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El portafolio virtual como una herramienta transversal de planeación y evaluación del aprendizaje autónomo para el desarrollo sustentable

The e-portfolio as a transversal tool for planning and evaluating autonomous learning for sustainable development

O portfólio virtual como ferramenta transversal para o planejamento e avaliação da aprendizagem autônoma para o desenvolvimento sustentável

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Resumen

En este trabajo se presenta la experiencia del portafolio virtual como herramienta de planeación y evaluación del aprendizaje autónomo en la materia Desarrollo Sustentable, la cual tiene impacto multidisciplinario y transversal desde su diseño curricular. Esta apoya los valores y principios de la acción universitaria, la formación de las competencias transversales de sustentabilidad y responsabilidad social, la conducta ético-valoral y la comprensión intercultural e internacional, plasmadas en planes de estudio que se ajustan al Modelo Universitario de Formación Integral y al Plan Institucional de Desarrollo de la Universidad Autónoma de San Luis Potosí. Este proyecto se encuentra en sintonía con la educación para el desarrollo sostenible de México, pues busca favorecer la consecución de los logros de las estrategias plasmadas en el Decenio de las Naciones Unidas de la Educación para el Desarrollo Sostenible al buscar generar, a través del portafolio, actividades de conocimiento y motivación hacia el cuidado del medio ambiente y el consumo sostenible.

El objetivo de este proyecto, por tanto, fue diseñar un portafolio electrónico como herramienta para evaluar aprendizajes en la materia Desarrollo Sustentable. Esta iniciativa surgió porque en una prueba diagnóstica se determinó que la mayoría de los alumnos no solo carecían de dominio conceptual y sensibilización hacia las dimensiones de la sostenibilidad, sino que además tenían un nulo involucramiento como actores en grupos sociales para promover cambios relacionados con la sostenibilidad de su entorno. En este sentido, se crearon los contenidos de la materia utilizando plataformas multimedia de tecnología educativa de acceso libre para promover escenarios educativos colaborativos intramuro y extramuro, con el propósito de fortalecer el aprendizaje activo, autónomo y reflexivo que las nuevas generaciones demandan. Esto facilitó al docente la planeación y la evaluación, pues esta tecnología innovadora ofrece herramientas como calendario de actividades, blog, diseño de proyecto y estadísticas de participación de los miembros, con instrumentos de diseño similares a los de un procesador de texto. El portafolio fue diseñado en la plataforma de Wikispaces Classroom, con 15 actividades e instructivos para su ejecución. Fue aplicado a nueve cursos, con grupos heterogéneos y multidisciplinarios, y ha sido rediseñado para adecuarse a las necesidades de la materia y del entorno. Este permitió contextualizar los contenidos y promover la interacción de los alumnos de forma asincrónica para diseñar y realizar sus actividades. Los resultados demuestran que 95 % de los alumnos ha participado en las actividades, en comparación al 20 % de los cursos totalmente presenciales. Al docente,

por otra parte, le facilitó el diseño, la interacción, la evaluación y la retroalimentación del aprendizaje. La utilidad del portafolio virtual se evaluó a través de un diferencial semántico aplicado a las cinco últimas generaciones que respondieron al final del curso, y otorgó un valor de 7.2 ± 0.6. Esto demuestra que las actividades del portafolio virtual fueron útiles para alcanzar los objetivos de fomento hacia el desarrollo sustentable y la generación de conciencia y responsabilidad social.

Palabras clave: aprendizaje autónomo, desarrollo sustentable, evaluación, portafolio virtual, wiki.

Abstract

This paper presents the experience of the e-portfolio as a tool for planning and evaluating autonomous learning in the field of Sustainable Development, which has a multidisciplinary and transversal impact from its curricular design. It supports the values and principles of university action, the formation of transversal competences of sustainability and social responsibility, ethical-value behavior and intercultural and international understanding, reflected in study plans that conform to the University Model of Integral Training and to the Institutional Development Plan of the Autonomous University of San Luis Potosí. This project is in tune with education for sustainable development in Mexico, since it seeks to promote the achievement of the strategies embodied in the United Nations Decade of Education for Sustainable Development by seeking to generate, through the portfolio, knowledge activities and motivation towards caring for the environment and sustainable consumption.

