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Design of a web system for the registration of reagents aimed at education 4.0

Diseño de un sistema web para el registro de reactivos dirigidos a la educación 4.0

MORALES-ZAMORA, Vianney†*, PAREDES-XOCHIHUA, María Petra and SÁNCHEZ-JUÁREZ, Iván Rafael

Instituto Tecnológico Superior de San Martín Texmelucan, Camino a Barranca de Pesos S/N San Lucas Atoyatenco San Martín Texmelucan, Puebla. C.P. 74120

ID 1st Author: *Vianney, Morales-Zamora* / **ORC ID:** 0000-0002-1181-825X, **Researcher ID Thomson**: S-6627-2018, **CVU CONACYT ID:** 308547

ID 1st Co-author: *María Petra, Paredes-Xochihua* / **ORC ID**: 0000-0003-1753-2313, **Researcher ID Thomson**: S-6991-2018, **CVU CONACYT ID:** 298117

ID 2nd Co-author: *Iván Rafael, Sánchez-Juárez* / **ORC ID:** 0000-0001-8296-5532, **CVU CONACYT ID:** 493160

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Abstract

The introduction of 4.0 technologies in universities requires profound changes, where technologies must be used as cognitive tools that develop students' knowledge, their critical thinking and their ability to communicate with others. The objective of the present work is to show the design of a web system focused on registering users, test programming registration with reagents that support the subject of web programming fundamentals aimed at education 4.0, which is distinguished as virtual courses that include a interactive presence in the form of blended learning and features driven by major challenges in educational technology that could include any of the following: personalized learning process, gaming and virtual reality/augmented reality based learning, communities of practice, adaptive technologies, data analysis learning, intelligent Chabot and electronic evaluation.

Education 4.0, Test, Reagents, Web system

Resumen

La introducción de las tecnologías 4.0 en las universidades requiere cambios profundos, donde las tecnologías deben utilizarse como herramientas cognitivas que desarrollen los conocimientos de los alumnos, su pensamiento crítico y su capacidad de comunicación con los demás. El objetivo del presenta trabajo es mostrar el diseño de un sistema web enfocado a registrar usuarios, registro de programación de test con reactivos que apoyen a la materia de fundamentos de programación web dirigido a la educación 4.0, que se distingue como cursos virtuales que incluyen una presencia interactiva en forma de aprendizaje combinado y características impulsadas por desafíos importantes en la tecnología educativa que pudiera incluir cualquiera de los siguientes: proceso de aprendizaje personalizado, juego y aprendizaje basado en realidad virtual / realidad aumentada, comunidades de práctica, tecnologías adaptativas, análisis de aprendizaje, Chabot inteligente y evaluación electrónica.

Educación 4.0, Test, Reactivos, Sistema web

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* Correspondence to Author: (E-mail: vianney.morales@smartin.tecnm.mx).
† Researcher contributed as first author.

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Introduction

The commitment of higher education institutions in this context is to adapt educational models according to the requirements to benefit the social and industrial area, change prototypes, use technology and take advantage of what Industry 4.0 offers (Rojas & Humberto, 2017). The prototype of traditional education must change, it must adapt, it must provoke with emphasis on research, development, innovation and motivate the entrepreneur to be the mainstay of industry (Márquez, 2020). The prospect of higher education leading and transforming teaching and learning in the era of higher education 4.0 in preparation for the evolution of Industry 4.0 has been a topic of debate not only in developed countries, but throughout the world's emerging economies (Salmon, 2019). The difference between a developed economy and an emerging economy is that the former may be more prepared to adopt Industry 4.0 readiness processes compared to other emerging economies. These emerging economies may face substantial challenges with the evolution of technology, so the adoption of higher education 4.0 may be lagging behind (Goh & Abdul-Wahab, 2020).

Theoretical framework

The industrial revolution (Industry 4.0) is associated with digitalisation and the dynamic development of media such as the internet, mobile tools and smart systems (Martinez Ruiz, 2019). The introduction of modern solutions incorporating digital and information and communication technologies results in increased business efficiency. These technologies have integrative functions, for example, they make it possible to connect remote branches of a company, increase the speed of implementing new business models, flexibly adapt production to market needs, customise products and better organise work (Rojas & Humberto, 2017). Industry 4.0 technologies include: Internet of Things (IoT), Big Data, cloud, 3D printing, robotics systems (Ciolacu et al., 2019; Rojas & Humberto, 2017). In particular, technologies such as artificial intelligence (AI), machine learning (ML), digital twin and 5G play an important role in the industry.

