be described, followed by the presentation of an example of a digital story about the role of vegetables in children's daily diet. Finally, the paper ends with a summary and future research plans.

### **Food safety and nutrition and the "EduForHealth" project**

Nowadays is more than obvious that the humans are dependent on consuming various foods that provide the required nutrients to sustain life. Good health, well-being and longevity

are based on the nutrient quantity and quality. If food systems are not able to provide sufficient amounts and enough diversity of foods to meet constantly the human needs, malnutrition will escalate among certain population groups, consequently their health and welfare will deteriorate (Welch, 2002). If the quality of the diet is poor, children and adolescents may be at risk for a lot of health problems that occur later in life, such as obesity, heart disease, as well as other chronic diseases. One of the most emergent concerns is the increased incidence of childhood obesity due to the poor diet quality (Frery, Johnson, & Wang, 2004).

A deeply understanding of eating behavior in children will allow developing effective education in order to positively influence it. In this sense, according to Social Cognitive Theory, the dietary intake is influenced by behavioral, personal and environmental factors, which operate in an interactive manner as reciprocal determinants of each other (Rosen, Burgess-Champoux, Marquart, & Reicks, 2012). Another approach to nutrition education is related to food labeling while a lot of data are focused on actual outbreaks and estimated incidences of food borne illness (Haapala, & Probart, 2004). On the whole, food safety education should be organized around five behavioral issues: practice personal hygiene, cook foods adequately, avoid cross-contamination, keep foods at safe temperatures, and avoid food from unsafe sources (Seaman, 2010).

Taking into account the abovementioned issues, the "EduForHealth" Project attempts to address the education for health from the scientific, pedagogical and legislative perspective, taking also into account the age of children, the classroom level, the psychosomatic development of students as well as the national and local particularities. As far as the teachers are concerned, they could be trained to better expand the current educational step by deploying an integrated approach in the teaching of food science, by exploiting traditional and web-based materials, as well as by adopting modern teaching approaches such as game based learning and digital storytelling.

Thus, in the context of this project, teaching and specific learning materials will be designed with a special emphasis on the field of nutrition. In fact, healthy nutrition is vital to good health and disease prevention, and it is also essential for healthy growth and development of children and adolescents. Hence, an appropriate intervention in order the specific problem to be addressed is food education that takes place into the classroom as children spend a great portion of their day in school. To this end, ten essential topics of Food Safety and Nutrition have been selected – according to the literature – as appropriate for pupils' and students' healthy nutrition education at the pre-, primary and secondary educational level. These topics are presented below:

- The Food Pyramid and the basic composition of foods (glucides, fats, proteins, vitamins, minerals, biological active compounds).
- The role of nutrients in the human body function and in the human health status.
- The biologically active compounds of foods and their implication in health wellness and preservation.
- The risk of chemical substances in food consumption (e.g. heavy metals, pesticides, self-born toxins, industrial born poison, etc.) and their implication in health.
- The biological health risks in food consumption (e.g. pathogenous and adulteration microorganisms and microbiological toxins).
- Chemical and biological risks and their prevention.
- The nutritional food labeling.
- The concept of RDA (Recommended Daily Allowance) and consumption security.
- Health logos.
- Food Hygiene.

Based on the above, a set of digital stories are being designed, containing and handling the aforementioned ten essential topics of Food Safety and Nutrition. In the context of intelligent digital storytelling, students' inappropriate behaviors and knowledge about nutrition, health and food safety will be firstly detected - by an appropriate digital tool that will be developed in the context of this project - and then, appropriate digital stories - illustrating the problems and the consequences of the detected inappropriate behaviors and knowledge on the heroes' health - will be assigned to each individual student. By observing the assigned digital stories, each student could potentially be in the same position with the hero of the story at hand, and suffer by the consequences of her/his inappropriate knowledge and behavior. Hence, changes on student's behavior and knowledge will be expected. In the next section, the design framework of the suggested digital story will be discussed.