The objective of this project, therefore, was to design an electronic portfolio as a tool to evaluate learning in the subject Sustainable Development. This initiative arose because in a diagnostic test it was determined that the majority of the students not only lacked conceptual mastery and sensitivity to the dimensions of sustainability but also had no involvement as actors in social groups to promote changes related to the sustainability of its environment. In this sense, the contents of the subject were created using multimedia platforms of educational technology of free access to promote collaborative educational scenarios intramural and extramural, with the purpose of strengthening the active, autonomous and reflective learning that the new generations demand. This facilitated the planning and evaluation to teacher, since this innovative technology offers tools such as calendar of activities, blog, project design and

participation statistics of the members, with design instruments similar to those of a word processor. The portfolio was designed on the platform of Wikispaces Classroom, with 15 activities and instructions for its execution. It was applied to nine courses, with heterogeneous and multidisciplinary groups, and has been redesigned to adapt to the needs of the subject and the environment. This allowed contextualizing the contents and promoting the interaction of the students asynchronously to design and carry out their activities. The results show that 95% of the students have participated in the activities, compared to 20% of the courses entirely attended. The teacher, on the other hand, facilitated it the design, interaction, evaluation and feedback of learning. The utility of the e-portfolio was evaluated through a semantic differential applied to the last five generations that responded to the end of the course, and granted a value of 7.2 ± 0.6. This shows that the activities of the e-portfolio were useful to achieve the objectives of promoting sustainable development and the generation of awareness and social responsibility.

Keywords: Autonomous learning, sustainable development, evaluation, virtual portfolio, wiki.

Resumo

Este artigo descreve a experiência de carteira virtual como uma ferramenta para o planejamento e avaliação de aprendizagem autónoma no Desenvolvimento Sustentável campo, que é multidisciplinar e multi-impacto desde o seu currículo é apresentado. Isto suporta os valores e princípios de acção universidade, formação de competências transversais de sustentabilidade e responsabilidade social, comportamento ético e relacionados com o valor ea compreensão intercultural e internacional, refletida nos currículos que se encaixam no modelo de universidade de Formação Integral e Plano de Desenvolvimento institucional da Universidade Autônoma de San Luis Potosi. Este projeto está em linha com a educação para o desenvolvimento sustentável no México, porque procura promover a realização das realizações das estratégias incorporadas na Década da Educação das Nações Unidas para o Desenvolvimento Sustentável, que buscam gerar, através da sua carteira , atividades de conhecimento e motivação para cuidar do meio ambiente e do consumo sustentável.

O objetivo deste projeto, portanto, era projetar uma carteira eletrônica como ferramenta de avaliação da aprendizagem no Desenvolvimento Sustentável campo. Esta iniciativa surgiu porque em um teste de diagnóstico determinou que a maioria dos estudantes não só faltava o

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domínio conceitual e consciência das dimensões da sustentabilidade, mas também tinha zero participação como atores em grupos sociais para promover mudanças relacionadas à sustentabilidade seu ambiente. Neste sentido, o conteúdo do tema utilizando plataformas de tecnologia educacional multimídia para promover o acesso livre ambientes educacionais colaborativas intramuros e extramuros, a fim de fortalecer a demanda ativa, autônoma e reflexivo de aprendizagem que as novas gerações foram criadas. Isso facilitou o planejamento e avaliação de ensino, como esta tecnologia inovadora oferece ferramentas como calendário de eventos, blog, concepção do projecto e participação estatísticas de membros com ferramentas semelhantes às de um projeto de processador de texto. A carteira é projetado sobre a plataforma do Wikispaces, com 15 atividades e instruções para execução. Foi aplicada a nove campos, com equipes heterogêneas e multidisciplinares, e foi redesenhado para se adequar às necessidades do sujeito e do meio ambiente. Este conteúdo contextualizar permitido e promover a interação do aluno de forma assíncrona para projetar e realizar suas atividades. Os resultados mostram que 95% dos alunos participaram de atividades, em comparação com 20% dos totalmente cursos. Os professores, por outro lado, ele facilitou o design, interação, avaliação e feedback de aprendizagem. A utilidade da carteira foi avaliada por meio de um diferencial semântica aplicada aos últimos cinco gerações que responderam no final do curso, e deu um valor de 7,2 ± 0,6. Isso mostra que as atividades de carteira foram úteis para a realização dos objectivos de promover o desenvolvimento sustentável e para a geração de consciência e responsabilidade social.