The implementation of Industry 4.0 technologies implies major changes in the demands placed on workers, who will communicate through networks not only with each other, but also with intelligent systems, machines and their products.

The term educational technology (EdTech) includes, among others, technical equipment and information and communication technology tools in teaching and learning (educational process). Education 4.0 responds to the demands of the labour market and revolutionary changes. Blaschke (2021) mentions the 15 most important skills that an employee should have. These include: analytical thinking, innovative ability, learning ability, complex problem solving, creativity, originality and initiative, leadership, social influence and the ability to use technology.

New technology-oriented education therefore requires a greater focus on competences corresponding to specialisations adapted to the requirements of industry and digital industries. These issues are reflected in the Common Digital Competence Framework.

Another context that emerges from the human-technology relationship is the challenges of preparing modern man through family and education to critically understand the media in the age of Big Data and algorithmisation. According to Adlih Oros-Méndez et al. (2020), this topic is absent from school curricula.

School must be a meeting place for educational technology, technology 4.0, which also implies a change in the design of educational spaces, as well as in the organisation of classrooms where students can work freely in teams. Higher education must take into account, among other aspects, the development of communication skills and understanding of others (active listening, paraphrasing, development of others' ideas, constructive criticism), as well as creative thinking, helped by the application of training in creative thinking and problem solving, and the use of computer programmes for artistic activities and self-expression. It is also important to introduce pupils to learning skills, leisure planning, active recreation and stress management.

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Development

A SCRUM methodology is used for the development of this web system to describe the progress and the process to be developed.

The SCRUM methodology of software development contemplates the phases: Planning, Execution and Adaptation.

Planning Phase

In this phase, interviews are carried out to obtain the functional and non-functional requirements of the system, then a list of activities is drawn up and organised according to priorities and, before being assigned to the work team, they are set in Sprint. In this phase the tools, languages and software to be used are also selected, in this case balsamiq, dia, sublimetext, Mysql, php, HTML 5, css3, boostrap, jquery, ajax, Json and Javascript.

Execution Phase

In this phase, the team begins to develop its activities, which include low-fidelity screens, use case diagrams, database design and development, as well as the development of high-fidelity screens. And all this in considerable advances called Sprints, which are presented to the client for feedback. Phase in which this project is currently in.

Adaptation Phase

Some Sprints will be developed, in the first sprint will be presented the design of the platform that will include the screens of low and the design of the database, in the second sprint will be presented the first screens of high fidelity and the development of the database, in the third sprint will be included the connection with the database and the handling of users, in the fourth sprint contemplates the session of the user administrator, in the fifth sprint will be presented the interfaces of the user teacher. And finally in the sixth sprint the feedback of the platform will be presented.

An issue that has been identified in some of the educational programmes of the TecNM campus San Martín Texmelucan is that students find it difficult to understand 100% of the topics of the subject of fundamentals of programming, so this project will be used in the first instance reagents of this subject, but with the intention of being adapted to any subject.

Most of the students are generally looking for playful activities that allow them to acquire knowledge in a quick and visual way.

Results

The following are the high fidelity interfaces of the system, starting with the user authentication, where all users must have a username and password to enter the system (see figure below 1).

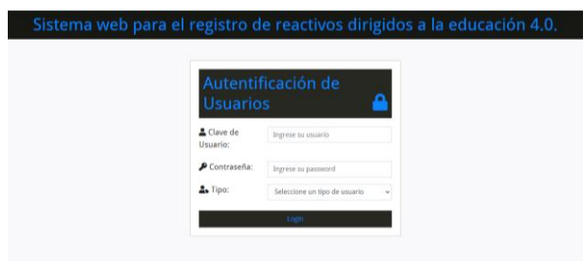

Figure 1 Authentication

Once the session has been initialised, figure 2 shows the main administrator page, where there is a menu of options for students, exams, evaluations and system administrator.

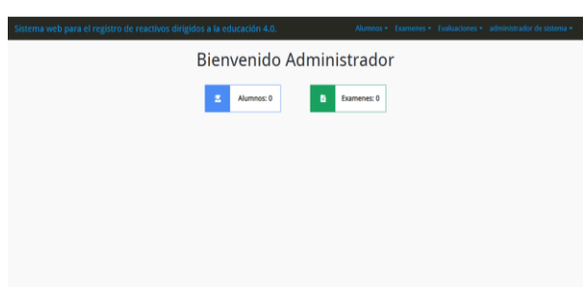

Figure 2 Main interface of dministrat
or

Figure 3 shows the form for editing the administrator's data information.

