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A Mobile First Approach for the Development of a Sustainability Game

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Abstract

This short paper attempts to show a preview of the process in the development of a sustainability digital game. The purpose of this game is to be available in mobile devices to be used in the classroom so the students can learn about sustainable development and mathematic concepts such as rate of change. The technical strategy for this goal is the use of Responsive Web Design or RWD and the mobile first principles. This technique can speed up the development and maintenance of the project, and it is currently one of the best practices in Web Design.

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1. Introduction

In 2010, Ethan Marcotte, proposed a design strategy called Responsive Web Design (RWD). This tendency arose based on architectural theories that base their structure in user behavior and environment¹. Nowadays, RWD is one of the more accepted and implemented tendencies on digital Web environments, even in many native mobile

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applications. The educational sector, particularly in Latin American countries like Mexico, starts to immerse in the use of this technology.

Implementation of this strategy requires the use of tools and technologies that have been growing in the last five years. The number of educational projects which use RWD is growing every day. Authors Zheng, Cheng & Peng², Lestari, Hardianto & Hidayanto³, Plechawska-Wojcik & Kesik⁴, Pandey⁵, and Zhu¹, include a revisit of the use of this technology in different projects which look for using RWD qualities and deliver content through different devices.

1.1. What is Responsive Web Design?

The term RWD was defined by Marcotte⁶, to unify a series of existing technologies under the same work space. These technologies corresponded to the use of fluid containers, flexible images and media queries use. When these different technologies were unified as a single technique, the way Websites were designed was changed in order to benefit both the user and the author of the content⁶. There are many terms that refer to the same work technique, like fluid design, elastic container, and adaptive or flexible design⁷.

1.2. What are the advantages of RWD in mobile projects?

Pandey⁵ presents a study case in which RWD is used, and it shows that RWD is becoming the new design and development standard because it offers a better retribution for business in term of web support and multi-platform maintenance vs performance and user experience.

Lestari et al.³ state that RWD is capable of maintaining quality of information, site functionality, content readability and user experience satisfaction in a website in contrast to a Desktop version of the same application. Results of their investigation also show a decrease of 74% of actions like screen scrolling to access content in contrast to a non-responsive mobile website.

Zhu¹ sustains that one of the main reasons of the implementation of this strategy is to save time, even if this could mean a possible increase in development cost. Nevertheless, compatibility amongst different platforms is what allows the website to reach the majority of devices.

1.3. The use of RWD in an education project

The project we are working on –which is being developed using RWD– is a mobile-oriented, digital game based on the *Tragedy of the Commons* or TOC⁸, originally developed as a board game by the Cloud Institute for Sustainability Education. The RWD aspect results useful for the game to be played online through different devices using a single website. Connectivity amongst players will be handled server-side using PHP and jQuery. The User Interface (UI) will be developed using RWD. The game objective is to observe the change of mindset in students about sustainable development and calculus concepts like the rate of change, derivative and integral.

Some technologies reviewed include web responsive frameworks, preprocessors and IDEs. Depending on the preference of the developer, some of the suggested frameworks can be swapped. It is important to remark that some previous knowledge on HTML and CSS is often needed to start working on one of this projects, as it may represent a steeper learning curve than the one present in the development of the project itself.

2. Development

Part of the RWD development in a project involves the use of mobile-first design strategies. This approach considers that site content should be constructed starting from the indispensable parts and at the smaller sizes of devices, up to the biggest gadgets, so a new layout containing crucial content can be generated for different viewports, focusing on accessibility.

2.1. Responsive Frameworks

In order to use RWD, a fluid container is needed. These containers are usually provided by responsive frameworks. Bootstrap 3, Foundation 5 and Skeleton were the frameworks reviewed. These frameworks can be used for projects at different levels of complexity, but each of them has its own strengths. Bootstrap 3 features a bigger community and lots of available information. Foundation has good community support, but focuses more on project personalization. Skeleton is probably the least complex of the three, but it also allows little customization. All these frameworks use a flexible, 960 pixel-wide containers of up to 12 columns. Each framework uses different classes with unique names so elements of the website adapt automatically to the style sheet of the framework used. It is possible to add some modifications to any style, though another style sheet with the overridden changes is preferable.

2.2. CSS preprocessors

Preprocessors are components that work between the CSS style sheet designed and the style sheet the web browser applies. Responsive frameworks are usually based on any of the most used preprocessors, SCSS, SASS or LESS. These preprocessors help reduce and simplify the amount of code written. In the case of the Fish Game, our project, we will be using SASS, which allows variables, Nesting Styles, Partials, Imports, Mixins, Inheritance, Extends and Operators. All of these available tools allow to reduce written code under the philosophy of *Don't Repeat Yourself* (DRY). Massive changes (like changing a single color for many elements in the website) are way easier in this way.

2.3. GUI tools for preprocessors and frameworks

Applications like Code Kit 2, Compass or Crunch! allow generation of necessary files and their structure. This way, it is possible to work locally with all files and folders generated via an application instead of working directly from terminal or command line to install the framework. Another advantage of this GUI tools is that they allow automatic compiling of style sheets using *helpers*, which complete each style sheet in order to be more easily accessible through different web browsers. Different browsers use different *prefixers* on *vendors* –the way each browser calls the needed elements on the website– so a GUI tool can automatically generate the browser-specific code as needed.

2.4. IDE

The integrated development environment in which the code is generated should be capable of recognizing the language syntax which will be used for the project. Some applications have a wider support for this feature, so it is more likely to have different highlighters for code. Most popular IDEs are Sublime Text, Brackets and Coda, all of them with a lot of plugins and add-ons specifically for web development.

3. Conclusion and future work

This project, through the Fish Game which uses the TOC metaphor, looks to create a visual representation (plot) of the rate of change of the players' consumption so that each player can develop cognitive relations between the plots and their own actions in the game, and relate them to the sustainable development. This serves as a situated proof, which is embedded in the digital environment⁹. Currently, the front-end is in development, where RWD is being implemented. It is expected that the resulting documentation can be a starting point for another educational projects which intend to use RWD strategies.



Fig. 1 The Fish Game in different devices and viewports

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