

<https://doi.org/10.23913/ride.v13i25.1253>

Artículos científicos

**La sustentabilidad desde la percepción de estudiantes: caso
Preparatoria 47 de Texca, Guerrero**

***Sustainability from the perception of students: Case Preparatoria 47 of
Texca, Guerrero***

***Sustentabilidade na percepção dos alunos: caso da High School 47 de Texca,
Guerrero***

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Resumen

El objetivo de esta investigación fue evaluar la percepción de la sustentabilidad en estudiantes de una preparatoria ubicada en Texca, Guerrero. La metodología fue cuantitativa; se empleó la técnica de la encuesta mediante la opción de respuesta en escala de Likert a 79 participantes (34 hombres y 45 mujeres). El alcance fue exploratorio por ser un fenómeno poco estudiado. Los hallazgos más destacados muestran que, en la dimensión ambiental, 71 % de los estudiantes tiene conocimientos y actitudes favorables hacia el cuidado del medio ambiente; en la social, 72 % está muy satisfecho con el desempeño de sus docentes y las condiciones de equipamiento de las instalaciones escolares, aun y cuando consideran que se requieren mejores condiciones físicas para la realización de sus actividades; en el área económica, 61 % está de acuerdo con el pago de los aranceles institucionales, pero les gustaría saber cómo y en qué se invierten los recursos cobrados. Este estudio concluye con el reconocimiento de una adecuada percepción de los temas ambientales y de la sustentabilidad por parte de los docentes y estudiantes del nivel medio en una comunidad rural; sin embargo, también se reconoce que es necesario continuar con el desarrollo de procesos de capacitación con los docentes.

Palabras clave: educación media superior, educación para el desarrollo sustentable, percepción, sustentabilidad, trabajo docente.

Abstract

The objective of this research was to evaluate the perception of sustainability in students of a high school located in Texca, Guerrero. The methodology was quantitative; the survey technique was used using the Likert scale response option for 79 participants (34 men and 45 women). The scope was exploratory because it is a little studied phenomenon. The most outstanding findings show that, in the environmental dimension, 71 % of the students have favorable knowledge and attitudes towards environment care; in the social, 72 % are very satisfied with the performance of their teachers and the equipment conditions of the school facilities, even though they consider that better physical conditions are required to carry out their activities; in the economic area, 61 % agree with the payment of institutional fees, but would like to know how the collected resources are invested. This study concludes with the recognition of an adequate perception of environmental issues and sustainability by teachers

and students at the middle school level in a rural community; however, it is also recognized that it is necessary to continue developing training processes with teachers.

Keywords: middle school education, education for sustainable development, perception, sustainability, teaching work.

Resumo

O objetivo desta pesquisa foi avaliar a percepção de sustentabilidade em alunos de uma escola secundária localizada em Texca, Guerrero. A metodologia foi quantitativa; A técnica de pesquisa foi utilizada por meio da opção de resposta da escala Likert para 79 participantes (34 homens e 45 mulheres). O escopo foi exploratório por se tratar de um fenômeno pouco estudado. Os achados mais destacados mostram que, na dimensão ambiental, 71% dos alunos possuem conhecimentos e atitudes favoráveis ao cuidado com o meio ambiente; no social, 72% estão muito satisfeitos com o desempenho de seus professores e com as condições de equipamentos das instalações escolares, mesmo quando consideram que são necessárias melhores condições físicas para realizar suas atividades; Na área econômica, 61% concordam com o pagamento de taxas institucionais, mas gostariam de saber como e em que são investidos os recursos arrecadados. Este estudo conclui com o reconhecimento de uma percepção adequada das questões ambientais e de sustentabilidade por professores e alunos do ensino médio em uma comunidade rural; no entanto, reconhece-se também que é necessário continuar a desenvolver processos de formação de professores.

Palavras-chave: ensino médio, educação para o desenvolvimento sustentável, percepção, sustentabilidade, trabalho docente.

Fecha Recepción: Febrero 2022

Fecha Aceptación: Agosto 2022

Introduction

The search for sustainability challenges traditional teaching and demands a comprehensive student-centered education, one that fosters knowledge and reflection for generations to come (Aziz, Tahir, and Qureshi, 2021; Kelley and Dikkers, 2016; Mogren, Gericke, and Scherp, 2019). Indeed, education plays an important role, since it helps to strengthen values and develop skills to reduce unsustainable practices in society (Munro, Marshall, Murray, Coyle and Sonnenberg, 2019; Yuan, Yu and Wu, 2021). The university, as part of that educational system and as a training institution, can and should play an

important role in building more equitable and sustainable communities (Tilbury, 2013). The foregoing through the commitment of its teachers, with teachings focused on sustainability and the generation of a change of attitude in students (Lazzarini, Pérez and Boni, 2018).

The United Nations Decade of Education for Sustainable Development (2005-2014) was presented as an opportunity to integrate knowledge, values, perspectives and practices related to sustainability in all its principles (Leal, 2009; Yarime and Tanaka, 2012). It was thought that with this initiative, education for sustainable development (ESD) would become a priority objective for teachers around the world, but this did not happen (Gil, Vilches, Toscano y Macías, 2006).

However, the 2030 Agenda is presented as a new opportunity to strengthen ESD, since, as established in the Sustainable Development Goal (SDG) 4, it seeks to "guarantee inclusive and equitable quality education and promote learning opportunities permanent for all" (United Nations [UN], 2018, p. 27). Goal 4.7, to the letter, says: "All students acquire the theoretical and practical knowledge to promote sustainable development, through education for sustainable development (...) and the contribution of culture to sustainable development" (ONU, 2018, page 29). This agenda proposes concrete strategies to face the challenges derived from modernity (Blanco, R-Pertierra, Benayas and Lozano, 2018). In this context, in May 2021, the United Nations Educational, Scientific and Cultural Organization (Unesco) and the German Federal Ministry of Education and Research held the World Conference on Education for Sustainable Development, in which resulted in the Berlin Declaration. There, commitments were established such as "empowering youth as agents of change to achieve sustainable development, creating opportunities for learning and citizen participation, providing them with the skills and tools to participate in ESD as co-creators of individual and social transformation" (Unesco, 2021, p. 4).

