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*Artículos científicos*

**Sustentabilidad en educación básica: caso Escuela Secundaria  
General de Las Vigas, Guerrero**

***Sustainability in Basic Education: Case of General Secondary School of Las  
Vigas, Guerrero***

***Sustentabilidade na educação básica: caso de Escola Secundaria General  
de Las Vigas, Guerrero***

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## Resumen

El presente trabajo de investigación se llevó a cabo en el año 2020, durante la pandemia, con una muestra por conveniencia, y tuvo como objetivo evaluar el nivel de sustentabilidad de una escuela secundaria general ubicada en Las Vigas, Guerrero, México. El estudio se dividió en tres partes. La primera consistió en el análisis del grado de vinculación del *Plan de Estudios de Educación Básica 2011* de la Secretaría de Educación Pública con la sustentabilidad; la segunda, se aplicó una encuesta a docentes y estudiantes para identificar conocimientos ambientales, y la tercera, se relaciona con la aplicación de una auditoría ambiental enfocada a identificar los principales problemas y necesidades de la escuela. Los resultados demostraron una escasa vinculación del *Plan de estudios 2011* con la dimensión ambiental, una vinculación parcial con lo social y una vinculación fuerte con la dimensión económica. En la encuesta, los estudiantes mostraron mayor conocimiento ambiental que los docentes, pero, aun así, se identificó un bajo nivel de compromiso generalizado con el uso racional de recursos naturales. La auditoría ambiental evidenció problemas en la disposición de agua de la llave, baños en malas condiciones, carencia de instalaciones de drenaje, cableado eléctrico escaso y muy pocas acciones de manejo de residuos sólidos urbanos. Por todo lo anterior, se llegó a la conclusión de que la escuela se encuentra en un nivel bajo de cumplimiento con la sustentabilidad.

**Palabras clave:** educación para el desarrollo sustentable, dimensiones, educación básica, sustentabilidad.

## Abstract

The present research was conducted in 2020, during the pandemic, with a convenience sample, and its objective was to evaluate the level of sustainability of a general secondary school located in Las Vigas, Guerrero, Mexico. The study was divided into three parts. The first consisted of an analysis of the degree of linkage of the basic education curriculum (2011) in Mexico with sustainability; the second, a survey of teachers and students; and the third, the application of an environmental audit focused on identifying the main problems and needs of the school. The results showed a scarce linkage of the curriculum with the environmental dimension, a partial linkage with the social dimension and a strong linkage with the economic dimension. In the survey, students showed greater environmental knowledge than teachers, but even so, a low level of generalized commitment to the rational use of natural resources was identified. The environmental audit revealed problems in the disposal of tap water, bathrooms in poor condition, lack of drainage facilities, scarce electrical wiring and very few actions for the management of urban solid waste. For all the above, it was concluded that the school is in a low level of compliance with sustainability.

**Keywords:** education for sustainable development, dimensions, basic education, sustainability.

## Resumo

A presente investigação foi realizada em 2020, durante a pandemia, com uma amostra de conveniência, e visava avaliar o nível de sustentabilidade de uma escola secundária geral localizada em Las Vigas, Guerrero, México. O estudo foi dividido em três partes. A primeira consistiu numa análise do grau a que o currículo da educação básica mexicana (2011) está ligado à sustentabilidade; a segunda consistiu num inquérito a professores e alunos; e a terceira consistiu numa auditoria ambiental destinada a identificar os principais problemas e necessidades da escola. Os resultados mostraram uma fraca ligação do currículo com a dimensão ambiental, uma ligação parcial com a dimensão social e uma forte ligação com a dimensão económica. No inquérito, os estudantes mostraram maiores conhecimentos ambientais do que os professores, mas mesmo assim, foi identificado um baixo nível generalizado de empenho na utilização racional dos recursos naturais. A auditoria ambiental revelou problemas na eliminação de água da torneira, sanitários em más condições, falta de instalações de drenagem, escassos cabos eléctricos e muito poucas acções para a gestão de

resíduos sólidos urbanos. Por todo isto, concluiu-se que a escola está a um baixo nível de conformidade com a sustentabilidade.

