

Webfolio: Secure Digital Portfolio for Early Childhood Education

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Abstract: In early childhood education, there are several techniques to understand children's development in kindergarten. One of these techniques is based on Portfolios that, in early childhood education, allows the understanding of the progress of the child, allowing a shared reflection with the child, teachers, and the child's parents towards the understanding on the child's learning process. The work described in this paper has as its main objective the development of a web application, which allows support for the construction of a platform for the storage and sharing of digital portfolios for early childhood education. In addition, it is intended that an access control of users be made so that it is possible to manage access to certain portfolios or sub-parts of them. The system has features such as: creating portfolios, creating notes, and managing user permissions. After the application was implemented, usability tests were carried out, with the participation of teachers. Through the techniques and methodologies used, it was possible to create a web tool to aid in the creation of portfolios for early childhood education, allowing the registering of audio, video, or image files. In addition, the system allows the sharing of portfolios with different users of the system who, in turn, can perform actions in the portfolio according to their role in the system.

1 INTRODUCTION

As Silva (1990) state, early childhood education has a set of peculiarities that distinguish it from other levels of education and teaching such as: the absence of an official program managed by the Ministry of Education; the pedagogical action based on the organization of space and materials as resources for learning, which are generally arranged by areas of activities and accessible to children; the kindergarten teacher considered as a determining factor in the educational environment, establishing a close relationship with children, facilitating and regulating the social interactions of the group and mediating the process of learning and socialization of children; the absence of a classification-based assessment, valuing the process of learning over the product.

These characteristics have enabled the pedagogical innovation that this sector of education has demonstrated over the past decades but, at the same

time, act as constraints to educational action, since the absence of standards and the lack of uniformity of criteria in the procedures, particularly with regard to planning and evaluation processes, mean that kindergarten teachers develop practices more by intuition than based on scientific and pedagogical principles.

Taking child-centered education and the particular characteristics of early childhood education as a reference, many educators express distaste for the function of assessment, even when they are professionals who are truly committed to their work. The reluctance to evaluate in early childhood education is often associated with the label that a teacher's value judgment can have on a child's schooling, in a period when all their skills are under construction. Thus, assessment is considered by many to be "a kind of black spot in this blue sea that could be the craft of teaching, if we were excused from performing it" (Roldão, 2003, p.31).

Taking into account that early childhood education preferably value the children's spontaneous learning in the interaction with their peers, in the direct action with the materials, in the appropriation that they make of the space whenever they act on it, and

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that they progressively dominate, in the cooperative relationship with the educator, the mechanisms of observation, reflection, even if informally, are present in the professionals' action. In order for the process to make sense, it is important to make it more intentional, it is important that each one of us appropriates tools for action and analysis that express this intentionality.

This broad approach to understanding the learning effectiveness and success in kindergarten leads to the quest for tools and methodologies that can be used for both reflect and help teachers improve their action. In this context, this paper describes a tool for registering and managing portfolios, supporting acquiring and storing different types of elements and providing regulated and secure access to these data. The tool should be accessible anytime, anywhere, so it follows a web development approach towards a full fledged web-based application, which we call WebFolio.

This paper is structured in five sections, starting with this introduction. Section 2 describe some related work, followed by section 3, that present the software design and implementation details. Section 4 focus on results and associated discussion and the paper ends in section 5, with some conclusions.

2 LITERATURE REVIEW AND RELATED WORK

In agreement with the perspective of Leite and Fernandes (2002), we argue that the existence of moments of reflection on the work developed helps children to understand what knowledge they are building as well as the means that facilitated their construction. The awareness of the construction of knowledge itself, through the reflective act, transforms it into effective learning. This line of analysis leads us to another broader discussion about the way the curriculum is structured in early childhood education. Since this level of education is generalist in nature which advocates the integral development of the child in all areas, implies that the evaluation process developed by early childhood educators should not only focus on cognitive knowledge, but on all dimensions of their development. In this sense, the choice of assessment instruments becomes particularly important, since they must allow for a comprehensive collection of all areas of learning, and through mechanisms of self and heteroreflexion help the child to situate himself in all dimensions of his development.

Our readings (Herbert, 2001; Leite and Fernandes, 2002; Parente, 2004) led us to consider that portfolios would be an assessment tool that could serve the two

functions stated: help the child to reflect on his/her own learning process; and provide data on all dimensions of the child's development.