Given this global panorama, it was considered pertinent to analyze how the actors of educational institutions are contributing to the achievement of sustainability. It was decided to carry out a study based on the perception of the subjects regarding sustainability. It should be specified that this concept of perception is understood here as follows:

Cognitive process of consciousness that consists of the recognition, interpretation and meaning for the elaboration of judgments about the sensations obtained from the physical and social environment, in which other psychic processes such as learning, memory and symbolization intervene (Vargas, 1994, p. 48).

That is, it is assumed that the perception of reality explains the way in which human beings interact with communities and their environment (Marques, Ursi, Lima and Katon, 2020). In the educational field, the teachers' perception of ESD can be decisive in the way in which students are instructed and trained to conserve resources for future generations (Anyolo, Kärkkäinen and Keinonen, 2018).

Likewise, the perception of young people provides information on how the teacher guides them in the development of academic activities in relation to the three dimensions of sustainability: environmental, social and economic (Brito, Rodríguez and Aparicio, 2018). And in this way, advance the achievements of ESD.

With these considerations, it was determined that this research had the objective of evaluating the perception of sustainability in high school students of Preparatory School No. 47 of the Autonomous University of Guerrero in the community of Texca, Guerrero.

Literature review

For the context of this research, sustainability is conceived as a way of rethinking the relationship of the human being with nature, integrating the economic, social, environmental and value dimensions; therefore, it is considered an interdisciplinary topic that must be approached with a holistic vision to preserve resources for present and future generations (Watson, 2017; Zarta, 2018).

The Berlin Declaration describes ESD as a lifelong learning process. It emphasizes that it must be integrated into all levels of education and training from early childhood to adulthood. It emphasizes cognitive skills, social and emotional learning, and competencies to promote individual behavior for sustainable development (Unesco, 2021).

In order to meet the demands of ESD, educational institutions have made an effort to insert into their educational plans and programs topics that urgently address the global problems of the 21st century (Jung, Park and Ahn, 2019; Mendoza and Rodríguez, 2021; Ramirez, 2018); however, it must be recognized that, in addition to the curricular dimension, it is necessary to increase actions that guide managers, teachers and students to become aware and sensitize, as well as the promotion of sustainable values and a change of attitude towards society (Gallardo, Dias and Ramos, 2019; Mendoza and Rodríguez, 2021; Msengi et al., 2019). Likewise, it is important to know how the SDGs are being integrated into educational processes from the perspective of the different actors (Muguerza and Chalmeta, 2020).

As part of that educational system and as a teaching and research entity, the university seeks to consolidate itself as an agent of change that provides answers to the multiple problems of society through scientific and technological experimentation, as well as the formation of human capital with a change of attitude towards the environment (Benayas, Marcén, Alba and Gutiérrez, 2017). Sustainable development is recognized as a guiding axis for achieving sustainability on campus (Savelyeva y Douglas, 2017).

It should be noted that, worldwide, universities have made efforts aimed at sustainability through the signing of agreements and their implementation throughout the educational system; however, it has not been possible to integrate holistically (Lozano et al., 2015).

Special mention deserves the upper middle level, where students are expected to be more critical, creative, reflective and aware of the problems of their environment and perceive them as global issues (Gallardo et al., 2019; Pérez, Miguel, Moreno and Martínez, 2019). Likewise, this educational level demands the need to have a comprehensive vision to successfully face the challenges of sustainability (Dlouhá, Heras, Mulà, Salgado and Henderson, 2019; Espejel and Flores, 2012; Isaac et al., 2011). In Mexico, the higher education system is based on the competency-based approach; one of them aims for the student to contribute to sustainable development in a critical way and with responsible interventions (Colín, Llanes e Iglesias, 2019; Pérez *et al.*, 2019).

Sustainability assessment experiences in education

In the national and international literature, it has been found that students show little knowledge of global problems, but they are familiar with the concept of sustainability (García, Jiménez and Azcárate, 2020a; Jeong, Jung and Koo, 2015; Stir, 2006). . Likewise, they are aware of the importance of conserving resources for future generations and show willingness to change to a more sustainable lifestyle (Tuncer, 2008). Formal education and the traditional techniques of universities have contributed to achieving this (Cottafava, Cavaglià and Corazza, 2019; Yuan et al., 2021).

Studies have also been carried out to measure knowledge, behaviors or perceptions regarding environmental problems in high school students. Quantitative studies measured with instruments such as characterization sheets and surveys predominate, with items with response options on a Likert scale (Andrade and Gonzales, 2019; Espejel and Flores, 2015; Gädicke, Ibarra, and Osses, 2017; Mendoza and Rodríguez, 2021). It is important to point

out that these studies do not focus on the educational process but on the environmental conditions of the context.

In the Mexican upper secondary level, various actions have been carried out, such as class programs that incorporate practical topics focused on caring for the environment so that students develop the skills to minimize environmental damage (Espejel and Flores, 2012; Vargas and Fernández, 2018); as well as the development of school projects that contribute to the change of perception, awareness and expectations of students in the incorporation of sustainable development in their daily actions. (Ramírez, 2018).

At the Autonomous University of Guerrero (UAGro), little research is reported on the upper secondary level. Those of Gervacio and Castillo (2019), Tapia, Rodríguez, Aparicio and Castro (2019) and Gervacio and Castillo (2020) stand out, which coincide in undertaking an analysis of the curriculum, as well as in the proposal of various activities aimed at development of the sustainable development competence with the purpose that students are able to address the problems of their environment and implement actions for the preservation of natural resources.