**Palavras-chave:** educação para o desenvolvimento sustentável, dimensões, educação básica, sustentabilidade.

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## Introduction

The progress of current civilization generates unquestionable benefits for society, but, at the same time, it becomes a growing obstacle to achieving sustainability due to the dependence that human beings have on the use of natural resources and, even more, to the lack of awareness of the damage that their productive activity causes in the environment (Ekins, Gupta and Boileau, 2019). According to Terrón (2019), Marqués and Xavier (2020) and De-la Peña and Vines (2020), environmental education becomes an option to promote a different way of perceiving this problem. Through it, you can promote the development of skills and make beneficial decisions for the natural environment. In schools, well-informed and environmentally competent teachers can act as the main generators of awareness and provide the leadership required to promote actions in favor of the rational use of natural resources (Sukma, Ramadhan and Indriyani, 2020).

Education for sustainable development is a lifelong learning process. The United Nations Educational, Scientific and Cultural Organization [Unesco] (2021) points out that it can help develop knowledge, skills, attitudes and values in people of all ages anywhere in the world in a multidimensional way. In 1995, UNESCO itself presented education for sustainable development as a new field of study that incorporates the social dimension to the environmental one, which makes it more critical and participatory. This proposal of global scope includes the ethical and political aspect, and the urgency to carry out actions to promote economic, ecological, social and cultural sustainability (Nay and Febres, 2019). The purpose of this type of education is to transform certain behaviors that are carried out both collectively and individually to strengthen the possibility of achieving the Sustainable Development Goals (ODS) (Nay y Febres, 2019).

In 2015, the United Nations (UN) approved the 2030 Agenda, which sets out 17 goals with 169 goals of an integrated and indivisible nature that cover the economic, social and environmental spheres. It is a common and universal commitment that highlights respect for

the sovereignty of the signatory States in terms of the decisions they can make about their own wealth, resources and economic activity. This implies that each nation can set its own goals and, at the same time, comply with the SDGs (ONU, 2018). However, despite the signing of this international commitment, not all countries act with the same degree of determination. For example, De Leon and Culala (2019) highlight that in the Philippines there is a clear concern on the part of the Government in developing environmental awareness among teachers and students. Contrary to what happens in Mexico, where, according to Calixto (2015), the Government delegates the responsibility of promoting competences of this type to a greater extent to society and to a lesser extent to the great decision makers, in addition to the fact that the issue of sustainability is little linked to basic education curricula. This can be taken, according to Novo (2012), as evidence of the urgency of incorporating environmental issues into curricula and of using schools as spaces to encourage behaviors in favor of nature both individually and collectively.

Environmental audits in schools facilitate the collection of real and contextualized information on the effectiveness of existing educational practices and contribute to improving learning processes and environmental quality (Altamirano, 2015). They also serve to encourage changes in the behavior of students, teachers and school workers and regulate responsible decision-making (Kim and Nam, 2020). In addition, environmental audits help achieve the desired environmental results, since evaluating the sustainability status of a specific place stimulates care for its environment (Aslam, Rehman and Asad, 2020). By encouraging critical thinking in students about environmental problems, the probability of generating a change in attitudes and values in relation to environmentally sustainable consumption is increased (Martínez, 2010).

Gómez, Rivas and Lobos (2021) state that teachers and administrative staff of schools are in optimal positions to provide multiple experiences in a controlled manner that influence the student training process. This means that, through their involvement, linking environmental education to the curriculum at early stages of learning can help students change everyday behaviors to more environmentally responsible ones.

