

Evaluation of the TAEP4.0 by Basic Education Teachers: a Case Study in the Context of Education 4.0

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Abstract. *Education 4.0 is characterized as a learning paradigm to prepare students for life in the 21st-Century. Thus, a website was created, called TAEP4.0, that aims to support teachers of Basic Education in creating projects based on Education 4.0. This paper presents the evaluation of TAEP4.0. In this case study, the teachers used the TAEP4.0 to carry out projects in the Informatics lab. Then, the teachers answered a questionnaire about their experiences to verify the impacts of TAEP4.0 on their work. The results indicated that the TAEP4.0 allowed teachers to rethink the resources to compose their class, allowing the inclusion of Informatics in classes. Overall, the evaluation performed can improve and broaden teachers' interaction with the TAEP4.0 and its resources.*

1. Introduction

Education 4.0 can be characterized as a student-centered learning paradigm that seeks to prepare them for the contemporary world, including the use of Information and Communication Technologies (ICTs) and the development of 21st-Century skills and competencies [Himmetoglu et al. 2020] [Maria et al. 2018] [Mourtzis 2018] [Ciolacu et al. 2017b] [Puncreobutr 2016]. In the literature, some authors show how education has been affected over time and can be renamed Education 1.0, 2.0, 3.0, and 4.0 [Ciolacu et al. 2017a] [Hartono et al. 2018] [Maria et al. 2018] [Alda et al. 2020] [Himmetoglu et al. 2020]. In this sense, Education 1.0 can be conceptualized as “download education”, where students receive content and focus on the teacher’s explanations. In turn, Education 2.0 can be defined as “open access education”, where there is the standardization of the curriculum, the inclusion of textbooks, and the university with a focus on research [Hartono et al. 2018]. Education 3.0 can be understood as “knowledge-producing education”, where students use technology to build knowledge. Finally, Education 4.0 can be contextualized as “innovation-producing education”, where students are expected to produce and adapt to new ICTs to contribute to the development of society [Himmetoglu et al. 2020].

Through a Systematic Mapping Study (SMS), it was observed that few publications discuss the role and challenges of the teacher in the Education 4.0 scenario [Silva et al. 2021a]. However, we recognize that the challenges for teachers are significant and tend to increase given the transformations brought about by Education 4.0. This process of change and adaptation requires teacher training in the use of ICTs. The COVID-19 pandemic reinforced this need, where teachers had to adapt and engage students in online learning environments [Whittle et al. 2020] [Butola 2021].

In this sense, TAEP4.0 was created to support Basic Education teachers in the creation of projects based on Education 4.0. The TAEP4.0 contains instructions and links to support materials and tools. Thus, the TAEP4.0 encourages the teacher to make decisions and creativity to choose the elements they deem relevant to their teaching proposal. Also, TAEP4.0 seeks to support the teacher in the preparation of practical, interactive, and diversified classes that encourage the student's protagonism and the development of 21st-Century skills and competencies through the use of ICTs.

Previously, the steps and content implemented into TAEP4.0 were evaluated by specialists in Informatics in Education through exploratory study [Silva et al. 2020] that supported the development of the TAEP4.0 website. The TAEP4.0 website allows the inclusion of ICTs in teaching and learning as per the recommendations of Education 4.0. Therefore, this paper presents a case study that aimed to evaluate the TAEP4.0, involving ICTs. In this case study, the evaluation of the TAEP4.0 website with four teachers is reported, including their perceptions about the benefits of projects produced from the TAEP4.0 website for students. Also, the case study can improve and broaden teachers' interaction with the TAEP4.0 website and its digital resources. The activities of this case study lasted for three months, including the training of teachers to use the TAEP4.0 and the execution of projects with students in the Informatics Lab. This case study sought to answer the main question (Q1) and two research sub-questions (SQ1 e SQ2):

Q1. What were the contributions of the TAEP4.0 to the projects of basic education teachers in the context of Education 4.0?

SQ1. What were the benefits of the projects generated through the TAEP4.0 website for the students from the teachers' point of view?