### The design of digital stories: the Ed-W model

The design of the aforementioned educational digital stories will be based on a modeling methodology, named Ed-W model (Kordaki, 2014). Three models are involved in this methodology, namely: (a) the model of the *subject matter*, related to the basic concepts of the learning subject in question combined with the basic tasks that are appropriate for the students in order to understand these concepts, (b) the *learner's model* containing the students' non-scientific conceptions about the said learning concepts defined before, and (c) the *learning model* containing the appropriate learning strategy through storytelling, based on social and constructivist views of learning (Vygotsky, 1980; Jonassen, 1999).

The Ed-W model is a 5-step digital story boarding strategy for the learning of a specific matter which, at the same time, probes the students' non scientific conceptions. The aforementioned 5 steps are as follows: (a) the hero confronts a troublesome situation where she/he has to apply the knowledge of the subject matter in question, (b) the situation is being aggravating, due to actions based on the hero's non scientific conceptions described in the learners' model, (c) the situation is improved because of external, uncontrollable factors, (d) the situation becomes frightful because the hero continues to act in the previously mentioned way, and (e) the hero is forced to reflect on her/his thoughts and practices, and makes appropriate corrections. Then, all problems are finally resolved. The Ed-W learning model has been inspired by the idea of the "W-model for storyboarding for writers" (proposed by Mary Carroll Moore; [http://www.youtube.com/watch?v=pMhLvMJ\\_r0Y&feature=related](http://www.youtube.com/watch?v=pMhLvMJ_r0Y&feature=related)). However, it is noteworthy to mention that the Ed-W learning model utilizes modeling techniques and it is devoted to the design of educational digital stories taking into consideration modern learning theories focusing on the acknowledgement and exploitation of students' misconceptions as tools for learning. The 5 steps of Ed-W storyboarding are illustrated in figure 1 and discussed herein:

