<u>Research Letter</u>

Collaborative Development of an Electronic Portfolio to Support the Assessment and Development of Medical Undergraduates

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Abstract

This study outlines the development of an electronic portfolio (e-portfolio) designed to capture and record the overall academic performance of medical undergraduate students throughout their educational journey. Additionally, it facilitates the capture of narratives on lived experiences and sharing of reflections, fostering collaboration between students and their mentors.

Introduction

The Brazilian curriculum guidelines for medical schools incorporate competencies in information technology, emphasizing students' co-responsibility in acquiring soft skills such as leadership, teamwork, and continuous professional development [1]. The curriculum experience must foster critical and reflective skills [2].

Ribeirão Preto Medical School at University of São Paulo, Brazil (FMRP-USP), is a 72-year-old traditional institution that initiated a curriculum change in January 2023. In this new proposal, we introduced a longitudinal axis and curricular unit called personal and professional development (PPD). The primary objective of PPD is to foster self-reflection on lived experiences, regular self-assessment, and monitoring of the students' progress in curricular and extracurricular activities, with a mentor's support.

To support the implementation of the PPD curricular unit, we collaboratively developed a software to serve as the electronic portfolio (e-portfolio) and record the overall academic performance of undergraduate medical students throughout their educational journey. An additional expectation is to encourage and guide teachers to provide and register formative assessments in their disciplines and rotations, and to document their experiences and reflections.

Methods

The collaborative development of the system involved developers, health educators, and students, which was crucial to ensure that the e-portfolio meets the needs and expectations of all stakeholders. Developers contributed technical expertise for functionality and accessibility, while educators shaped content based on educational principles. Students, as primary users, provided valuable feedback.

The main challenge in developing the e-portfolio was to create an initial set of requirements. With various participants bringing different ideas, there was a multitude of perspectives in the initial phase, which brought fundamental enrichment during development but also increased the difficulty of integrating all perspectives.

These challenges were overcome with Scrum [3] integrated with socio-technical research methodology to facilitate the collaborative environment. We implement Scrum practices, such as daily 5-minute meetings and biweekly 30-minute sprint reviews, ensuring incremental and continuous deliveries and communication between the development team and stakeholders, mainly regarding system development. Additionally, we integrated the socio-technical research methodology [4] into SCRUM, aiming to understand the software requirements as well as the various social and technological factors involved.

Regarding software development technologies, we used HTML, CSS, PHP, and the MySQL database management system.

Ethics Approval

The study received approval from the research ethics committee of the Clinical Hospital of FMRP-USP (CAAE: 67577523.1.0000.5440).

Results

The e-portfolio utilizes a web application architecture (Figure 1). Initially, we developed a structure to manage the registration of all the programs within the medical school, different curricular units, and offerings. We created a registration module for students and faculty members, allowing those to act as mentors, teachers, and discipline coordinators. Additionally, e-portfolio enables the recording of direct observed assessments in clinical settings, using preregistered forms based on methods such as mini-clinical evaluation exercise (Mini-CEx) [5], 360-degree assessment [6], One-Minute Preceptor, direct observation of procedural skills (DOPS), and case-based discussion/chart-stimulated recall (CBD/CSR) [7].

For narratives in medicine [8], there is a specific form to guide students on how to report a lived experience followed by a meaningful reflection, based on the REFLECT rubric for assessing reflective writing [9] (Figure 2).

Students are allowed to fill in data in their private profile (Figure 1), access their disciplines and received assessments, respond to formative assessments, record significant events for their education, check and compare their performance with their cohort, register extracurricular activities, and consult critical incidents recorded.

e-Portfolio enables students, discipline coordinators, and members of the student assessment committee to track assessments and feedback received, providing a longitudinal and progressive view of the student's cognitive, psychomotor (skills), and attitudinal development (Figures 1 and 2).