SQ2. What characteristics of Education 4.0 were perceived in the projects prepared by the teachers on the TAEP4.0 website?

After use the TAEP4.0 website, the teachers answered the post-study questionnaire. Data were analyzed qualitatively using a subset of the procedures of the Grounded Theory method [Corbin and Strauss 2014]. The results indicated that the TAEP4.0 allowed the teachers to rethink how to present the contents of the discipline to students.

This paper is organized as follows: Section 2 presents resources that can be worked in the context of Education 4.0. Section 3 shows the educational process, and context of the use of the TAEP4.0 website. Section 4 details the case study with Basic Education teachers, organized into Planning, Execution, and Verification. Section 5 presents the qualitative analysis of the data and discusses the results. Finally, Section 6 concludes the paper with the final considerations and the next steps of the research.

2. Related Work

Some works were identified on teacher support resources through Education 4.0 that involve Artificial Intelligence (AI) and Gamification, such as the Pedagogical Decision-Making Process (PDMP) and Authoring Gamified Intelligent Tutoring Systems (AGITS).

PDMP is a cyclical, iterative, and semi-automatic process [Paiva et al. 2016]. It is composed of two phases with four stages each, being Construction (Define Scenario, Investigate Scenario, Make Pedagogical Decision, and Define Evaluation) and Execution (Detect Scenarios, Discover Patterns, Recommend, Monitor, and Evaluate). In the

Construction phase, it requires actions coordinated by education and technology professionals, but it also requires actions mediated by AI through algorithms, methods, among others, to create computational artifacts that will automatically execute the process in the Execution phase. The PDMP helps detect pedagogical problems in the learning environment, making it possible to model and analyze student interactions in the environment. The process helps to define patterns and trends related to issues. In addition, it helps to monitor and assess whether decisions made by teachers were effective or not, comparing student performance to improve learning experiences.

In sequence, AGITS is a Gamified Intelligent Tutor System used to support teachers' authorship, either totally or partially [Dermeval et al. 2018]. This system has an ontological model that helps the teacher to customize AGITS. In addition, this ontology has a dual role, containing knowledge about the domain model created by the teacher, which an AGITS can substantiate. Also, it includes the decision on which gamification behavior is selected by a teacher, allowing you to activate various activity loops in the system. In short, the system incorporates features that enable you to reuse previous AGITS configurations. Thus, the teacher can apply a model, reuse curriculum and educational resources to reduce the effort needed to create an AGITS. Additionally, teachers can select game design elements and target behavior to be added to AGITS.

In general, few studies mention the teacher contextualizing Education 4.0, whether to help the student solve a problem, use ICT or complete a challenge [Silva et al. 2021a]. Additionally, it was found that even though Education 4.0 is an emerging theme, a large part of the studies is not discussed the teacher's role [Himmetoglu et al. 2020] [Ayub et al. 2018]. Thus, it is believed that the lack of a framework to support the teacher in this change can make it difficult for Education 4.0 to be put into practice [Himmetoglu et al. 2020].

In this context, the TAEP4.0 website is presented as a proposal to teachers to support the organization of classes using ICTs. When looking at the TAEP4.0 website, it is possible to notice some similarities and differences between the works presented in this section. Similar to the works presented, the TAEP4.0 provides a diagnostic evaluation so that the teacher can identify the learning problem, which allows him to align his classes according to the needs of the students. The TAEP4.0 also provides the monitoring of the teacher in the projects through a continuous formative assessment. Moreover, TAEP4.0 provides for the teacher's authorship through the choice of the elements that will be part of their classes. Project adjustments can be made in partnership with other teachers and/or Educational Technology (ET) coordination. Unlike the works presented, the TAEP4.0 website was organized in a simple but instructive and interactive way so that the teacher could use it even with little knowledge of Informatics. The TAEP4.0 suggests some tools, examples, and activities for the teacher to create their class in the best possible way, following the characteristics of Education 4.0. The TAEP4.0 will be presented in Section 3 below.