The references cited above, although they mean an important contribution to the literature on sustainability in high school classrooms, are insufficient, since it is also necessary to know the vision of other actors involved, such as students; Thus, the question of this research arises: what perception of sustainability do the UAGro high school students have? In order to respond, a case study was carried out at Preparatory School No. 47 of this institution, in the town of Texca, Guerrero.

Method

The objective of the research was to evaluate the perception of sustainability in high school students of High School No. 47 in the community of Texca, Guerrero. The study was of a quantitative type; the survey technique was used using the Likert scale response option. The scope was exploratory, because it is a little studied phenomenon at this educational level. (Hernández y Mendoza, 2018).

Contextualization

Preparatory School No. 47 belongs to UAGro, a public institution with 48 upper secondary schools, which have a total enrollment of 52,618 students (59.22% of the total university) (UAGro, 2021). The Texca community is located in the northern part of the municipality of Acapulco de Juárez; It has a population of 2,314 inhabitants (1,142 men and 1,172 women). In economic activity, corn farming, animal husbandry and masonry work stand out (National Institute of Statistics and Geography [Inegi], 2020). According to Moctezuma et al. (2021), the critical socio-environmental problems that occur in the community are: the lack of sense and environmental commitment of the locals, the contamination by agrochemicals used in the cultivation of corn and the inadequate management of their urban solid waste.

Sample

Preparatory School No. 47 has 134 students, of whom 79 participated (58.96%), distributed as shown in table 1. The highest participation occurred in semester two, with prevalence of the female gender. The age ranges ranged between 15 and 19 years. Participation was voluntary, without any coercion.

Table 1. Participating students

Género	Semestre 2	Semestre 4	Semestre 6	Total
Hombre	12	8	14	34
Mujer	21	11	13	45
Total	33	19	27	79

Source: self made

Process

We worked with the instrument of Brito et al. (2018), which was transferred to a Google form. This instrument has response options of 0-4, where 4 is excellent and 0 is poor; the four options measured different levels of perception (satisfaction, frequency and opinion) of topics related to sustainability in high school students. For the validation of the instrument, four teacher-researchers from the area of environmental sciences, experts in topics related to sustainability, participated; To strengthen it, a literature search was carried out according to

the educational level and context (Isaac et al., 2011; Mendoza and Rodríguez, 2021; Tilbury, 2013; Vargas and Fernández, 2018; Ramírez, 2018; Yuan et al., 2021).

The form consisted of three sections: a) objective of the research and instructions for the participants on filling out and using the information (academic and research purposes), b) general data on age, gender, semester and shift and c) 21 items for evaluate the perception of sustainability (table 2).

Table 2. Sustainability variables at Preparatory School No. 47

Dimensiones de la sustentabilidad	Variables
Ambiental	<ul style="list-style-type: none"> • Acondicionamiento del aula para las clases • Uso de las tecnologías de la información y la comunicación (TIC) para la evaluación • Manejo de residuos • Congresos y conferencias sobre EDUCACIÓN AMBIENTAL y desarrollo sostenible • Participación en actividades que organiza la escuela o el profesor • Material para el desarrollo de las clases amigable con el medio ambiente • Limpieza de sanitarios, aulas y otras áreas
Social	<ul style="list-style-type: none"> • Equipamiento de laboratorio para desarrollo de actividades académicas • Nivel de desempeño de docentes en temas de sustentabilidad • Nivel de respeto entre docentes y estudiantes • Nivel de satisfacción en equipamiento de centro de cómputo y biblioteca • Opinión sobre las áreas de comida, sanitarios, esparcimiento y áreas verdes • Frecuencia de asistencia a eventos académicos y sociales

	<ul style="list-style-type: none"> • Satisfacción sobre trámites administrativos
Económica	<ul style="list-style-type: none"> • Aranceles de la escuela (establecidos y voluntarios) • Participación en estancias de verano de la investigación • Informes de actividades y su periodicidad

Source: self made

The form was sent by email to the students of the three current semesters in the period February-July 2020.

The information obtained was processed in the Microsoft Excel software to determine the Cronbach's alpha coefficient, the absolute frequencies and the measures of central tendency (mean, variance and standard deviation), as well as the data to evaluate the perception of the students regarding the sustainability.

Likert scale reliability

A Cronbach's alpha coefficient of 0.839 was obtained, so it is concluded that this value shows a strong internal consistency in the instrument used.

Results

The results show the evaluation of the students' perception in relation to sustainability.

General information of the participants

The participants were made up of a total of 34 men (43%) and 45 women (57%). Regarding age, the highest frequencies were 15 years old (35.4%), 17 years old (34.2%) and 16 years old (19%); while the casualties were 18 years (7.6%) and 19 years (3.8 %).

Perception of sustainability

Regarding the conditions of the classroom to receive the classes, the equipment of laboratories, computers, library, recreation areas, food and green areas, 85.1% showed responses of excellent, very satisfied and satisfied; meanwhile, 14.9% stated that they were little or not at all satisfied (table 3).

Table 3. Responses of students from High School No. 47

Ítems	Escala de respuestas de Satisfacción	Frecuencia	Porcentaje (%)
1,6,7,10, 11, 12, 13, 14 y 15	Excelente	201	28.3
	Muy satisfecho	199	28.0
	Satisfecho	205	28.8
	Poco satisfecho	83	11.7
	Nada satisfecho	23	3.2
Escala de respuestas de frecuencia			
2,3,4,5,16, 18 y 19	Siempre	221	40.0
	Casi siempre	114	20.6
	A veces	89	16.1
	Pocas veces	60	10.8
	Nunca	69	12.5
Escala de respuestas de actitud y conocimiento			
8, 9 y 17	Excelente	114	48.1
	Muy bueno	81	34.2
	Bueno	35	14.8
	Regular	7	3.0
	Malo	0	0.0
Escala de respuestas de satisfacción			
20 y 21	Totalmente de acuerdo	48	30.4
	De acuerdo	83	52.5
	Ni de acuerdo ni en desacuerdo	15	9.5
	Parcialmente de acuerdo	8	5.1
	En desacuerdo	4	2.5

Fuente: Elaboración propia

In the same way, 60.6% of students perceive that the use of paper and consumables has always and almost always decreased, as well as the management of solid waste. In the opposite direction, 16.1% of the participants answered sometimes and 23.3% rarely and never.