(Herbert, 2001) states that the portfolio as an assessment tool enables critical reflection and awareness on the part of the child about the work developed and the entire learning process. He also considers that what the educator wants is to understand the child's development as a whole, stating that occasional observations of the child's actions in spontaneous situations provide a more individualized, and more accurate picture of the child's growth. The introspections that children can make, together with the work they produce and select, can be elements for both their own and the kindergarten teacher's evaluation.

This evaluation tool takes as a reference idea that all actions are potential moments of data collection that translate into a more globalizing survey of the child's path. We accept for this study the elements found by Parente (2004) in different referencing that:

Assessment portfolios are systematic and intentional collections of evidence made for the purpose of demonstrating learning and progress over time. Understanding the portfolio solely as a collection of assignments is a failure both from the standpoint of the concept and from the standpoint of its potential, hence the importance of reflection and selection throughout the process. The goals underlying the process of selecting work or selecting evidence transform the portfolio of work into a portfolio with evidence and with reflections on the child's goals, objectives, and achievements.

It is in this sense, that we believe that the functions and processes of implementation of portfolios should be very well understood. This statement implies that early childhood educators must have the courage to break away from the educational stereotypes that underlie some of their of their practices and to organize their work in ways that favor the child's learning, by themselves, with adequate resources and tasks that help them that help them build new knowledge, through discovery and and problematizing the way they acquire this knowledge.

In contrast with other education levels, where Learning Management Systems (LMS) (Leone et al., 2020; Tenorio et al., 2018; Tenório et al., 2018), even if supported with virtual assistants (Gubareva and Lopes, 2020), are the standard tools to support recording and assessing students progress, these tools are not in use in early childhood education.

To assist in recording the development of children in early childhood education, the portfolio includes a

collection of items and information that illustrate and represent the different aspects of the development of the child Shores (2001). It supports the child's education, enabling the reflection of themselves, teachers, and parents, helping them to understand the development process and allowing them to keep a record that can serve as a basis for the continuity of the work even if by another teacher Neves and Moro (2013). Typically, portfolios are physical files of objects, including text, images, collages, photographs, or videos. These, due to their characteristics, do not allow easy access to parents or the community, as it would be necessary to be physically close to being able to explore and understand it. Digital portfolios, on the other hand, allow to store observations, comments, videos, photographs, and children's work, as a basis for pedagogical documentation. Thus, the development of a safe and free platform for the national community of kindergarten teachers is of great importance.

In the approach of Mesquita and Lopes (2013), a method for recording child monitoring observations in a mobile application is presented. This observation can store data such as text, images, video, and audio, contributing to creating an electronic portfolio using a smartphone or tablet.

Childdiary (2021) is a web-based platform developed for creating portfolios, examining recording routines, managing children on waiting lists, parental involvement through individual messages, and sharing documents and invitations to meetings. The system has access via computer, tablet, and mobile phone, however, its free use is limited. Functionalities such as the number of teachers who can access the system, maximum number of children, reports, and visibility for Management or Coordination are examples of limited resources in the system.

In the SeeSaw application, it is possible to create digital portfolios containing text, images, and audio, in addition to allowing the export of the file in PDF format (Seesaw, 2021). The tool can be used by students to autonomously document what they are learning, in addition to sharing the portfolio with their teachers, parents, or peers. However, its free use has restrictions, limiting features such as class activities per teacher, creating multiple posters, saving work as a draft, creating and sharing activities and student grade-to-grade monitoring portfolios. Moreover, the platform only supports the English language, with difficult use in other languages.

In another approach, the EduClipper platform can be accessed through the web or through the iOS mobile app Educlipper (2021). It allows creating and sharing dynamic content, in addition to allowing recording feedback on children's tasks. It is also pos-

sible to capture and track the development and performance over time in digital learning portfolios. The application is free to use and has no paid plans.

Three Ring is an Android or iOS mobile application, allowing you to document classroom activities, create multimedia portfolios and share with parents, administrators and other teachers (Santos, 2015). In the application, it is possible to capture photos, videos, audios, and class notes, in addition to having unlimited storage. The use of the platform is free.

Easy Portfolio is an application for mobile iOS and Mobile and does not have a free version (Portfolio, 2021). In the tool, students and teachers can capture and share their work, such as photos, videos, audio and music recordings, web addresses, digital documents, creating a digital portfolio.

Most of these tools focus on individual use, with most of the features associated with storage and organizing. As stated above, an important role of portfolios for early childhood education is to stimulate reflection on the child progress among all the actors: parents, children, teachers and staff. For that, collaboration is essential, while maintaining a secure environment (Lopes and Mesquita-Pires, 2014).