Figure 1. Profile and performance report of the medical student in the electronic portfolio (e-portfolio). (A) Profile created by the student in the e-portfolio. (B) Student's performance in various subjects is presented in relation to the radar chart: the blue line represents a comparison with the cohort mean (depicted by the gray area).
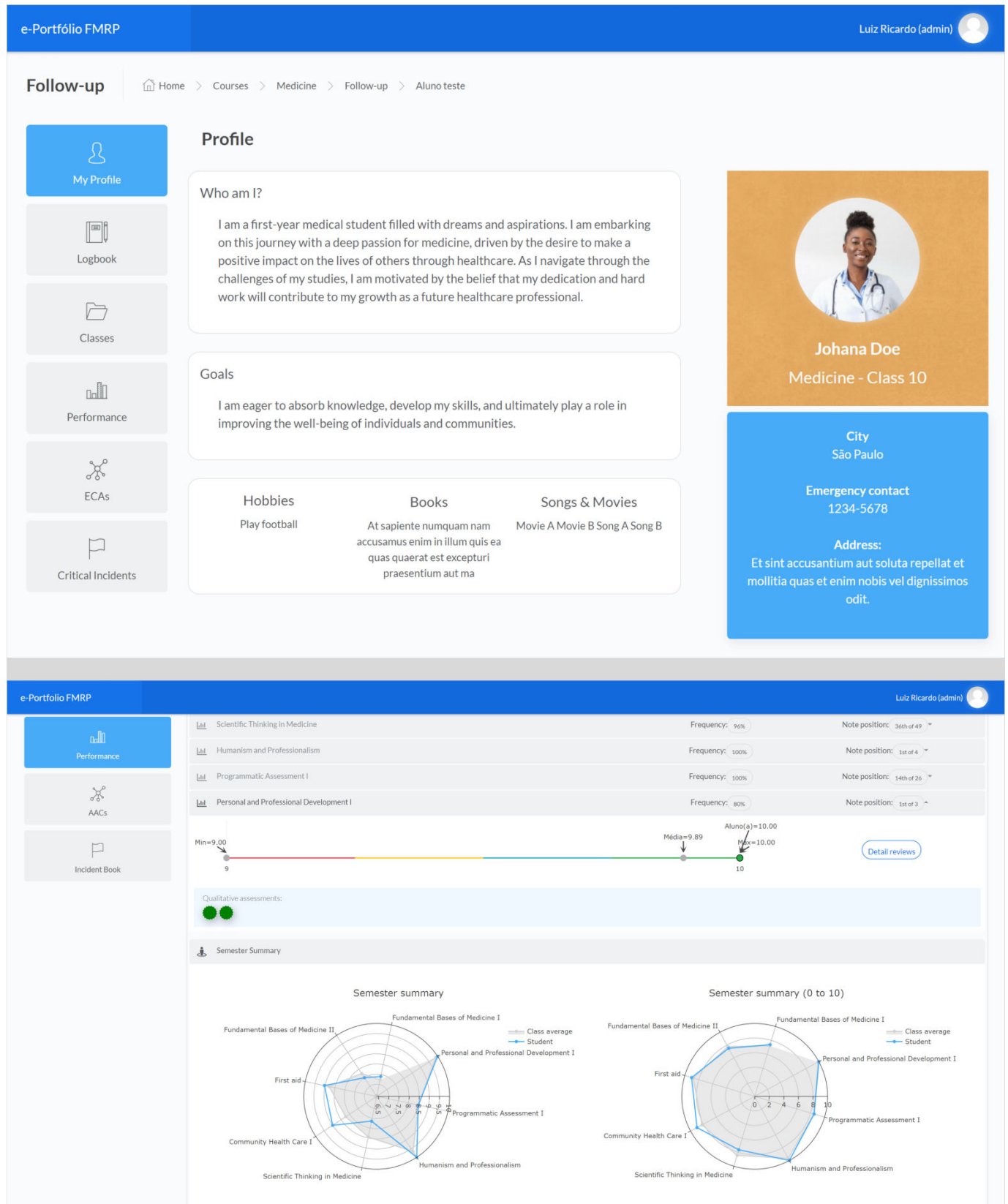
Figure 2. Evaluation form in the electronic portfolio (e-portfolio) with narratives and the adapted REFLECT rubric to guide the medical student and the mentor.