3. TAEP4.0 Website

The TAEP4.0 aims to structure the workflow of teachers through your educational process, aligning learning objectives with Education 4.0 through Project-Based Learning [Silva et al. 2020]. The TAEP4.0 can be viewed at the following link <https://>

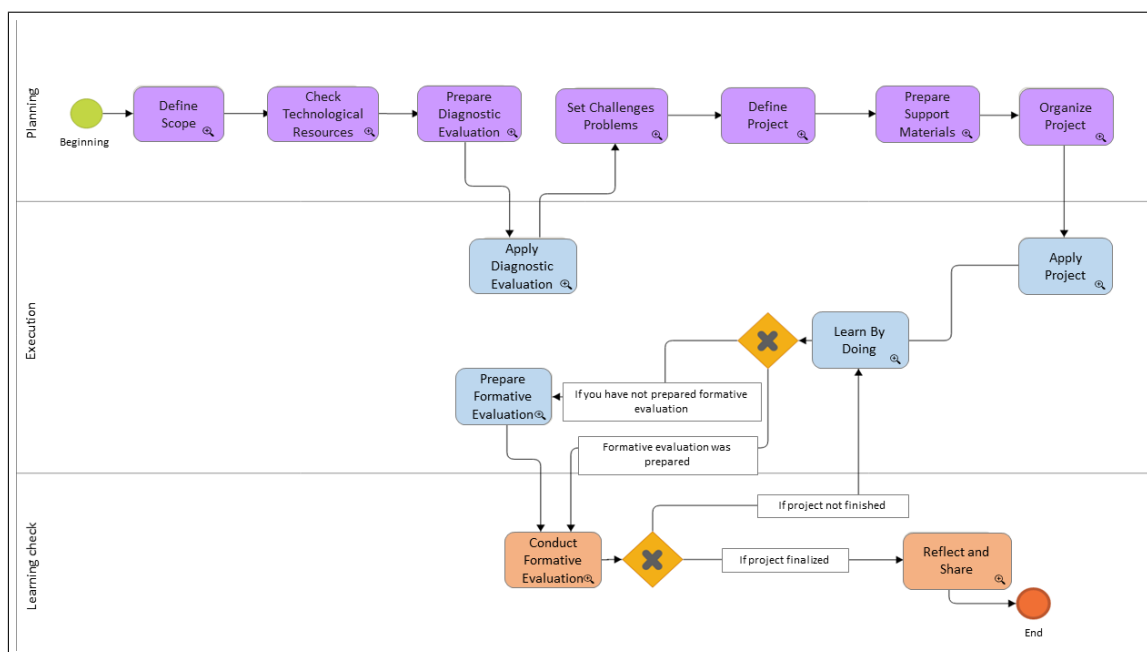


Figure 1. Educational Process of TAEP4.0

[//sites.google.com/view/taep/home](https://sites.google.com/view/taep/home). The ADDIE model, an acronym for the Analyze, Design, Development, Implementation, and Evaluation stages guided the TAEP4.0 proposition and evaluation [Silva et al. 2021b]. This paper presents the evaluation stage that was carried out with four Elementary and High School teachers in a real context.

3.1. Educational Process of TAEP4.0 Website

The TAEP4.0 is composed of thirteen steps divided into three main activities (Figure 1), namely: Planning, Execution, and Verification. The steps and activities of the TAEP4.0 website are accessed by the teacher through the menu.

The Planning activity has seven steps and indicates the selection of elements to be worked on in classes. They are: Define the Scope (the step aims to delimit the scope of the project to be developed with the students); Check the Technological Resources (the step aims to check which ICTs are available at the school); Prepare the Diagnostic Assessment (the step aims to understand the initial needs and difficulties of students before starting a new project); Elaborate the Challenges Problems (the step aims to define challenges to be solved in the projects); Define the Project (the step aims to delimit the project whether it is a result of a product or the solution of a problem); Prepare Support Materials (the step aims to produce or gather materials that students will use during the project) and Organize the Project (the step aims to make a checklist of previous steps to reduce risks and avoid discomfort in project execution).