Considering Calixto's (2015) statements that the socio-environmental element has a weak presence in the 2011 Basic Education Plan of the Ministry of Public Education [SEP] (2011), and based on the arguments of other recent authors mentioned about the benefits of knowing the conditions in which a school works as a starting point to subsequently design and implement programs that promote changes in behavior among the school population, the

decision was made to carry out an investigation in a secondary school to collect data empirical data that allow verifying or refuting these affirmations. To do this, instruments were developed to verify if there is actually a disconnection between the study plan and sustainability issues and to what degree. This study is complemented with a survey of teachers and students about their knowledge and environmental habits, and with the application of an environmental audit focused on identifying the main problems and needs of the school.

## **Materials and methods**

This research work was carried out at the Rubén Mora Gutiérrez General Secondary School, located in the municipality of Las Vigas, Guerrero, Mexico, during the period from August 28 to September 4, 2020.

The study is divided into three stages. The first of these consisted of reviewing the 2011 Study Plan to seek information that would allow measuring the degree of linkage that this document has with different dimensions of sustainability. An instrument of our own design was used that distinguishes 12 curricular components considered important for the integral formation of students with critical thinking and a responsible commitment to the environment. The instrument has a Likert scale with four response options: 4 = It is very linked (to sustainability), 3 = Partially linked, 2 = Little linked and 1 = Not linked at all. The instrument was printed in triplicate and a different use was given to each of the three prints and their 12 points to investigate. One of the impressions was used to analyze the environmental dimension (personal and collective conduct and the state of the campus), another was destined to the social dimension (responsibility for the common welfare, respect, safety and quality of life) and with the third, the economic dimension was reviewed (costs considered for the development, administration, maintenance and management of activities). The criterion used to assign a value to each dimension was the number of times words or ideas referring to each curricular component were mentioned.

The second stage consisted of the application of surveys to the school population. The high school has a total of 347 students in both shifts and 23 teachers (including the director, who was included in the survey as one more teacher). It should be noted that the application was made during the contingency caused by the 2019 coronavirus disease (covid-19) pandemic, so there were no face-to-face classes at that time. To establish contact with the

participants, the director sent messages to as many people as possible and made contact by phone asking them to come to the school to answer a survey. A convenience sampling was carried out that included 45 students (second and third year, 2011 Curriculum), in addition to 15 teachers and the director, that is, a total of 61 participants with whom they spoke individually and separately, respecting sanitary measures to avoid infections. For data collection, two self-designed instruments were used, one for teachers (31 items) and the other for students (27 items) with a Likert scale and five response options. The items refer to the frequency with which the respondents perform certain actions. Some of the items are the same in both instruments, while others are applicable only to a part of the population studied. Data collection is divided into five dimensions: 1) environment, 2) society, 3) economy, 4) health and 5) education.

The third stage was dedicated to the application of an environmental audit in order to verify the degree of sustainability with which the school operates. An instrument divided into three sections was used, which was used by Gabriel (2019) as part of his doctoral thesis, which in turn was based on other instruments. The first two sections were adapted from the work carried out by Gervasio (2008) and Maldonado (2012) and were used to quantify the conditions of the facilities, the regulatory compliance of water and electricity consumption. The third section was adapted from Maldonado (2012) and was applied to review the management of urban solid waste (MSW) generated in the school. Their classification and final disposal were investigated, and the containers placed in different places were quantified and verified.

Finally, the information was reviewed and processed. Microsoft Word was used to collect the data and create a table. A database was generated in Excel 365 to obtain the average, variance and standard deviation to identify the level of sustainability of the uses and customs of the participants.

## Results

The results showed that, regarding the relationship between the 2011 Study Plan and sustainability, there are different degrees of connection. The environmental dimension registered a low level, with 16 points, because this concept was only mentioned in the presentation, the introduction and in the graduation profile. The social dimension, partially linked with 30 points, is present in most of the components. And the economic dimension is

closely linked (44 points), for having been mentioned in the 12 components. Table 1 shows the results that allowed specifying these grades.