Regarding the knowledge of teachers about sustainability and their performance in the development of activities, the responses of very good and excellent add up to 82.3%; meanwhile, for 14.8% the attitude, performance and knowledge is good, and for 3% it is deficient, regular or bad.

Regarding the payments made at the school (fees and voluntary cooperation), 82.9% of the students agree and totally agree, 14.6% partially agree and 2.5% disagree.

Assessment of sustainability by gender

The students identified the problems that affect the planet and consider that it is important to implement actions from their educational environment to contribute to the achievement of sustainability in its three dimensions (environmental, social and economic). Specifically, men showed percentages of 76%, 74% and 61%, respectively; while women showed 68%, 69% and 62% in the same dimensions.

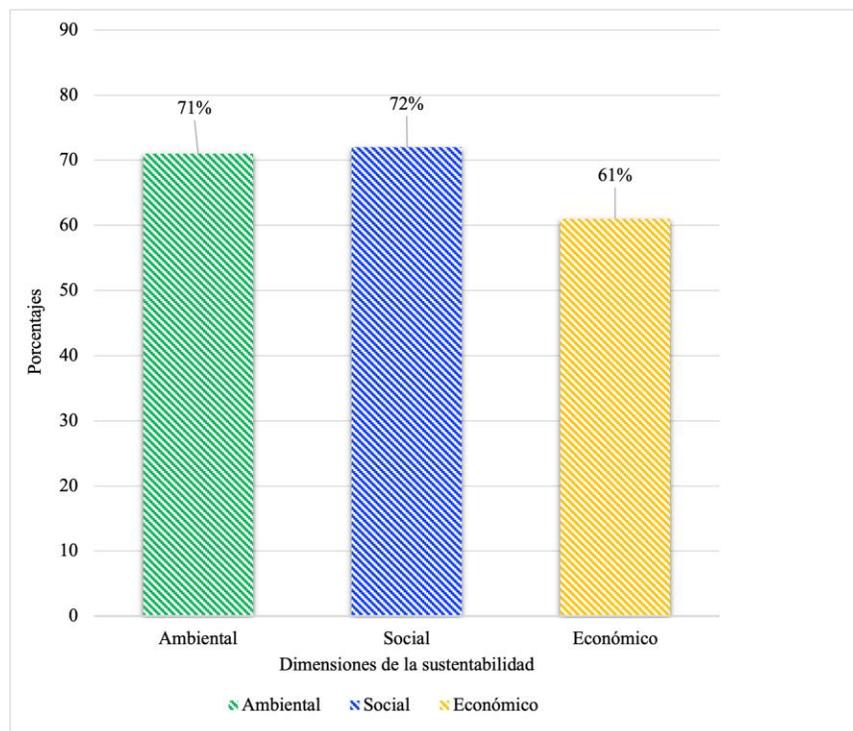
Evaluation of the dimensions of sustainability

Regarding the environment, it is reflected that 71% of the students have greater knowledge in the use of technologies to present their tasks, disposition for the adequate management of waste and a favorable attitude to participate in activities focused on caring for the environment (figure 1).

In the social dimension, 72% of the students show that they are very satisfied with the teachers' knowledge on the subject of sustainability and the good relationship between teachers-students and managers, as well as the conditions and equipment of the laboratories, the areas where They take food and clean the toilets.

In the economic dimension, the students agree (61%) with the established fee payments; however, even when the result is good, they point out that financial support is needed to carry out summer research stays, and they consider that it is necessary to know where the resources are allocated in the institution.

Figure 1. Evaluation of the dimensions of sustainability



Source: self made

Discussion

According to the results obtained, it can be affirmed that, in general, the students of High School No. 47 perceive sustainability as good, based on the actions they develop to minimize damage and conserve the resources of their environment.

Specifically, 85.1% of the students expressed satisfaction with the conditions of comfort, infrastructure and equipment; however, 14.9% were little and not at all satisfied. Colin et al. (2019) refer that the conditioning and equipping of spaces are aspects that contribute to the achievement of young people's learning. Another finding in the research is that the participants carry out actions to care for the environment and reduce the impacts that affect the planet. These results have an approximation to those of Espejel and Flores (2012), who developed and executed an environmental program with students from the Center for Technological, Industrial and Services Studies (CETis) 104 of Puebla and the Technological Industrial and Services Baccalaureate Center. (CBTis) 212 from Tlaxcala; They detected that values and attitudes grew to lessen the deterioration of the planet due to the tasks of the school and the community.

It was also found that 82% of the students perceive that teachers have an excellent level of performance on the subject of sustainability, while 3% thought that it is deficient. There is a similarity with Espejel and Flores (2015), who in the research carried out in the CBTis 212 found that the students have knowledge of sustainability but consider that it is insufficient due to the lack of training of the teaching staff. In this way, the more knowledge and awareness of the problems of their environment the students have, the more their perception of the problem will change, and they will be able to propose actions for the preservation of natural resources for future generations.

Regarding gender, it was identified that men have a good attitude and knowledge in relation to environmental and social problems (76% and 74%, respectively); This is explained because, in addition to fulfilling their role as students, most carry out activities in the field. Women also show a good attitude, 68% and 69% respectively. In contrast, Vargas and Fernández (2018) found that, although high school students have a good attitude and knowledge, there is a predominance of the female gender; they emphasize that in both cases the knowledge acquired in the classroom is related to society through sustainable school projects.

