The Development Process of a Coding Game Engine for Culture Transfer in Social Sciences Education: SIGUN

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Abstract

This study aimed to explain the development stages of an online coding application engine (SIGUN) according to the R2D2 instructional design model to support and develop cultural transfer in social sciences education and popularize the national culture. During the definition phase of R2D2, analyzes of needs, learner, task and content were made. In needs analysis, it was decided to develop a coding application that transfers national culture instead of transnational culture in coding education. In the analysis of learners, the coding skills of the students at different grades were examined through samples, and it was decided that SIGUN should be editable according to their developmental characteristics. It was planned to assign tasks to learners in task analysis and to fictionalize the tasks in the prototype through Dede Korkut stories in content analysis. In the design and development phase of R2D2, it was decided to create an online system choosing media and equipment. Subsequently, the design and development process of SIGUN was started creating a draft graphic design interface through determining the development environments. In this sense, a web-based coding engine was developed with various coding languages. The rapid prototype was analyzed for process evaluation as being equipped with national culture elements and thus, the final version was created. Due to its dynamic structure, SIGUNwas can be adapted for different developmental stages of children and popularized while transferring abstract and concrete cultural elements with animations.

Key Words: Coding, Coding application, R2D2 instructional design model, Popular culture, Culture transfer, Social sciences

Introduction

The social sciences course aims to train citizens with a democratic attitude supporting reasoning depending on accurate information. This information is reflected in real life going beyond theoretical knowledge (Doğanay, 2012). This feature of the social sciences course plays a role in perceiving and assimilating national and universal culture (Kabapınar, 2014; Öztürk, 2012). This process, expressed as cultural transfer, actualizes with the approach of transferring social knowledge to citizenship and gives individuals a sense of social belonging (Çulha Özbaş, 2012).

Cultural transfer realized with cultural heritage education is an important factor in constructing national cultural awareness. The multidisciplinary nature of the social sciences course supports this process (Gürel & Çetin, 2018), and social characteristics are transferred to future generations within this framework (Safran, 2011; Sever, 2015). The studies carried out in this field have also revealed the importance of social sciences courses in cultural transfer (Çepni, et al, 2019). While the digitalization of the transfer process expands the influence of culture, instructional methods adapted to this process have also attracted the attention of teachers (Srinivasacharlu, 2020). Coding education is one of the technologies that can be evaluated in this context.

With the existence of coding education as a part of programming, its importance has been noticed in human life. This field, which facilitates people's work, has been considered one of the skills that should be acquired in the twenty-first century (Dolmaz, 2019). Code.org as web-based and Scratch as desktop coding applications, which are among the various applications that have attracted the attention of individuals and develop their skills, have become prominent (Aytekin et al., 2018; Sırakaya, 2018). When the projects on Code.org are examined, it is noticed that teachers are possible to develop content or have access to ready-made content. However, it is understood that some of the ready-made contents reflect and popularize the globalization-centered culture. Therefore, this study explained the development process of a coding application in line with national cultural policies to solve this situation.

Purpose of the Research

In this study, it was aimed to develop a coding application engine running (SIGUN) on the internet and local network by the R2D2 (Recursive, Reflective, Design, Development) instructional design model to support, develop and popularize the cultural transfer process in social studies teaching at the preschool, primary and secondary school levels and to explain this process.

Importance of the Study

The study was important in developing a coding engine that could be adapted to the developmental levels of students. It was noticed that no adaptation was possible to be fulfilled in the application named Maskod developed on Unity by the Turkish Ministry of National Education (MNE). Also, Maskod did not include the contents of national culture elements and disciplines. When the coding functions of the Maskod are examined, it was noticed to indicate that it was not suitable for the early years of preschool and primary school. However, considering how necessary early childhood programs were in terms of cultural transfer (Seefeldt, et al., 2015), it was possible to regard that MNE made a great effort and that coding activities were given great importance, especially in preschool educational institutions. It was noticed that the Fatih Project (Yolcu & Bayram,

2016), which was estimated to cost 8 billion Turkish Liras (around 3 billion dollars at that time) in 2016, has offered a suitable infrastructure for coding training.