3 WEBFOLIO ARQUITECTURE AND DEVELOPMENT

The architecture follows the guidelines for web applications, with three tiers (Figure 1).

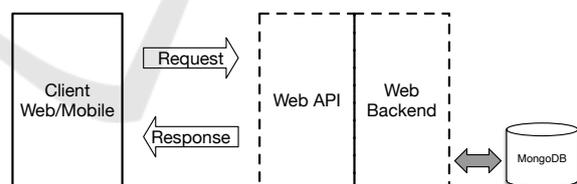


Figure 1: WebFolio architecture.

The database is document oriented, based on MongoDB. The access is performed, exclusively through the Web Backend, that exports its functionality through a REST API to both Web and mobile clients.

3.1 Analysis

The guidelines for the functionality arise from the use cases.

The "Login" use case allows any authenticated user to access the system. To log in it is necessary to enter the user's email and password. Then, it is

checked whether the data entered is registered in the application’s database, otherwise, the login is not performed. The “Create Account” use case can be performed by any user to create an account in the application. The user must provide the information of email, name, password, and educational institution to which he belongs. If the email is already registered in the application, the account creation is not performed. The “Recover Password” use case allows users to recover and change their password. The user must enter the email so that a password recovery message is sent. After that, it is possible to change the access password. The “Logout” use case is associated with all users who accessed the application

The “Update Profile” use case is associated with any user logged into the system. This allows users to make changes to their profile and to change information such as name, email, institution, and profile picture. It is also possible to change the password. The “Portfolio View” use case is available to any user in the system, as long as he has adequate permissions. Whenever a request is made to view the portfolio, the “Verify Access Permissions” use case is activated to authenticate this user’s entry to view the portfolio. In addition, it is always checked by the use case “Verify User is Authenticated to the System” so that the user can continue to use the application. If the user is not authenticated in the application, he will be automatically redirected to the login page to log in again. The use case “Update Portfolio” is associated with the role “Child”, which allows the user of this type to change the information in their portfolio, such as name, age, group, or institution. The “Manage Observation” use case is associated with the actors of the “Manager” role in the system. This use case allows managers the operations of creating, changing, viewing, and deleting observations from a portfolio. The “Allow Access” use case is associated with the actors of the “Teacher” role, which allows another user to access a specific portfolio. The user must enter the email of the other user in which he wants to allow access to the portfolio.

The “Manage Portfolio” use case is associated with the actors of the “Teacher” role, which allows teachers to create, change, view, and delete portfolio operations. To create a portfolio it is necessary to enter information such as the child’s name, age, and group to which he or she belongs. The “Update Role” use case is associated with the actors of the role “Administrator”. The use case allows the user of the “Administrator” role to change the role of another user, so that he can have more options for activities and functionalities within the system, such as creating new observations or portfolios. The “Associate Portfolio”

use case is associated with actors of the “Administrator” type, in which it associates portfolios with users so that you can view, change, or delete a portfolio or observation according to the user’s role.

The information stored in the database is structure in five entities (Figure 2).

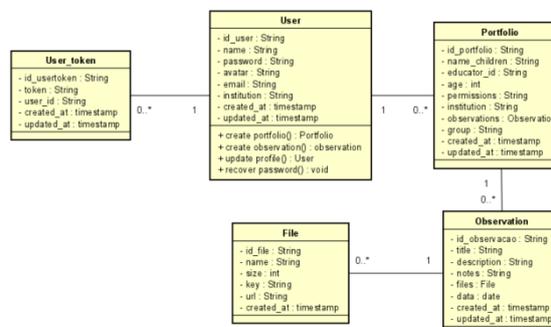


Figure 2: Webfolio Application Class Diagram.

The User token class is used to recover the user’s password in the application. The user, after obtaining the token, is allowed to create a new password to log into the application. The relationship shows that a user can have more than one token created for password recovery. The Portfolio class can contain many Observations, while each Observation can only be associated with only one portfolio.

The Observation class can contain many Files while a File can only be associated with one Observation. The User class has user identification, name, password, avatar, email, and institution. In addition, the user has the create portfolio methods, indicating that the user can create portfolios in the application, create observation, that allows the user to create observations in the system, update profile, allows the user to change their information on the system, recover password, allow the user retrieve the user password if he lost it.

The Portfolio class has the attributes of identification of the portfolio, child’s name, age, institution, age of the teacher who created the portfolio, and finally its access permissions. The Observation class has the observation identification attributes, observation title, activity description, observation date, observation files, and notes, which can refer to a child’s particular performance during an activity. The File class contains the information needed to store the file size, its name, and path to access the file.