Narrative of the beginning of the course - 14613611 - Daniel Santos   ✕

Aggregation method: **amount of green** ⓘ

Write your narrative, based on your arrival at FMRP this year. Your reflective text must be between 2800 and 4000 characters without spaces, not counting the title.

Suggested itinerary to assist in your narrative:
  1. Think about three situations (moments, experiences) that have been memorable for you since your arrival at FMRP-USP, until this moment
  2. Choose one of them to report in this narrative.
  3. Describe:
      The. What was this situation? where did it happen?
      B. Who was involved?
      w. Why was it important to you?
          i. What did you think based on what you experienced?
          ii. What did you feel (what feelings were mobilized)?
          iii. Did this experience have any consequences? If so, what was it?
      dd How this experience made you think about your beliefs and/or your previous understanding of reality (life at university).
      It is. Reflect and record how you can use what you learned in other situations in the future?

Your text can be accompanied by links to images, videos or other forms of expression that you deem relevant to complement the meaning that this experience had for you.

Quality of the narrative

○ Below expected   ⦿ As expected

It has a first-person narrator, it has a plot and its development tells the chosen situation, the environment, it has a chronological or psychological order, it may or may not involve characters and conflicts. Includes an outcome.

Presence/Personal Involvement

○ Below expected   ⦿ As expected

In the text, the active voice predominates, analysis of facts and emotions from an internal, personal and self-responsible point of view, with multiple occurrences of writing from the "I".

Pay attention to emotions

○ Below expected   ⦿ As expected

Emotions are reported in several instances. Behaviors or developments in the experience are observed through an emotional lens. Emotions are recognized and explored and emotional insight is gained.

Quality of reflection

○ Below expected   ⦿ As expected

The general style is reflective and critical. Sufficiently describes details that indicate the importance of the experience. There are elements of self-awareness and correlation between emotions and behaviors.

Analysis and elaboration of meaning and learning

○ Below expected   ⦿ As expected

Explores the reported experience, making sense of facts or perceptions, relating the experience to some potential future behavior or applicable learning.

Narrative strengths:

Which can be maintained in future deliveries.

Improvement points:

Which can be improved in future deliveries.

Global Narrative Assessment

○ unsatisfactory   ○ Borderline   ○ Satisfactory   ⦿ Great

[To switch off]   [Cancel]   [To save]

Discussion

This work presents the successful development of an e-portfolio at FMRP-USP. The e-portfolio is continuously enhanced and updated, and it is currently in a state suitable for use in a pilot study. The use of similar tools has been recognized for stimulating personal reflection, fostering collaboration, and strengthening digital literacy among students, encouraging active participation in the learning process [10].

The application of Scrum offered an adaptable framework, promoting efficient collaboration among stakeholders. Additionally, socio-technical research methods, such as qualitative interviews involving in-depth conversations with individuals or groups to explore their experiences related to technology, provided valuable insights into the needs and dynamics of end users in the educational context. The use of Scrum with socio-technical research methods enables a more integrated, collaborative, and reflective approach during development.

Future Steps

We intend to evaluate e-portfolio usability, effectiveness, acceptance, and satisfaction in practical contexts with the objective of consistently enhancing the system and its outcomes.

Authors' Contributions

LRAS and VRB contributed to the study concept and design, data acquisition, analysis, interpretation, and manuscript writing. AMO, LMACS, GJA, WDLC, and DCBD contributed to the interpretation, manuscript writing, and critical review of the manuscript for important intellectual content. All authors read and approved the final manuscript.

Conflicts of Interest

None declared.

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Abbreviations

CAPES: Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (Coordination for the Improvement of Higher Education Personnel)
CBD/CSR: case-based discussion/chart-stimulated recall
CNPq: Conselho Nacional de Desenvolvimento Científico e Tecnológico (National Council for Scientific and Technological Development)
DOPS: direct observation of procedural skills
e-portfolio: electronic portfolio
FMRP-USP: Ribeirão Preto Medical School, University of São Paulo
Mini-CEx: mini-clinical evaluation exercise
PPD: personal and professional development