**Table 1.** Linking the 2011 Study Plan. Basic education with the dimensions of sustainability

| Componentes curriculares del <i>Plan de estudios</i><br><i>2011. Educación básica</i> | Dimensiones de la sustentabilidad |        |           |
|---|-----------------------------------|--------|-----------|
|   | Ambiental                         | Social | Económica |
| Presentación e introducción   | 2                                 | 1      | 3         |
| Reforma Integral en Educación Básica  | 1                                 | 2      | 3         |
| Características del Plan de estudios 2011   | 1                                 | 2      | 3         |
| Principios pedagógicos que sustentan el Plan de estudios                              | 1                                 | 2      | 4         |
| Competencias para la vida   | 1                                 | 3      | 3         |
| Perfil de egreso de la educación básica   | 2                                 | 3      | 4         |
| Mapa curricular de la educación básica  | 1                                 | 3      | 4         |
| Campos de formación para la educación básica  | 1                                 | 3      | 4         |
| Diversificación y contextualización curricular  | 2                                 | 2      | 4         |
| Gestión para el desarrollo de habilidades digitales                                   | 2                                 | 3      | 4         |
| La gestión educativa y de los aprendizajes  | 1                                 | 4      | 4         |
| Estándares curriculares y aprendizajes esperados                                      | 1                                 | 2      | 4         |
| Total de puntuación   | 16                                | 30     | 44        |

Very linked (34-48), Partially linked (23-33), Little linked (12-22) Not linked at all (1-11).

Source: self made

The sustainability indices are observed in table 2, while the dimensions of sustainability in teachers and students are shown in table 2 and figure 1. In that of teachers, in terms of the environmental dimension, the participants express that they are Aware of the importance of caring for the environment, they say they are concerned about the issue and that they carry out activities to promote sustainability among their students. Regarding the social dimension, there is concern for the promotion of respect, equity and equality at school in both cases. And in relation to the economy, the teachers point out that the resources allocated to the maintenance and conservation of the school facilities are reduced. In the environmental health dimension, the majority considers that hygiene is inadequate in the



bathrooms and the school cooperative; In addition, they complain about the presence of foul-smelling wastewater. Regarding the dimension of education, they believe that, despite being aware of the scope of their work, it should not be limited to daily educational activities, but should be extended to the promotion of environmental skills.

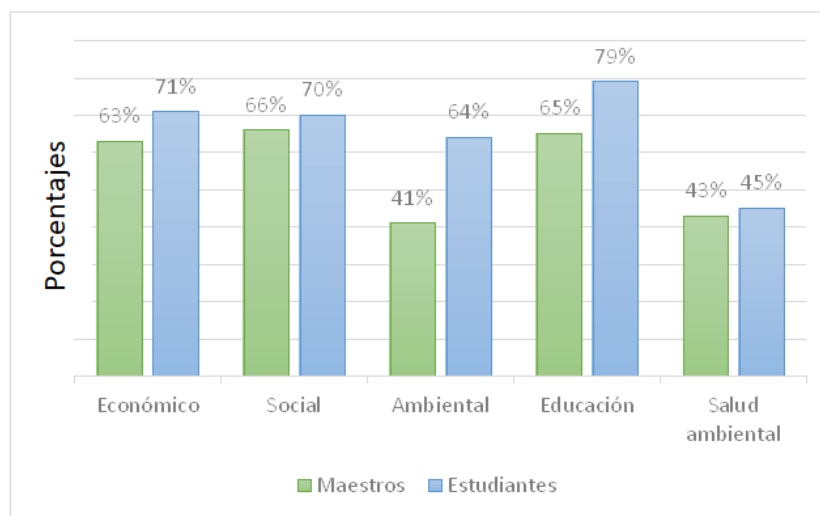
In the student surveys, it stands out that this population group expresses greater willingness than teachers to carry out activities that contribute to caring for the environment, that in terms of the environmental dimension. As far as the social dimension is concerned, there is a negative result in general, specifically, with regard to tolerance of different people, a weakness is shown. In the economic dimension, the percentage was above the average, and in a particular way, in relation to the activities of collecting polyethylene terephthalate (PET) and caps to generate a resource that is used in the same school. In the dimension of environmental health, like teachers, the percentage was low; The respondents point out that cleanliness is needed in the school facilities and that it is necessary to promote healthy habits in food consumption and generate a culture of personal hygiene. Finally, it was observed that, in the education dimension, the students showed a more positive attitude towards the environment compared to the teachers. The observation remains that it is necessary to include environmental issues in their classes.