For their part, Tesfaia, Nagothua, Šimekb and Fučikc (2016) conducted a study in four secondary schools in the Vysocina region, in the Czech Republic; found that the age of the students, the place they live and the level of education do not affect their perceptions; however, gender did seem to be an influencing factor (women were more positive in their responses and showed greater commitment to the environment). The authors suggest the need to strengthen environmental education through awareness campaigns in schools where students are involved in activities focused on caring for the environment. Gädicke et al. (2017) also found that women students from Temuco, Chile, show greater concern than men. Aginako and Guraya (2021), in a study at the University of the Basque Country, found that sustainability in the academic, personal and professional fields is important for engineering students. Also in Spain, at the Iturrama Secondary Education Institute, only 32.3% of high school students were aware of the SDGs; however, this can be considered a successful case, viable to be replicated in other spaces, since in class they address almost all the 17 SDGs in the subjects of Social Sciences, Natural Sciences and Economics, mainly through the implementation of the Iturrama Solidario e Green Iturrama (Muguerza y Chalmeta, 2020).

Environmental dimension

The findings on the evaluation of the students of High School No. 47, in the environmental, show 71% in knowledge about sustainability, as well as the attitude to participate in the activities that the directors and teachers develop to put into practice the learning of the environment. classroom. This coincides with the research by Soto et al. (2014), who worked with young people between the ages of 14 and 21 in the rural community of Turuachi, Chihuahua, and found that the perception of environmental problems is influenced by everyday experiences. Punzalan, Signo, Signo and Marasigan (2019), in their research with students from urban private and rural public schools in the Philippines, found that participants from both areas have a high level of environmental awareness, so no significant difference was found and which is due to the direct influence of the environment in which they live.

Esteban and Amador (2018), in their study on the pro-environmental attitude and behavior of first-year environmental science students at the Pablo de Olavide University in Seville, Spain, found that most have prior knowledge about the environment, but They consider that it is necessary to develop environmental education processes to fully understand the problems that surround them, and achieve sustainability. For their part, Kagawa (2007) and Kiely, Parajuly, Green and Fitzpatrick (2021) point out that students perceive that sustainability is a good thing, they associate the concept of sustainable development with the environment. Finally, Córdor (2018) points out a tendency of young people to contribute through different actions in the preservation of natural resources.

Social dimension

The findings in this dimension show a satisfaction level of 72% in relation to teachers' knowledge of the problems that affect the planet. This result resonates with those of García et al. (2020b), who add that after the teachers' training, the participants indicated that their perception of education for sustainability evolved towards more complex visions. Mendoza and Rodríguez (2021) maintain that, at present, high school students have a high degree of social perception about the effects of climate change and its negative effects.

For their part, Gervacio and Castillo (2020), in their study with students from preparatory schools in the urban area of the UAGro, found that their knowledge and socio-environmental practices on environmental issues were scarce to regular; They conclude that their environmental perception is poor, so their awareness to care for and protect their

environment goes in the same direction. They state that they also found a low willingness to solve environmental problems locally. Although the same curriculum is used for all the preparatory schools of the UAGro, these results differ from those of High School No. 47, since in this one it was found that the students do have knowledge of the problem, as well as a willingness to carry out actions. actions for the environment and sustainability.

Conclusions

The results reflect that the perception of students in relation to sustainability is good; however, given that the problems that affect the planet are growing exponentially, it is necessary to strengthen educational training through the management of a more critical curriculum, which leads them to question the current forms of coexistence and move towards styles more sustainable life. The objective of evaluating the perception of sustainability in high school students of the UAGro in a rural community was achieved.

The perception of the students regarding the knowledge that teachers have about environmental issues and sustainability was identified: they expressed their confidence in their performance for a correct approach in the classroom; however, given the dynamic nature of environmental problems in the world, it is considered important to strengthen training and updating processes with teachers.

The literature consulted was relevant to the objectives of this research. The sources agree on the need to achieve the link between the educational system and society through the development of school projects, contextualized and connected with their immediate surroundings.

Future lines of research

This study lays the foundations for future lines of research that seek to address the link between the educational institution and the community and achieve the empowerment of students as future decision makers. In addition, the opportunity arises to design surveys that measure the institution's progress on the SDGs, especially goal 4.7 and how it is addressed by the teacher in his class program. Due to the above, it is also pertinent to open other lines that generate information to monitor the training of students and evaluate teachers.

Strengths and limitations

The survey adapted from Brito et al. (2018) and applied in this research contributed to the achievement of the stated objective, and is considered the basis for further studies in other schools of the same educational level and with the same social context.

This study represented a first approach to the subject of sustainability in teaching in a rural community, based on the questionnaire suggested by Brito et al. (2018). Based on these results, new, deeper investigations can be proposed with an exhaustive theoretical review that incorporates new variables and new questionnaires that respond not only to the educational context, but also to the environmental, social and economic context of Texca, Guerrero.

Acknowledgment

Thanks to Mtra. Edith Miranda Guerra, director of the Preparatory School No. 47 of the UAGro, and the students, directors and teachers, who gave their consent to develop this research.

References

- Aginako, Z. and Guraya, T. (2021). Students' Perception about Sustainability in the Engineering School of Bilbao (University of the Basque Country): Insertion Level and Importance. *Sustainability*, 13(15), 8673. Retrieved from <https://doi.org/10.3390/su13158673>.
- Andrade, J. y Gonzales, J. (2019). Relación entre actitudes pro-ambientales y conocimientos ecológicos en adolescentes con relación al entorno rural o urbano que habitan. *Revista Kavilando*, 11(1), 105-118. Recuperado de <https://kavilando.org/revista/index.php/kavilando/article/view/287>.
- Anyolo, E., Kärkkäinen, S. and Keinonen, T. (2018). Implementing Education for Sustainable Development in Namibia: School Teachers' Perceptions and Teaching Practices. *Journal of Teacher Education for Sustainability*, 20(1) 64-81. Retrieved from <https://doi.org/10.2478/jtes-2018-0004>.
- Aziz, F., Tahir, F. y Qureshi, N. A. (2020). Millennium development goals (MDGs-2000-2015) to sustainable development goals (SDGs-2030): a chronological landscape of public sector health care segment of Pakistan. *Journal of the Pakistan Medical Association*, (71), 596-601. Retrieved from <https://doi.org/10.47391/JPMA.394>.