The Execution activity has four steps and indicates the starting point of the project. They are: Apply Diagnostic Evaluation (the step aims to obtain an overview of the student's difficulties to align the project based on these problems); Apply the Project (the step aims to start the project, including the presentation of the proposal and organization of students); Learning by Doing (the step aims to allow students to learn through practi-

cal individual and collaborative activities using ICTs); and Prepare Formative Evaluation (the step aims to create a record for monitoring and evaluating students individually and collaboratively in the project).

The Verification activity has two steps and indicates continuous monitoring of students and project completion. They are: Conduct Formative Evaluation (aimed at verifying and supporting students' progress, knowledge acquisition, and the improvement of certain skills and competencies); and Reflect and Share (the step aims to allow participants to self-assess and outline their perceptions and experiences in the project). Each step of the TAEP4.0 contains explanations about the importance of the step and how the teacher can apply it in his class. Moreover, the steps have links to support materials and tools to facilitate lesson design. However, the steps in the TAEP4.0 are suggestive and the teacher can adapt them, omit them or add new steps, according to the needs of the students and the reality of the school. The TAEP4.0 also encourages decision-making and teachers' creativity in choosing relevant elements for the lessons. The details of the steps coming from TAEP4.0 are reported in [Silva et al. 2020].

3.2. Context of Use of TAEP4.0 Website

The TAEP4.0 was produced to support teachers, specifically in Elementary and High School, where the TAEP4.0 was used and evaluated. However, the TAEP4.0 steps can be used by teachers at other levels of education such as Higher Education [Silva et al. 2020]. The TAEP4.0 can be directed to any discipline such as Portuguese, Arts, Biology, Spanish, Geography, History, among others. In this context, TAEP4.0 encourages interdisciplinary work, allowing teachers to integrate their discipline with others, using the areas of the term STEAM (an acronym for the areas of Science, Technology, Engineering, Arts, and Mathematics). Finally, the teacher defines the skills and competencies that he/she needs to encourage in their students throughout the projects. In general, the teacher uses the TAEP4.0 content (diagram, instructions, explanatory notes, materials, and tools) to record decisions and document the project. The teacher assesses what is relevant to their context, makes checklists of items, creates artifacts to support their assessments, and students, among others. Therefore, the teacher creates a project from decisions through TAEP4.0.

4. Case Study

The case study was carried out in partnership with the ET coordination of the Dom Amando school in the city of Santarém, west of the state of Pará. Initially, a presentation letter about the study with the TAEP4.0 was sent to the school director to present the proposal for the work, ask for authorization to carry out activities and invite some teachers to participate in this case study. Subsequently, four teachers (two from Elementary School and two from High School) agreed to participate in the evaluation. In this case study, we did not have direct contact with the students, only with the teachers who signed the Informed Consent Form (ICF).

4.1. Participants

The teachers were selected according to their availability and interest. The first participant (P1) is a 1st-grade Arts teacher in High School classes A, B, and C. The second participant (P2) is a Spanish Language teacher in the 2nd grade of classes A and B of High School. The third participant (P3) is a Portuguese Language teacher in the 5th year of classes A,

B, C, and D of Elementary School 1. And the fourth participant is a Writing teacher in the 8th year of classes A, B, and C of Elementary School 2. The four participants are female. They work in a private school. The school has two labs with internet access for teachers and students, with one lab for each level of education. The school also offers training twice a year to teachers in the use of ICTs. However, even with permanent training, not all teachers use the Informatics Lab, and Elementary School teachers make better use of this space with their students than High School teachers.

4.2. Materials and Procedure

For this case study, the following artifacts were prepared: a) Slide presentation containing the goals, motivations, procedures, and an overview of the TAEP4.0 website; b) Informed Consent Form (ICF) to verify the consent of teachers and formalize the invitation to participate in the case study; c) Planning model for teachers to prepare a project with TAEP4.0 following the lesson plan, and d) Post-study questionnaire to collect teachers' evaluation in using of TAEP4.0 website for planning and carrying out projects with ICTs. The artifacts used were reviewed by a researcher in Informatics in Education and verified by the ET coordination so that they could be used with the teachers. The artifacts are available at the following link <https://figshare.com/s/8d56ce9baffa2ba47bc4>.