**Table 2.** Value of teachers and students indicators

| Indicadores               | Valor el indicador (VI) |            | Factor de ponderación (FP) |            | Resultado Vi*FP |            |
|---------------------------|-------------------------|------------|----------------------------|------------|-----------------|------------|
|                           | Docente                 | Estudiante | Docente                    | Estudiante | Docente         | Estudiante |
| Ambiental                 | 0.63                    | 0.71       | 0.30                       | 0.30       | 0.19            | 0.21       |
| Social                    | 0.66                    | 0.70       | 0.20                       | 0.20       | 0.13            | 0.14       |
| Económico                 | 0.41                    | 0.64       | 0.10                       | 0.10       | 0.04            | 0.06       |
| Educación                 | 0.65                    | 0.79       | 0.30                       | 0.20       | 0.20            | 0.16       |
| Salud ambiental           | 0.43                    | 0.45       | 0.10                       | 0.10       | 0.04            | 0.05       |
| Índice de sustentabilidad |                         |            | 1                          |            | 0.60            | 0.69       |

Source: self made

**Figure 1.** Dimensions of sustainability for secondary school teachers and students



Source: self made

The results of the environmental audit on water disposal, energy consumption and MSW disposal are shown in Table 3. During the tour of the facilities, bathrooms in poor condition were observed, without drainage, with little water in the cisterns and without sinks. On the other hand, energy consumption was minimal due to the fact that Hurricane Max severely affected the school's transformer in 2017, leaving most of the facilities without electricity. Finally, four deposits were located for the collection of PET and two bags to place the screw caps in the management area.

**Table 3.** Results of the environmental audit on water disposal, energy consumption and MSW disposal

| Elemento ambiental | Registro                          | Comentario  |
|--------------------|-----------------------------------|---|
| Agua               | Drenaje                           | El drenaje no está completo, lo que provoca concentración de aguas grises y mala higiene en los baños y en la cooperativa.                                      |
|                    | Cisternas                         | Hay varias cisternas cerca de los baños y la cooperativa, pero no son suficientes debido a la escasez de agua en la zona y las existentes presentan mal estado. |
| Electricidad       | Instalaciones eléctricas          | La mayor parte de la escuela no cuenta con cableado necesario para abastecer de electricidad, debido al vandalismo y las instalaciones están en mal estado.     |
|                    | Uso de energía eléctrica          | En su mayoría, los focos existentes están encendidos todo el día; aun cuando no es necesario.   |
| RSU                | Contenedores por tipo de residuos | Se localizaron cuatro contenedores para el PET y dos para las taparrosas. No hay en existencia contenedores para separar el resto de los RSU.                   |

|  |           |  |
|--|-----------|--|
|  | Composteo | No se encontraron áreas destinadas al composteo. |
|--|-----------|--|

Source: self made

## Discussion

The secondary education level is the stage in which young people strengthen their training in environmental knowledge, attitudes and values and, according to Calixto (2015), this gives relevance to strengthening the presence of sustainability in the study plans they consider. The results generated in this research agree with the final reflections of Calixto (2015), who observed that the 2011 Curriculum. Basic Education presents sustainability as a broad knowledge instead of an educational process, in addition to burdening society with responsibility. and untimely detract from the Government's commitment. The study carried out by Anicasio (2014) differs on the one hand from the previous analysis, due to the fact that it finds a transversal environmentalization in the subjects of Biology, Physics and Chemistry, and less presence in Geography, Civic Education and Ethics and History.