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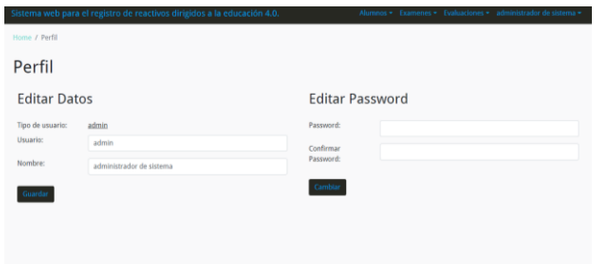

Figure 3 Edit admin profile

Figure 4 shows the form to record the information of the students who will be able to take the test.

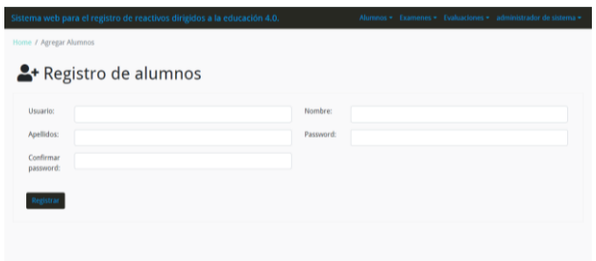

Figure 4 Registration of students

Figure 5 starts with the registration of the test, and once registered, it will be presented in a table where you will have the option to configure it, edit it, delete it, and then you will have the option to delete it.

Figure 5 Registration of exams or tests

In figure 6 you can configure the date, start and end time when the test will be available for the students.

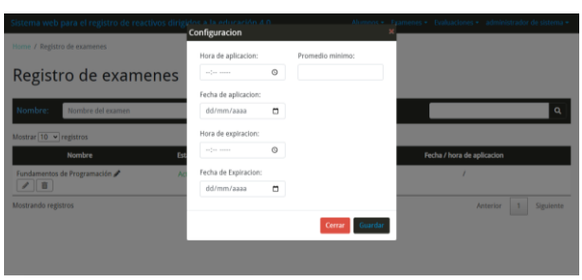

Figure 6 Test configuration

In figure 7 you can write the instructions that will be presented at the start of the test.

Figure 7 Adding instructions

In Figure 8 the administrator will be able to register the test items, together with the multiple-choice answers, where the correct option can be selected.

Figure 8 Writing reagents

Conclusions

We are currently finishing the administrator user interfaces, as well as the database connection, all this to validate the user session, perform the user registration, the test and its configuration, the registration of questions and answers, so that the student user can view the generated test in his session.

The interfaces worked so far have been presented as a first advance, however it will be updated with other colour combinations, the logo of the Tecnologico Nacional de Mexico Campus San Martin Texmelucan will be added. In addition to generating the test with the use of images and with automatic selection and change response, once a question has been answered.

References

Ciolacu, M. I., Binder, L., Svasta, P., Tache, I., & Stoichescu, D. (2019, October). Education 4.0–jump to innovation with IoT in higher education. In 2019 IEEE 25th International Symposium for Design and Technology in Electronic Packaging (SIITME) (pp. 135-141). IEEE.

ECORFAN® All rights reserved.

Blaschke, L. M. (2021). The dynamic mix of heutagogy and technology: Preparing learners for lifelong learning. British Journal of Educational Technology, 52(4), 1629-1645.

Goh, P. S. C., & Abdul-Wahab, N. (2020). Paradigms to drive higher education 4.0. International Journal of Learning, Teaching and Educational Research, 19(1), 159-171.

Márquez, A. M. B. (2020). Educación 4.0. en las instituciones universitarias. Contribuciones de la tecnología digital en el desarrollo educativo y social, 70-79.

Martínez Ruiz, X. (2019). Presentación. La industria 4.0 y las pedagogías digitales: aporías e implicaciones para la educación superior. Innovación educativa (México, DF), 19(79), 7-12.

Rojas, C., & Humberto, J. (2017). La cuarta Revolución Industrial o Industria 4.0 y su impacto en la educación superior en ingeniería en Latinoamérica y el Caribe. Universidad Antonio Nariño, Colombia.

Salmon, G. (2019). May the fourth be with you: Creating Education 4.0. Journal of Learning for Development, 6(2), 95-115.

Vázquez, M. L., Alcivar, I. A. M., & Aguilar, G. F. C. (2022). La Educación Superior 4.0: retos y perspectivas. Serie Científica de la Universidad de las Ciencias Informáticas, 15(4), 71-89.

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