After authorization from the school director and acceptance from the teachers, the activities were started. This case study has been organized following the main activities of the TAEP4.0 website, such as Planning, Executing, and Verification. This case study had a total duration of 3 months, including the participation of teachers, students, and ET coordination. In this case study, emphasis will be placed on the participation of teachers.

4.2.1. Planning, Execution and Verification Activities with the TAEP4.0

In the Planning stage, the teachers signed the consent form to confirm their participation in the study. Then, the teachers had to plan a project with ICTs, according to the level of education and the discipline they work on using the TAEP4.0 project planning template. From the explanation and discussions with the researcher about the TAEP4.0 website, the teachers delimited the projects, defining content, objectives, dates, skills and competencies, ICTs, among others, integrating their discipline with other themes and areas for the purpose to explore various possibilities and knowledge with the projects.

The researcher presented the teachers' projects to the ET coordination, who carried out their considerations. The coordination checked the pre-scheduled classes in Informatics Lab and tried to fit the projects from the TAEP4.0 into the available times, according to the days and times of the teachers' classes. The four projects elaborated by the teachers were: a) feuilleton Project of the 5th-grade Portuguese teacher of Elementary School 1; b) Comics Project of the Writing teacher of the 8th grade of Elementary School 2; c) Interactive E-Books Project of the 1st-grade High School Art teacher; and d) Interactive E-Books Project of the 2nd-grade High School Spanish teacher.

The teachers chose the elements of the project according to their interests and needs. The teachers chose the contents of the teaching material to work practically, using ICTs available in Informatics Lab. In this case study, the teachers chose to work with resources and applications that had experience, as they had previously received training

from the ET coordination to use these resources. This decision streamlined the process and implementation of the projects because if they opted for other ICTs contained in the TAEP4.0 for work with Block Programming and Robotics, more time would be needed for training before starting the projects with the students.

In the Execution stage, a total of 415 students participated in the projects, including the 5th (111 students) and 8th-grade (115 students) of Elementary School, and 1st-grade (108 students) and 2nd-grade (81 students) of High School. The execution of the projects varied from four to five weeks, depending on the students' productivity and the number of tasks defined by the teachers (Organize Project step). The projects started from the Apply project step of TAEP4.0 website. In the first class of each project, the ET coordination explained the tool's functioning and showed some examples of what could be produced and presented as a final work. From this moment on, students began to search the internet, gather content on the topic addressed, ask questions about the work and about the tool's functionalities, among others (Learn by Doing step). For these projects, the productions served as evaluative items for the composition of the grade of the first two months, with an agreement made between the teacher and students in the classroom. To keep the record of each class and make the individual and team evaluation, the teachers prepared their evaluation form containing the criteria they considered relevant to be evaluated, as a demonstration of knowledge when asked questions about the content, demonstration of skills in the construction of products, active participation, among others (Prepare Formative Evaluation step).

In the Verification stage, the students were accompanied and supported by the responsible teacher for the project, but they also had support from the ET coordination and the responsible researcher. Guided by the TAEP4.0 website, the teachers continuously guided and challenged the students to improve their productions (Conduct Formative Evaluation step). While there is time to carry out the project, a teacher encouraged the student, met with each team or individual to ask questions and give directions to consolidate knowledge of the contents and develop 21st-Century skills and competencies. Then, the teachers answered the post-study questionnaire (Reflect and Share step).

4.3. Data analysis

The questionnaire contained eight open questions about the experience of teachers evaluating the TAEP4.0 website in preparing and conducting classes. The data obtained were analyzed qualitatively using the Atlas.ti tool (version 6). For data analysis, a subset of the Grounded Theory method procedures was used [Corbin and Strauss 2014].