Even though a portfolio is linked to a user, it can still be accessed by other users, as long as those users are on your whitelist. However, the portfolio has only one creator user of this respective portfolio.

3.2 Implementation Details

To establish communication between clients and the application, a RESTful API was developed. Access control is performed through JSON Web Token (JWT) authentication, which is generated after the user logs into the system.

Some routes, in addition to requiring authentication tokens, also require a certain level of permission on the system. To update a user’s information, for example, the user who initiated the request must be a user holding the “Administrator” role.

To prevent Distributed Denial of Service (DDoS) attacks, the Express rate limit tool was added to the application. It saves the Internet Protocol (IP) address of each user who accesses the application in memory (Redis, 2021). Along with the IP, the timestamp in which the access is made is also saved, to attempt to deny this user’s access or not and thus prevent an attack.

4 RESULTS AND DISCUSSIONS

The front-end Web application was developed in React with TypeScript, aiming at simplicity and user friendly experience (Figure 3).



Figure 3: Application login page interface.

For the Dashboard page (Figure 4), an option for system administrator was added to the menu, which can only be seen by users who have the title of “Administrator”, to access exclusive resources for administrators. In addition, when there is more than one user-created portfolio, a new button is added to the page, called “Create Observation for Room”, which allows the user to create an observation for more than one child at a time. To facilitate access to a child’s portfolio information, the name and or form can be clicked on to access the chosen child’s portfolio. The portfolio table filter can be used to help search for a specific portfolio, thus optimizing the search for portfolios in the system.

Portfolios are colored differently to differentiate

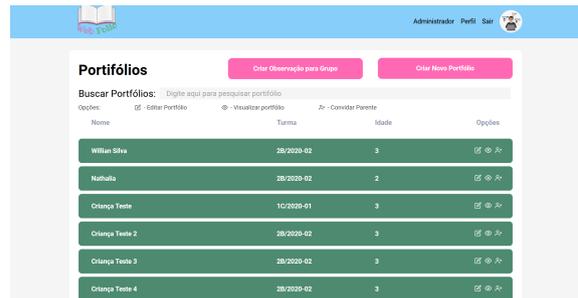


Figure 4: Application Dashboard Page Interface.

their permissions. In the table, the ballot that has a green color indicates that the portfolio was created by the user logged into the system, this portfolio has three icon options, in which the first icon is related to the functionality to update the portfolio, the second icon has the functionality to redirect the user to the portfolio page, for its full view, and the third and last icon has the functionality to redirect the user to the invite another user page so that that other user can view this portfolio. The ballot in the table that has a pink color indicates that the user was invited by email to view the portfolio, so this table contains only an icon with the functionality to direct the user to the portfolio page. The purple ballot indicates that the user has been associated with a portfolio through an administrator action, as this user also has teacher permissions, he can edit, view, or invite another user through the available icons.

In the interface to create a portfolio (Figure 5), placeholders were included to help the user to know what information is needed in the field to be filled out. The interface to update portfolio has an extra field on the form, in case the child has changed institution. The update portfolio interface also has the information fetched from the application’s database, the information of the chosen portfolio, when clicking the confirm alterations button, the portfolio information is updated. For practical reasons, a button to return to the main page, which is located above the title, has been added to these pages.

On the portfolio page, the observations have been subtitled to help identify the child’s activity (Figure 6). Through the use of libraries such as “react-audio-player” and “react-player” it was possible to play files such as audio, video, and images.

To record a new observation, markers were also added to assist the user in filling in the fields. To create an observation, it is necessary to fill in at least some field on the form, which has the observation title, description, observation data, notes, and child evaluation fields, while an interface of the update observation page works similar to the page of update



Figure 5: Application Portfolio Create Page Interface.

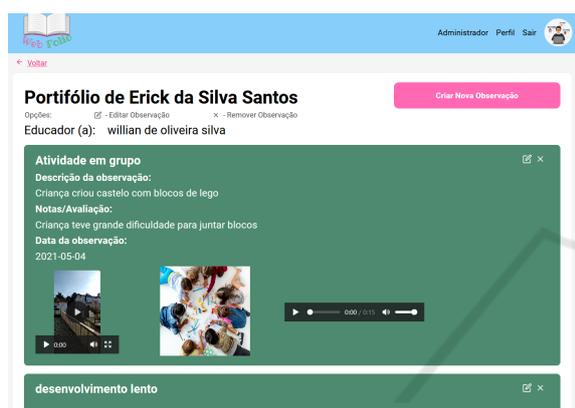


Figure 6: Application portfolio page interface.

portfolio, in which it brings all the information from the observation to its information update. The form has all the information to create an observation for a group, except for the grades and evaluation, as it is exclusive information for that child, however, the form contains a new Selectable field to search for a specific group in the application, allowing you to choose which children participated in the observation (Figure 7).