- Benayas, J., Marcén, C., Alba, D. y Gutiérrez, J. M. (2017). *Educación para la sostenibilidad en España. Reflexiones y propuestas*. Madrid, España: Fundación Alternativas y Red Española para el Desarrollo Sostenible. Recuperado de https://www.unirioja.es/servicios/os/pdf/Informe_Educacion_Sostenibilidad_Espana.pdf
- Blanco, N., R-Pertierra, L., Benayas, J. y Lozano, R. (2018). Sustainability Leaders' Perceptions on the Drivers for and the Barriers to the Integration of Sustainability in Latin American Higher Education Institutions. *Sustainability*, 10(8), 2954. Retrieved from <https://doi.org/10.3390/su10082954>.
- Brito, R. M., Rodríguez, C. and Aparicio, J. L. (2018). Sustainability in Teaching: An Evaluation of University Teachers and Students. *Sustainability*, 10(2), 439. Retrieved from <https://doi.org/10.3390/su10020439>.
- Colín, N. A., Llanes, L. e Iglesias, D. (2019). El sistema educativo en México, ¿visión sustentable? *Revista CoPaLa*, 5(9), 155-170. Recuperado de <https://app.box.com/s/vnhkmzm7q41f12km1cvv7lv3a2mcutnu>.
- Cóndor, E. J. (2018). Dimensión ambiental en la formación profesional de los estudiantes de la Facultad de Educación de la Universidad Nacional de Huancavelica. *Educación* 27(53), 41-56. Recuperado de <https://doi.org/10.18800/educacion.201802.003>.
- Cottafava, D., Cavaglià, G. and Corazza, L. (2019). Education of sustainable development goals through student's active engagement: A transformative learning experience. *Sustainability Accounting, Management and Policy Journal*, 10(3), 521-544. Retrieved from <https://doi.org/10.1108/SAMPJ-05-2018-0152>.
- Dlouhá, J., Heras, R., Mulà, I., Salgado, F. and Henderson, L. (2019). Competences to Address SDGs in Higher Education: A Reflection on the Equilibrium between Systemic and Personal Approaches to Achieve Transformative Action. *Sustainability*, 11(13), 3664. Retrieved from <https://doi.org/10.3390/su11133664>.
- Espejel, A. y Flores, A. (2012). Educación ambiental escolar y comunitaria en el nivel medio superior. *Revista Mexicana de Investigación Educativa*, 17(55), 1173-1199. Recuperado de http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S1405-66662012000400008&lng=es&tlng=es.
- Espejel, A. y Flores, A. (2015). Conocimiento y percepción del calentamiento global en jóvenes del bachillerato, Tlaxcala. *Revista mexicana de ciencias agrícolas*, 6(6), 1277-1290. Recuperado de

http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S2007-09342015000600011&lng=pt&tlng=es.

- Esteban, M. y Amador, L.V. (2018). Una aproximación a las actitudes de los universitarios hacia el medio ambiente. (Una experiencia innovadora en el ámbito de las ciencias ambientales). *Revista de Estudios y Experiencias en Educación*, 17(33). Recuperado de <http://www.rexe.cl/ojournal/index.php/rexe/article/view/514>.
- Gädicke, J., Ibarra, P. y Osses, S. (2017). Evaluación de las percepciones medioambientales en estudiantes de enseñanza media de la ciudad de Temuco, Región de La Araucanía, *Estudios Pedagógicos*, 43(1), 107-121. Recuperado de <https://www.redalyc.org/pdf/1735/173553246007.pdf>.
- Gallardo, O. A., Dias, P. H. y Ramos, L. (2019). Educación ambiental transformadora. Estudio comparado entre Brasil y Cuba. *Revista Pedagógica*, 21, 500-523. Recuperado de <http://dx.doi.org/10.22196/rp.v22i0.4844>.
- García, E., Jiménez, R. and Azcárate, P. (2020a). Approaches to teaching and learning for sustainability: Characterizing students' perceptions. *Journal of Cleaner Production*, 274. Retrieved from <https://doi.org/10.1016/j.jclepro.2020.122928>.
- García, E., Jiménez, R. and Azcárate, P. (2020b). Education for Sustainability and the Sustainable Development Goals: Pre-Service Teachers' Perceptions and Knowledge. *Sustainability*, 12(18). Retrieved from <https://doi.org/10.3390/su12187741>.
- Gervacio, H. y Castillo, B. (2019). Dimensión socioambiental en los contenidos del currículo del nivel medio superior de la Universidad Autónoma de Guerrero. *RIDE Revista Iberoamericana para la Investigación y el Desarrollo Educativo*, 10(19). Recuperado de <https://doi.org/10.23913/ride.v10i19.500>.
- Gervacio, H. y Castillo, B. (2020). Conocimientos, actitudes y prácticas socioambientales en estudiantes de la Universidad Autónoma de Guerrero, México. *RIDE Revista Iberoamericana para la Investigación y el Desarrollo Educativo*, 11(21). Recuperado de <https://doi.org/10.23913/ride.v11i21.798>.
- Gil, D., Vilches, A., Toscano, J. A. y Macías, O. (2006). Década de la educación para un futuro sostenible (2005-2014): Un punto de inflexión necesario en la atención a la situación del planeta. *Revista Iberoamericana de Educación*, (40). Recuperado de <https://rieoei.org/historico/documentos/rie40a06.htm>.
- Hernández, R. y Mendoza, C.P. (2018.) *Metodología de la investigación. Las rutas cuantitativa, cualitativa y mixta*. México: McGraw-Hill.