5. Results and discussions

The qualitative analysis aimed to verify the contributions of the TAEP4.0 website to teachers in the creation of projects involving ICTs and encouragement of 21st-Century skills and competencies. Qualitative data were analyzed using a subset of the GT method: open coding (1st step) and axial coding (2nd step). In the first stage of the GT (open coding), codes were identified (concepts) according to feedback from participants. Subsequently, the codes were grouped according to their properties, forming concepts that represent categories. Finally, these codes were related to each other - axial coding (2nd step). Two researchers participated in these steps, one carried out the coding steps and the other carried out the review of these coding. When there was disagreement, it was discussed and

a consensus was reached. In this case study, we did not carry out the 3rd step of the GT (selective coding) to create a theory, as multiple data collection and analysis would be required [Corbin and Strauss 2014], and this study was the 1st of this research.

5.1. Teachers' opinion regarding the use of TAEP4.0

One of the teachers stated that the TAEP4.0 website helps to prepare classes in an organized way (see the quotation from P4). Another teacher shared that the TAEP4.0 supports everyday practice (see the quotation from P3).

"It was a process that first took place in the preparation of the class, and this was very advantageous because you saw what was being consistent, conscious, and coherent within your class, we checked which steps we had to comply with, without having to burn any class, that is, had organization. The process is very advantageous for teachers" (P4).

"This sequence of steps that we used in the project was very important because it was able to guide me in my daily practice. Every class we attended at Informatics Lab, we had something to do" (P3).

Teachers positively consider that the TAEP4.0 website supported them in their basic activities. Through feedback, it is possible to see that the TAEP4.0 can allow the teacher to find advantages related to their class, make choices about what is most suitable for students, maintain an organized sequence of classes, and support them in conducting activities in the Informatics Lab. Thus, the steps of the TAEP4.0 website can enable teachers to rethink their classes and reflect on pedagogical practices with ICTs.

5.2. Teachers' opinion on the projects derived from the TAEP4.0

One of the teachers considered the project to be innovative because of its interdisciplinarity (see the quotation from P4). Also, one of the teachers said that the project attracted the students' attention (see the quotation from P3).

"I consider the project to be innovative due to the interdisciplinarity exercised during the practice" (P4).

"The project caught the students' attention, it made them quickly assimilate the proposed content within the unit. And more than that, get that little taste of wanting more. Is it over yet? What a pity" (P3).

Each project produced had its particularities such as content and discipline. However, all projects had points in common, as they were produced by the teachers following the steps and recommendations of the TAEP4.0 website. Therefore, the teachers were encouraged to relate their disciplines to the others, think of different themes to integrate and enrich their class, define skills to be encouraged in students, and choose ICTs available at the school. These characteristics are reflected in the teachers' feedback.

5.3. Teachers' opinion on 21st-Century skills and competencies

One of the teachers reported that the most evident skills were creativity and innovation, collaboration, and communication (see the quotation from P2). Moreover, one of the teachers said that the project allowed her to develop greater practice in ICTs and creativity (see the quotation from P3).

“The most evident skills were creativity and innovation, collaboration and communication necessary in the collective construction to carry out the project. The unit I chose was intended to develop the student’s critical sense of the other’s culture. This makes him able to value the other and the way he expresses himself even more” (P2).

“It was possible to exercise curricular skills and competencies. But also, develop greater practice in technological tools, creativity (use of colors, shapes, typefaces, ideas, ”knowing how to do it”) (P3).

According to the teachers, Creativity was one of the most cultivated skills in the projects. In these projects, students needed to think, discuss, reflect, and communicate an idea using Informatics Lab’s ICTs. Therefore, students were encouraged to use their creativity in a collaborative way to solve problems related to the topic of the class.

5.4. Teachers’ opinion regarding the learning and assessment process

One of the teachers said that the project must have the evaluative items measured by the teacher (see the quotation from P4). Finally, one of the teachers shared that she was able to assess and attribute the concept, avoiding the test (see the quotation from P3).

“Applicability must have the evaluative items measured by the teacher, observing from the items developed from the socio-emotional skills to the evaluative items of the textual structure used as the theme of the class” (P4).

“The result was the product that we aspired to have, once the student was able to complete his production, the printing and presentation of the material was proposed, it was still possible to evaluate and even assign a concept, without necessarily taking a test, specific to the evaluation traditional” (P3).