For this reason, coding training was carried out on giant screens in classrooms and distributed tablets with Scratch and Code.org. However, it had the support of engineers from American-centered global firms such as Code.org, Google, Microsoft, Facebook and Twitter and economic support from economic support of the firms such as Microsoft, Facebook, Amazon and Infosys. It also included media companies such as Disney, Century Fox and Cartoon Network besides Mutant and Zombie characters of Electronic Arts. These have been known to be linked to the culture that was associated with neo-liberalism and was the opposite of the nation's culture. Therefore, it was understood that the global culture was transferred with coding applications on Code.org. In this context, SIGUN's transferring the national culture in preschool and other educational institutions affiliated to the Ministry of National Education made the study important.

Development Process

In the study, R2D2 (Recursive, Reflective, Design, Development) instructional design model was adopted to develop a coding application called SIGUN. For the R2D2 instructional design model, Willis (1995) stated that R2D2 was an instructional design model that emerged in studies at NASA's Johnson Space Center and the University of Houston. In addition to the recursive, reflective design and development aspects of R2D2, R2D2 had three processes of definition, design and development and delivery (spread).

The name SIGUN (Fallow Deer) given to the coding application was expressed as a sacred deer in Turkish mythology. SIGUN symbolized the earth and Gökbörü symbolized the sky (Uslu, 2017). It has even been thought that one branch of the Turkish ancestry came from Gökbörü and another branch from Fallow Deer (Ögel, 2010). SIGUN has been therefore considered as a guide in Turkish mythology. Gökkurt guided Oghuz Khan and SIGUN to the Huns (Ögel, 2010). Since this feature of SIGUN, which stood out in Turkish mythology, was similar in

coding practices to guide the characters of children, this name was deemed appropriate for the study.

Definition

The definition was made in the first stage of the R2D2 instructional design model. Within this framework, the needs, learner, task and content analyses of the study were performed (Ocak, 2011).

The identification stage was started with a needs analysis. In this sense, it was understood that coding education was a pillar of globalization and addressed nation cultures. With the Anglo - Saxon based cultural transfer, it was determined that the elements belonging to this culture were popularized in the minds of children. A coding application (SIGUN) that could transfer the national culture elements was planned to solve this issue.

The needs analysis findings guided the analysis of learners. SIGUN was decided to be suitable for the skills of preschool, primary and secondary school students due to its cultural transfer function. Accordingly, the coding area was planned to be adaptable. Therefore, direction arrows for the children in preschool and first grades of the primary school and direction arrows with the simple denomination for children in the last and middle school levels of primary school were considered to be within the scope of coding.

After the analysis of learners, task and content analysis of SIGUN was performed. In this step, it was planned to adapt the SIGUN algorithm according to R2D2 features such as reading, reflecting, showing and making. Thus, it was decided to carry out the activities on a task-based basis in task analysis and to choose the tasks and content from Turkish tales and stories in the content analysis due to the culture transfer structure of SIGUN. Therefore, it was planned to add multimedia support to SIGUN. That is why the prototype tasks included Dede Korkut Stories.

In line with the findings obtained from the definition process, an algorithm was created to develop SIGUN.

Design and Development

The second phase of the R2D2 instructional design model covered the design and development processes of SIGUN. For this, the media and equipment of SIGUN were selected following the algorithm developed in the previous stage. SIGUN was decided to run online like other coding applications. Development platforms were determined for this and the tools were selected. SIGUN's codes were planned to be written in Adobe Dreamweaver with HyperText Markup Language (HTML), Active Server Pages (ASP), Cascading Style Sheets (CSS) and JavaScript (JS) languages, the graphic arrangements were planned to be administered in Adobe Fireworks and the development process was started.

A draft graphical interface including the function areas of coding, welcome, hint and task areas over the transaction algorithm for the design of SIGUN was created (Figure 1).

Figure 1: SIGUN Draft Graphical Interface

By the draft graphic work, a blank web page was created in Adobe Dreamweaver and web design was started. After determining the properties such as the filename, meta keys, language and attributes of the file, the tables of SIGUN were created with HTML codes. To automatically adapt the tables and the platform to the page and devices, SIGUN was given the responsive feature with CSS codes. Moreover, Google Apis for the fonts of SIGUN, Font Awesome for font characters (place - direction signs), Bootstrap for buttons, Creative.css link for animations were created.

After the attributes of the page were determined with CSS codes, the JQuery library was benefited to run the functions that would create the dynamic structure in the coding area. Thus, the directions determined in the "Select Direction" multiple selection areas were transferred to the lower part in the form of block code sequentially. This area was expanded due to its dynamic structure. In the code

string, the deletion was carried out with the cross mark on the assigned codes. This icon was created with Font Awesome. The direction selections in the coding area were easily changed since they were text-based (Figure 2).