- Instituto Nacional de Estadística y Geografía [Inegi]. (2020). Censo de Población y Vivienda 2020. Recuperado de <https://www.inegi.org.mx/programas/ccpv/>.
- Isaac, R., Salavarría, O., Eastmond, A., Ayala, M., Arteaga, M. A., Isaac, A. P., Sandoval, J. L. y Manzanero, L. A. (2011). Cultura ambiental en estudiantes de bachillerato. Estudio de caso de la educación ambiental en el nivel medio superior de Campeche. *Revista Electrónica de Investigación Educativa*, 13(2), 83-98. Recuperado de <http://redie.uabc.mx/vol13no2/contenido-isaacmarquezetal.html>.
- Jeong, M., Jung, Y. and Koo, D. (2015). College Students' Perceptions of Sustainability: A Regional Survey. *Journal of Building Construction and Planning Research*, 3(4), 209-220. Retrieved from 10.4236/jbcpr.2015.34021.
- Jung, Y., Park, K. and Ahn, J. (2019). Sustainability in Higher Education: Perceptions of Social Responsibility among University Students. *Social Sciences*, 8(3), 90. Retrieved from <https://doi.org/10.3390/socsci8030090>.
- Kagawa, F. (2007). Dissonance in students' perceptions of sustainable development and sustainability: Implications for curriculum change. *International Journal of Sustainability in Higher Education*, 8(3), 317-338. Retrieved from <https://doi.org/10.1108/14676370710817174>.
- Kelley, C. and Dikkers S. (2016). Framing Feedback for School Improvement Around Distributed Leadership. *Educational Administration Quarterly*, 52(3), 392-422. Retrieved from <https://doi.org/10.1177/0013161X16638416>.
- Kiely, L., Parajuly, K., Green, J. A. and Fitzpatrick, C. (2021). Education for UN Sustainable Development Goal 12: a cross-curricular program for secondary level students. *Journal Frontiers in Sustainability*, 2. Retrieved from <https://doi.org/10.3389/frsus.2021.638294>.
- Lazzarini, B., Pérez, A. and Boni, A. (2018). Key characteristics of academics promoting sustainable human development within engineering studies. *Journal of Cleaner Production*, 188, 237-252. Retrieved from <https://doi.org/10.1016/j.jclepro.2018.03.270>.
- Leal, W. (2009). La educación para la sostenibilidad: iniciativas internacionales. *Revista de Educación*, (número extraordinario), 263-277. Recuperado de <https://www.educacionyfp.gob.es/dam/jcr:f00db625-ad50-4963-93d3-a93720c7a812/re200912-pdf.pdf>.

- Lozano, R., Ceulemans, K., Alonso, M., Huisingh, D., Lozano, F. J., Waas, T., Lambrechts, W., Lukman, R. and Hugé, J. (2015). A review of commitment and implementation of sustainable development in higher education: results from a worldwide survey. *Journal of Cleaner Production*, 108, 1-18. Retrieved from <https://doi.org/10.1016/j.jclepro.2014.09.048>.
- Marques, V., Ursi, S., Lima, E. and Katon, G. (2020). Environmental Perception: Notes on Transdisciplinary Approach. *Scientific Journal of Biology & Life Sciences*, 1(2), 1-9. Retrieved from <http://botanicaonline.com.br/geral/arquivos/Marques%20et%20al%202020.pdf>.
- Mendoza, I. y Rodríguez, O. (2021). Percepción social del cambio climático en estudiantes de bachillerato técnico en Jiutepec, Morelos, México. *Revista Iberoamericana Ambiente & Sustentabilidad*, 4. Recuperado de <https://doi.org/10.46380/rias.vol4.e121>.
- Moctezuma, L. M., Aparicio, J. L., Rodríguez, C., Gervacio, H., Galán, E. A. y Sánchez, M. L. (2021). Diagnóstico socioambiental participativo en una comunidad rural: el caso de Texca, Guerrero. En Villerías, S. y Nochebuena, G. (coords.), *Procesos territoriales un enfoque multidisciplinario* (pp. 218-236). Argentina: Lugar Editorial.
- Mogren, A., Gericke, N. and Scherp, H. A. (2019). Whole school approaches to education for sustainable development: a model that links to school improvement. *Environmental Education Research*, 25(4), 508-531. Retrieved from <https://www.tandfonline.com/doi/full/10.1080/13504622.2018.1455074>.
- Msengi, I., Doe, R., Wilson, T., Fowler, D., Wigginton, C., Olorunyomi, S., Banks, I. and Morel, R. (2019). Assessment of knowledge and awareness of “sustainability” initiatives among college students. *Renewable Energy and Environmental Sustainability*, 4(6), 1-11. Retrieved from <https://doi.org/10.1051/rees/2019003>.
- Muguerza, M. y Chalmeta, R. (2020). Educación para el desarrollo sostenible: análisis del Centro de Secundaria Iturrama. *RIDE Revista Iberoamericana para la Investigación y el Desarrollo Educativo*, 11(21). Recuperado de <https://doi.org/10.23913/ride.v11i21.766>.
- Munro, S., Marshall, S., Murray, P., Coyle, E. J. and Sonnenberg, J. (2019). Using vertically integrated projects to embed research-based education for sustainable development in undergraduate curricula. *International Journal of Sustainability in Higher Education*, 20(8), 1313-1328. Retrieved from <https://doi.org/10.1108/IJSHE-10-2018-0198>.