The teachers were able to accompany the students throughout the projects: guiding and motivating. Through the steps and recommendations of the TAEP4.0, the teachers defined the evaluative items to assess the participation of students through the appropriation of content and the development of skills demonstrated in the production of the work. The main contribution of the formative assessment was the possibility for the teacher to perceive the students’ difficulties during learning and could help them in this process.

5.5. Teachers’ opinion on their experiences

One of the teachers considered the experience fruitful, being a different way of expressing her opinion (see the quotation from P4). Another teacher said that the TAEP4.0 was a free and creative way of exercising the goals through the project (see the quotation from P3).

“I found my experience fruitful. We had guidance from the research that links prior knowledge, formation of items and handling of technological tools for the elaboration of the textual genre, which is a different form of expression of opinion” (P4).

“The process allowed me to work the content in another way. The TAEP4.0 made me envision a free and creative way to exercise my goals based on the project” (P3).

The teachers received support for using and applying the steps of TAEP4.0, but they were free to choose the items they considered most suitable for their class and the groups they worked on. At the end, the teachers felt the experience with the TAEP4.0 was fruitful, as they managed to define a didactic sequence and achieve a positive result.

Through monitoring, the teachers were able to perceive the involvement of students in the activities, being a different way of presenting and evaluating the curricular content.

6. Conclusions and Future Work

This paper presented a case study about the evaluation of the TAEP4.0 website by Elementary and High School teachers. The teachers used the available ICTs at Informatics Lab to present the contents to students and encourage 21st-Century skills and competencies based on Education 4.0. This case study contributed to verify the impacts of this website on the area of education, based on the experiences of Basic Education teachers. TAEP4.0 contributes to the area of Informatics in Education, as it allows teachers with little knowledge in Informatics and few financial resources to be able to develop projects with ICTs or unplugged activities. TAEP4.0 provides guidance and brings together examples, activities, and tools to facilitate the preparation of classes. The differential of TAEP4.0 is that the process can be worked with other resources and artifacts that are not contained in the website. Thus, other methodological and technological approaches can be included in one of the different steps of TAEP4.0, as the teacher wishes.

The results indicated that: (Q1) the TAEP4.0 allowed teachers to use ICTs for planning and executing student-centered projects. Thus, the teachers were able to make choices, maintain an organized and documented sequence of classes to support students in the Informatics Lab, and include elements considered important for 21st-Century learning. Furthermore, (SQ1) the projects derived from the TAEP4.0 website allowed students to learn by doing, being Creativity is one of the skills most perceived by teachers. During the projects, students needed to think, discuss, and transform ideas into products based on available ICTs. Also, the formative evaluation allowed the teacher to take a closer look at project progress and student learning, eliminating testing; Finally, (SQ2) the TAEP4.0 enabled the teachers to build an active learning process for encourages students' protagonism through practical and interactive. Also, the TAEP4.0 encouraged interdisciplinarity to enrich the classes further, allowed to personalize and present the contents of the school curriculum differently, to define and work with 21st-Century skills and competencies and enable the use of ICTs. The TAEP4.0 website contributes to the Informatics in Education area because it helps to expand and improve the relationship and interaction of teachers with Education 4.0, in addition, include of ICTs in teaching and learning processes.

In this case study, we sought to identify possible limitations to the validity of this study. One is about the sample. Thus, we searched for teachers from different levels of education, such as Elementary and High School, to have a more heterogeneous sample. However, it is recognized that the main problem may be related to the size of this sample, with 4 teachers. Another limitation is related to the homogeneity of the sample, as all participants are from the same educational institution. Therefore, there is some limitation to the results, which are considered indications but not conclusive.

Future steps are intended to evaluate the use of TAEP4.0 with participants from other levels of education, such as Undergraduate and Graduate. This can help to understand the benefits of TAEP4.0 from different perspectives and contexts. Finally, we intend to compare the use of TAEP4.0 with other teaching processes and models to verify its effectiveness in educational projects with ICTs.

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