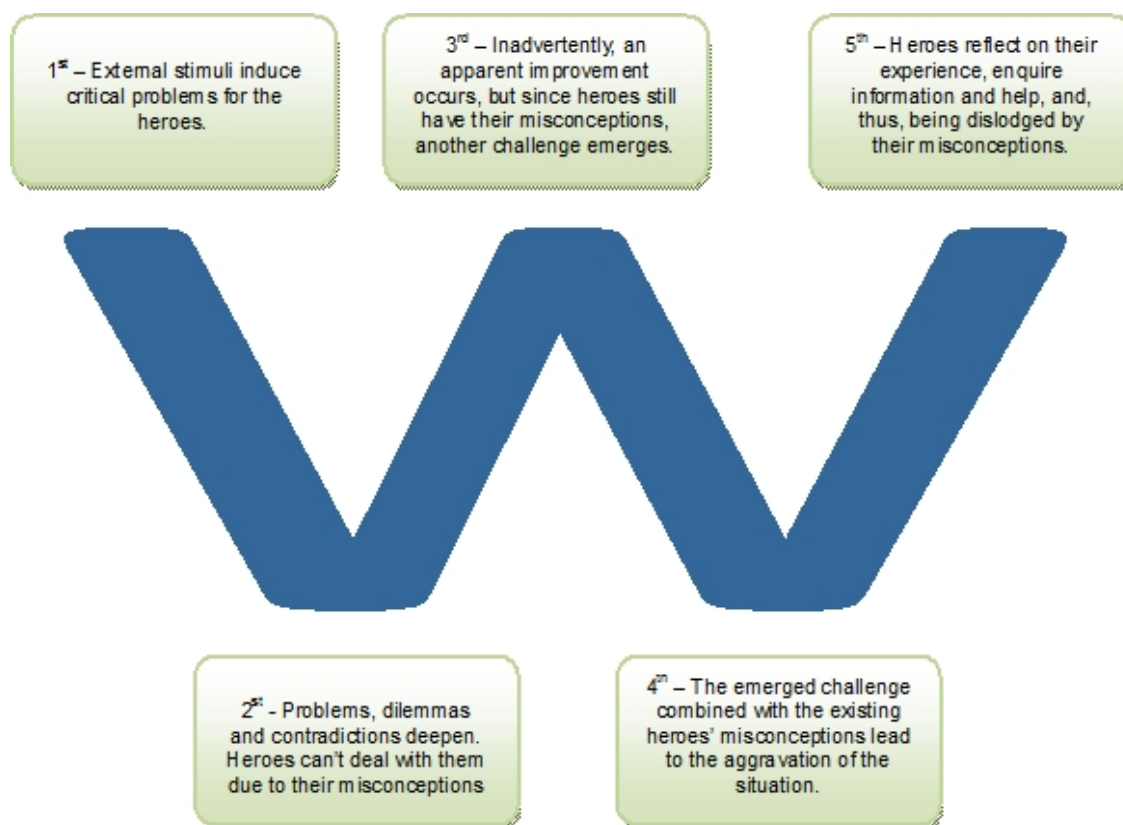


Fig. 1. The Ed-W Model

**1<sup>st</sup> edge of W:** In the beginning of the story external stimuli induce critical problems and heroes have to face them. The situation is relevant to the learning concept in question while the problems that the heroes have to confront are caused by their misconceptions about the subject matter (1<sup>st</sup> top left edge of W).

**2<sup>nd</sup> edge of W:** The story evolves and the problems, the dilemmas and the contradictions are deepening for the heroes and gradually worsen while they are unable to realize the significance of their actions due to their misconceptions (1<sup>st</sup> down left edge of W).

*3<sup>rd</sup> edge of W:* All of a sudden, inadvertently the situation meliorates and the heroes feel relieved of their problems. But still, they have not clarified their misconceptions about the basic concepts involved in the problems they are facing. Hence, while the story evolves, one more challenge emerges that leads to the escalation of the situation (arriving the middle point of W: 2<sup>nd</sup> edge in the middle of W).

*4<sup>th</sup> edge of W:* The emerged challenge in combination with the existing heroes' misconceptions are the sources of the aggravation of the situation, thus, the situation reaches a lowest point (2<sup>nd</sup> right down edge of W).

*5<sup>th</sup> edge of W:* In this phase, due to the crucial point of the situation at hand, heroes have to reflect on their experience in order to try to look for some reasons and to obtain explanations about the problems they have met. Besides, they also endeavor to enquire about some information and help; hence, they gradually become aware of their misconceptions. Being dislodged from their misconceptions and having grasped the appropriate knowledge, heroes are able to face the problems occurred in genuine and suitable ways. Herein, the situation ameliorates leading to the end of the story where heroes have an enlightening dialogue which indicates that they have learned from the situation at hand (3<sup>rd</sup> top right edge of W).

In conclusion, the Ed-W methodology for the design of educational digital stories is implemented by defining the following steps.

*Step 1:* Definition of the subject matter model and the learners' model.

*Step 2:* Definition of the learning aims of the digital story: The digital story has to highlight the learning of at least one of the concepts included in the subject matter model and enable students to overcome their difficulties related to this concept, as emerged from the students' model, by providing them appropriate learning challenges.

*Step 3:* Creation of the storyboard using the "Ed-W" model.

In the next section, an example of a storyboard designed by exploiting the aforementioned model, related to one of the said essential topics of Food Safety and Nutrition, will be discussed.

### **The example of a storyboard for the learning of the vegetables' role in children's diet**

The aforementioned Ed-W model will be used in the design of 10 groups of digital stories for the learning of nutrition, health and food safety. To clarify the aforementioned methodology, the storyboard of a digital story for the learning of the nutritional value of "Vegetables" will be presented below.

*Step 1 - Definition of the subject matter model and of the student model.*

*Definition of the subject matter model:* The model of the *subject matter* considers the nutritional value of vegetables.