- Organización de las Naciones Unidas [ONU]. (2018). *La Agenda 2030 y los Objetivos de Desarrollo Sostenible. Una oportunidad para América Latina y el Caribe*. Santiago, Chile: Naciones Unidas. Recuperado de https://repositorio.cepal.org/bitstream/handle/11362/40155/24/S1801141_es.pdf.
- Organización de las Naciones Unidas para la Educación, la Ciencia y la Cultura [Unesco]. (2021) Declaración de Berlín sobre la Educación para el Desarrollo Sostenible. Recuperado de <https://en.unesco.org/sites/default/files/esdfor2030-berlin-declaration-es.pdf>.
- Pérez, M., Miguel, A. E., Moreno, J. y Martínez, K. A. (2019). Educación media superior y desarrollo sustentable en las ciudades del estado de Oaxaca, México. *Perfiles educativos*, 41(163), 69-87. Recuperado de http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S0185-26982019000100069&lng=es&tlng=es.
- Punzalan, C. H., Signo, C. M., Signo, M. A. and Marasigan, A. C. (2019). Environmental Awareness of Selected Urban and Rural High School Students in the Philippines. *Journal on School Educational Technology*, 15(2), 15-25. Retrieved from <https://eric.ed.gov/?id=EJ1239347>.
- Ramírez, C. A. (2018). Educación ambiental: percepción, conciencia y expectativas sustentables en estudiantes de bachillerato. *Axon, Revista de Ciencias Sociales, Humanidades y Tecnología*, (3), 43-50. Recuperado de <https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwiiq6j56K7yAhWVsDEKHbMmB7IQFnoECAIQAAQ&url=https%3A%2F%2Ftyreditorial.com%2Fpdf%2FAxon%2F3%2F7.pdf&usg=AOvVaw1Nq4x8RP4F0BtGvBM5pXWt>.
- Savelyeva, T. and Douglas, W. (2017). Global consciousness and pillars of sustainable development: A study on self-perceptions of the first-year university students. *International Journal of Sustainability in Higher Education*, 18(2), 218-241. Retrieved from <https://doi.org/10.1108/IJSHE-04-2016-0063>.
- Soto, R. A., Lebgue, T., Balderrama, S., Vélez, C., Aguilar, N., Viramontes, O. and Durán, A. (2014). Environmental Awareness of the Young in A Rural Community in the Sierra Tarahumara, Chihuahua, Mexico. *Journal of Education and Practice*, 5(4), 197-201. Retrieved from https://issuu.com/alexanderdecker/docs/environmental_awareness_of_the_young.

- Stir, J. (2006). Restructuring teacher education for sustainability: student involvement through a “strengths model”. *Journal of Cleaner Production*, 14(9-11), 830-836. Retrieved from <https://doi.org/10.1016/j.jclepro.2005.11.051>.
- Tapia, H. P., Rodríguez, C., Aparicio, J. L. y Castro, M. (2019). Transversalización de la competencia desarrollo sustentable en el nivel medio superior de la Universidad Autónoma de Guerrero. *Revista Dilemas Contemporáneos*, 6(especial), 1-21. Recuperado de <https://www.dilemascontemporaneoseduccionpoliticayvalores.com/index.php/dilemas/article/view/1393>.
- Tesfaia, M., Nagothua, U. S., Šimekb, J. and Fučík, P. (2016). Perceptions of Secondary School Students' Towards Environmental Services: A Case Study from Czechia. *International Journal of Environmental & Science Education*, 11(12), 5533-5553. Retrieved from <https://eric.ed.gov/?id=EJ1115680>.
- Tilbury, D. (2013). Another world is desirable: a global rebooting of higher education for sustainable development. In Sterling, S., Maxey, L. and Luna, H. (eds.), *The Sustainable University: Process and Prospects* (pp. 71-86). London, England: Routledge.
- Tuncer, G. (2008). University Students' Perception on Sustainable Development: A Case Study from Turkey. *International Research in Geographical and Environmental Education*, 17(3), 212-226. Retrieved from <https://doi.org/10.1080/10382040802168297>.
- Universidad Autónoma de Guerrero [UAGro]. (2021). *Anuario estadístico. Ciclo escolar 2020-2021*. Chilpancingo, México: Universidad Autónoma de Guerrero. Recuperado de https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjHjqCXgbLyAhXnmWoFHfSiBdAQFnoECCQQAQ&url=http%3A%2F%2Finformacionestadistica.uagro.mx%2FAnuarios%2FAnuario_Estadistico_UAGro_CE_2020-2021.pdf&usg=AOvVaw2wGZ3dCifnUE8NSG7gP74Z.
- Vargas, L. M. (1994). Sobre el concepto de percepción. *Alteridades*, 4(8), 47-53. Recuperado de <https://www.redalyc.org/pdf/747/74711353004.pdf>.
- Vargas, C. y Fernández, M. C. (2018). Percepción de la educación ambiental en alumnos del nivel medio superior. *Revista Atlante: Cuadernos de Educación y Desarrollo*.

- Recuperado de
<https://www.eumed.net/rev/atlante/2018/08/educacion-ambiental-superior.html>
- Watson, A. (2017). *Sustainability Education in Primary and Secondary Schools: Great Needs and Possible Solutions*. (Chancellor's Honors Program Project). Retrieved from https://trace.tennessee.edu/utk_chanhonoproj/2026.
- Yarime, M. and Tanaka, Y. (2012). The Issues and Methodologies in Sustainability Assessment Tools for Higher Education Institutions: A Review of Recent Trends and Future Challenges. *Journal of Education for Sustainable Development*, 6(1), 63-77. Retrieved from 10.1177 / 097340821100600113.
- Yuan, X., Yu, L. and Wu, H. (2021). Awareness of Sustainable Development Goals Among Students from a Chinese Senior High School. *Education Sciences*, 11(9), 458. Retrieved from <https://doi.org/10.3390/educsci11090458>.
- Zarta, P. (2018). La sustentabilidad o sostenibilidad: un concepto poderoso para la humanidad. *Tabula Rasa*, (28), 409-423. Recuperado de <https://www.redalyc.org/jatsRepo/396/39656104017/html/index.html>.

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