Figure 2: Coding Space and the Resulting Dynamic Code Strings

After the block code sequence was created in the coding area, pressing the "I completed my codes" button sent the parameters of this series to the task area through a data form. However, this process was one of the most difficult processes in the design and development stage of SIGUN. Here, it took a long time to obtain the direction parameters in the dynamic area created with JQuery and interpret it by the task area. Within this framework, complex functions were written to convert the directions into x and y values for the task area after being transformed into index entry (Figure 3).

**Figure 3: Some of the Codes defined for SIGUN**

SIGUN coding area just below the tip area was located in Dede Korkut animations published by Turkey Radio and Television Board (TRT) connected with the content embedded youtube APIs (İneç, 2020).

The direction and x, y parameters created in the coding area were taken to the task area with the request object of ASP. Various values in pixels were assigned to these parameters with functions written in ASP. Here, the direction the characters traveled and the number of the pixels were determined by mathematical operations. Therefore, the characters acted according to these values (Figure 4).


Figure 4: Some of SIGUN ASP codes

For the parameters and defined functions to work in the task area, the Let's go to the broadcast button of Dede Korkutwas pressed to listen to the story. This button ran all functions through parameters (Figure 5).
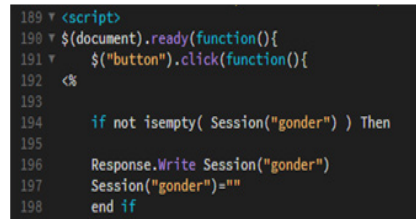
Figure 5: The Codes related to the Final Process

The graphics on the SIGUN were taken from Dede Korkut animations prepared by TRT and adapted for SIGUN. Among these, Aybüke and Basat, Dede Korkut, Tepegoz, oba and cave graphics were used for prototype purposes. Tables and layers of SIGUN were created with CSS codes. The coding base and SIGUN logo in the matrix layout were designed by the researcher. All images were processed with Adobe Fireworks. All routing options and visuals in the coding area were changeable. The researcher dubbed dedeKorkut stories. Dede Korkut guided students to these stories and ensured that the sounds were played (Figure 6).
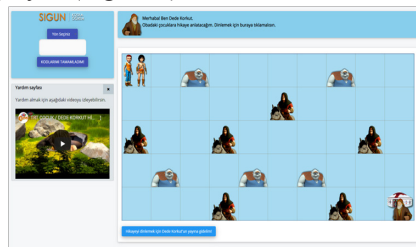
Figure 6: SIGUN Rapid Prototyping Model

The resulting SIGUN rapid prototyping model was subjected to various analyzes and tested in different browsers. Google Chrome, Edge, Explorer, Mozilla Firefox, Opera and Safari desktop and mobile versions of Chrome, Edge, Opera, Dolphin, Firefox and UC Browser were used. As a result, no

problems were encountered. These determinations were related to the responsive nature of SIGUN.

Spread

This stage represented the final stage of the R2D2 instructional design model. Here, the latest version was revealed, the innovative version was made widespread, and innovations were adapted (Ocak, 2011). In this context, the last version was revealed by the researcher reviewing the code, content and graphic infrastructure of SIGUN for the last time.

The latest version files of SIGUN on the local host were uploaded to the hosting service of the domain name http://www.precoder.net via ftp protocol. Widespread access to SIGUN and adaptation of innovations to children were enabled to make it accessible to worldwide users.

Conclusion

In this study, an online coding application called SIGUN was developed based on the R2D2 instructional design model to support and develop the cultural transfer process in social sciences teaching and to popularize the local culture, and this process was explained.

SIGUN was designed as a coding application focusing on the transmission of national culture as an alternative to transnational cultural transmission. SIGUN, in this context, was designed as customizable for preschool, primary and secondary school grades. Optimized code and dynamic structure also minimized the data transfer between server and client. Furthermore, SIGUN converted dynamic commands into a block code input and then moved cultural characters in the x, y coordinate plane.

To create a prototype, Dede Korkut Stories, one of the basic concrete elements of Turkish culture, was used in the SIGUN engine. The content of the story was transferred to SIGUN, and the tasks supporting it were narrated by Dede Korkut. For the prototype, the characters from the Dede Korkut animated movie published in TRT Çocuk were used.

The structure of SIGUN, which included real-world context and coordinate plane, indicated that SIGUN was possible to perform coding training based on docu-games or geo-games.

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