*Definition of the student model:* Students of this age get difficulties to understand the fact that vegetables are of significant importance in their daily diet; hence, students overlook them, they believe that they hate them and also refuse even to try to eat them. The abovementioned difficulties should be investigated in order to be surpassed during the designed digital story.

*Step 2 - Definition of the learning aims of the digital story:* This digital story tries to help students to overcome their misconceptions about the consumption of vegetables. Specifically, it aims to support students to: (a) learn the nutritional value of vegetables, (b) identify which foods belong to the vegetables' group, and (c) encourage students to try vegetables.

*Step 3 - Creation of the storyboard using the Ed-W model:* In this step the storyboard of the digital story has to be designed based on the Ed-W model.

*Implementation of the ED-W model:*



Fig. 2. Scenes from the "Ioli and Veggie" Digital Story

**1<sup>st</sup> edge of W:** Ioli, the story heroine refuses to eat her vegetables because as she says “They are awful!!!” (see figure 2, frame 1). This is the stimulus that leads in the beginning of the story. Due to her refusal to eat vegetables, Ioli gets sick more often from her other friends while she also has problems with her intestine.

**2<sup>nd</sup> edge of W:** Ioli's problems are getting worse – her stomachache insists and she can't go to the toilet regularly - while she is also obliged to take medicine in order to be relieved. In order, Ioli to be convinced and change her mind, a super-hero called Veggie man appears and introduces himself as a proponent of vegetables, whose mission is to change children's perspective about vegetables (see figure 2, frame 2). The heroes travel to the Veggie town, where Ioli has the opportunity to be informed about vegetables and their essential role in children's nutrition. However, based on her personal perspective about vegetables, she insists on her beliefs and wants to leave (see figure 2, frames 3-4).

**3<sup>rd</sup> edge of W:** Ioli has left Veggie town and is really happy. Now, she has been in a fast-food place where she can eat her favorite junk food. Overexcited from her pleasure she is being impelled and eats a lot (see figure 2, frames 5-6).



**4<sup>th</sup> edge of W:** Unfortunately, having eaten plenty of junk food, she feels a really bad stomachache. Her problems are being worse, as she throws up the eaten food (see figure 2, frame 7).

**5<sup>th</sup> edge of W:** Here, loli seems to be affected by her setbacks and tries to reflect and revise her perspectives about the role of vegetables in her diet. She remembers Veggieman's words and wishes to be with her. Luckily, her wish comes true and Veggieman appears again. He tries to explain loli the harmful effects of junk food as well as the essential role of vegetables in everyday nutrition (see figure 2, frames 7-8). This is a turning point for loli. She realizes that vegetables should be an essential part of her daily diet in order to get the complete advantage of the nutrients and the necessary fiber that her body needs (see figure 2, frame 9). The story ends when she finally tries her vegetables and realizes that they are delicious, too (see figure 2, frame 10).

### Summary and future research plans

This paper presents a narrative approach in food safety and nutrition education. Ten essential topics about Food Safety and Nutrition for school children have been suggested by experts which will be handled by 10 groups of educational digital stories. The Ed-W model (Kordaki, 2014) has been employed for the design of the said stories as a supplemental tool for the learning of basic topics about nutrition, health and food safety in meaningful and enjoyable way. According to the aforementioned model adopts a 5-step digital story boarding strategy for the learning of a specific matter which at the same time probes the students' non scientific conceptions. The aforementioned 5 steps are as follows: (a) the hero confronts a troublesome situation where she/he has to apply the knowledge of the subject matter in question, (b) the situation is being aggravating, due to actions based on the hero's non scientific conceptions described in the learners' model, (c) the situation is improved because of external, uncontrollable factors, (d) the situation becomes worse because the hero continues to act in the previously mentioned way, and (e) finally, the hero has to reflect on her/his thoughts and practices, and makes appropriate corrections. In the end, all problems are resolved. The implementation of the aforementioned model is illustrated through an example of a digital story about one of the above 10 essential topics while the design of all the groups of the digital stories concerning the total of topics is in our future plans.

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