In the interface of the profile page, the user can change the name, email, or institution without having to change the password. If it is necessary to update the password, the old password must be typed, along with the new password, and the confirmation of the new password (Figure 8).

The portfolio association page contains all portfolios created at the institution. The table contains information about the portfolio such as the child's name, group, age and contains three options, in which the first icon indicates associating the user with that portfolio, the second icon indicates removing the user's association with that portfolio and the third icon indicates to delete the application portfolio (Figure 9).

To solve the responsiveness of the system's layout, Media Queries was used to adapt the use of the application on mobile phones, so that all navigation in the

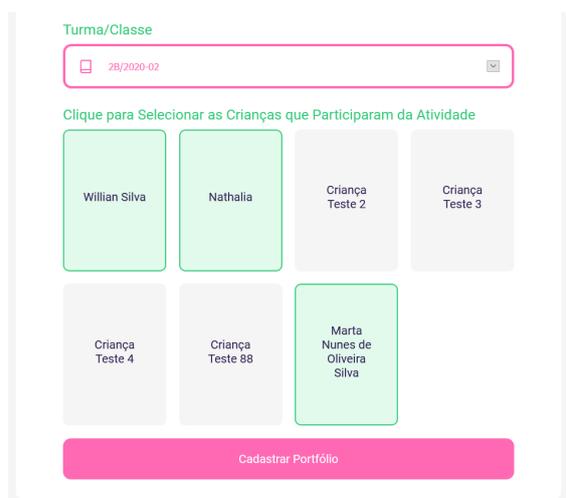


Figure 7: Chosen group checkbox.



Figure 8: User profile page interface in the system.



Figure 9: Portfolio association page interface in application.

system can also be done by mobile phone. For the login and user registration pages the content on the page was limited to contain only the application logo and the form for entering user information (Figure 10).

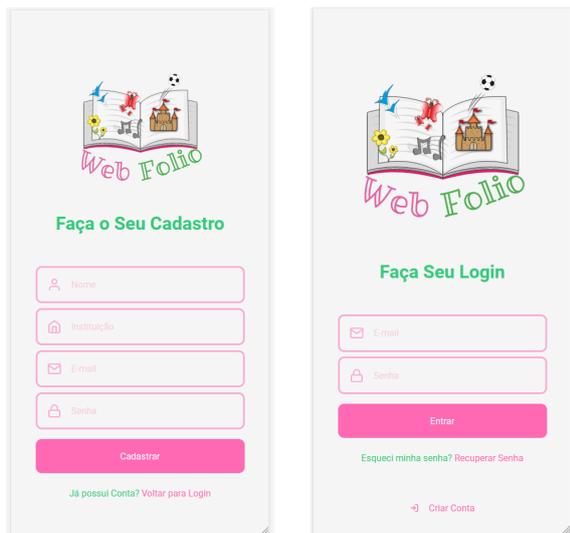


Figure 10: Mobile version user registration login pages.

For the mobile version dashboard page, the buttons to create a portfolio and create observation for the class were replaced by buttons with icons to maintain the application's default layout.

For all forms of the system in the mobile version, there were no changes in their content, there was only content resizing to maintain the standard layout of pages that have these forms. The administration page and the portfolio association page only had changes in their presentation, in which the portfolio icons and information are now displayed in block.

5 CONCLUSIONS

Considering that the main objective of this work was based on the development of a web tool to aid in the creation of a portfolio for early childhood education, allowing the organization and management of different types of content, the application proved to be useful and ready to use. Furthermore, it is expected that the tool allows users to have different roles to be played in the application and that there is also a method of managing them. It is expected that the application can help and facilitate the process of learning in kindergartens. The most important requirement was the security assurance and, for that authentication and access control at resource level was implemented, which requires a very flexible and efficient mechanism to verify access permissions. For future work, a functionality is suggested to hide the display of an observation of a portfolio that is not yet complete, apply internationalization in the application to allow the application to be used in other languages,

and the use of tools to evaluate and prevent files sent to the application that contains inappropriate content for viewing or reproduction. It is also necessary to perform in context test, with teachers, children and family.

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