Despite the limitations of the health contingency, such as the difficulty of gathering groups of people or contacting them in the midst of isolation, an acceptable population was able to gather to apply the instruments.

The dimensions of sustainability analyzed in the surveys applied to teachers and students yielded similar results, although it is observed that students have a greater commitment compared to their teachers, especially in the environmental dimension, where the difference is more evident. with 23% in favor of the students. Taking into account Tovar's (2021) observation of the need for teachers to encourage students to change their reality to preserve the environment, the need for teacher training is evident so that they together reach an optimal level of sustainability. However, an educational intervention of this type must be planned carefully, because, in some studies on school environmental projects, the school community is not willing to change or transform the scenario in which it finds itself. (Restrepo, 2013).

The teachers, in the environmental dimension, added 63% of coincidence in terms of the importance they give to the promotion of activities to care for the environment; These results are similar to those of Terrón and Cobano-Delgado (2008), who consider that teachers are the ones in the best conditions to generate awareness in students about the proper use of

natural resources. And along the same lines, Mwendwa's (2017) study conducted in secondary schools in Tanzania found that teachers have extensive knowledge and understanding of basic environmental issues. The social dimension presented a good result, this is related to the commitment that teachers have to promote respect and equity among their students, as reflected in the 2011 Study Plan in its components.

The results of the environmental audit showed anomalies in the facilities: open-air dumps were located in several areas, as well as inadequate electrical installations, the drainage is incomplete, which creates puddles of gray water and requires better practices in the management of MSW. . These findings are similar to those of Gabriel (2019), who found toilets in poor condition, water shortages, and insufficient cisterns. In terms of electricity, they do not have saving light bulbs, switches in poor condition and high consumption due to the use of computer equipment and projects that are used all day. And as for the mismanagement of MSW, with the exception of PET and screw caps, it may be due to the lack of adequate knowledge or the lack of interest of both teachers and students, since no containers were found to dispose of other types of waste. such as paper, cardboard, glass, aluminum, among others. While Gabriel (2019) found that there is no proper management of MSW and proposed that an environmental management committee is necessary to raise awareness and monitor the proper use of resources and materials.

On the other hand, the results of the research differ from those found by Jerath, Ladhar and Deepali (2012), who carried out this type of audit in 36 schools in the state of Puna in India. They found that the actors in the educational process of these institutions are aware of the importance of protecting the environment and it is reflected in the infrastructure of the schools, given that they have water collection systems, equipment that consumes energy efficiently electricity and proper management of all MSW.

## Conclusions

The investigation revealed that the 2011 Curriculum was found to be poorly linked to the environmental dimension in the curricular components, so it is necessary to include it in it, in order for teachers to appropriate the theme and develop activities with the students. that contribute to caring for the environment.

It was found that teachers must develop knowledge of the dimensions of sustainability. Therefore, it is important that training be carried out in order to strengthen

them in environmental issues, as well as in environmental health, and how to address it in their daily classes.

It was observed that the students present knowledge of the problems of their environment and attitude to develop actions that contribute to the care of the environment. However, it is necessary to strengthen the other dimensions of sustainability, for comprehensive training. This study lays the foundation for future research in secondary schools so that students can achieve autonomous, interdisciplinary and transdisciplinary learning at all educational levels.

All the information obtained by carrying out this study can be used as a point of reference to design and implement environmental education programs or education for sustainable development, as described by UNESCO. A lifelong learning process that can help develop knowledge, skills, attitudes and values in people of all ages in a multidimensional way.

### **Contributions to future research**

This research had a limited sample due to the health contingency, so it is considered to expand the field of study in different schools in similar situations. Even so, the results of the surveys can contribute to the design of a socio-environmental education program that allows the actors of the educational process to generate environmental competencies that contribute to the preservation of the environment of the community under study, as well as for the design of a teacher training program that provides them with tools so that they can integrate education for sustainable development into their daily work. The use of regular environmental audits is recommended so that the actors of the educational process monitor the environmental status of their school and can implement strategies that contribute to caring for the environment.

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