Palavras-chave: aprendizagem autónoma, de desenvolvimento sustentável, de avaliação, de carteira virtual, wiki.

Fecha Recepción: Marzo 2017 **Fecha Aceptación:** Noviembre 2017

Introduction

The portfolio is a tool that proposes instruments and activities that allow to assess the needs of the real world and boost problem-solving skills, as well as the construction of meanings; In other words, through this tool you can know the values of the current community and promote collaborative and multidisciplinary work (Eisner, 1993, Tur and Urbina, 2016). In effect, the virtual educational portfolio is an integrating resource of the teaching-learning process (Barberà, Bautista, Espasa and Guasch, 2006) that relies on information and communication technologies (ICT) to contribute to the development of creativity and inventiveness, which is particularly valuable in the labor market (Organization for Economic Cooperation and Development [OECD], 2015).

This means that ICTs empower the portfolio, since it offers a number of benefits, such as breaking the time-space barriers of learning activities, generating open and flexible training processes, optimizing communication between the different agents of the process, obtaining a teaching more personalized, expedited access to information, enable interaction with information, raise interest and motivation of the student, improve educational effectiveness by allowing the teacher to have more time for other tasks and perform complementary activities to support learning (Ferro, Martínez and Otero, 2009).

In addition, it has been proven that technological tools can not only assist, encourage and structure autonomous regulated learning, but also are partners in the development of skills and strategies to continue learning throughout life (Järvelä, 2015). In addition, co-regulation in computer-assisted learning supports evaluation, as it allows the design of scenarios where discussion is encouraged and motivated, decisions are made and new skills are orchestrated for future contexts, which positively impacts on self-reflection and evaluation, as well as in the student's continuous learning (Bernat y Alsina, 2013).

In this regard, Huerta (1995) indicates that "the partial evaluation is the result of a summative follow-up mechanism that is based on an alternative evaluation, that is, focused not on a final number, but on dimensioning the individual's growth in order to make him aware of their skills, learning styles, linguistic abilities and areas of study "(p 10).

In this sense, Wikispaces Classroom is a work space offered by Wikispaces par of tes® for education where the actors of the learning process (teacher and students) can communicate and work individually or as a group in writing projects, through of the tools offered by the platform to measure the student's contribution and commitment in real time.

This free access portal works optimally in browsers, tablets and modern phones, which facilitates the shift towards a non-traditional education, endorsed by 10 million users and used as a support tool by the teacher to promote collaborative work , active and reflective, as well as the monitoring of learning and evaluation, thanks to its advantages of interconnectivity, intraconnectivity, flexibility and versatility (Perea, Estrada and Campos, 2013).

Based on these resources, environmental education should lead the student towards critical thinking that brings him closer to objective knowledge based on facts and to identify the diversity of values involved in an event, so that he can develop his own criteria for making decisions and specifying actions specific (Mogensen and Mayer, 2009). In accordance with this, education for sustainable development is interpreted as a teaching-learning process whose objective is to promote the democratic participation of students as active citizens in social and environmental change to exert a constructivist pressure or a good environmental revolution; The portal for Education for Sustainable Development designed by the United Nations Educational Organization [Unesco] (s.f.) is an example of the different resources, forums and results achieved.

For this reason, the present project intends to combine all these elements to apply them in the development of autonomous learning of the subject Sustainable Development, which is offered as an optional subject to discipline in the Chemical Engineering career of the Academic Coordination Altiplano Region [Coara] and as General elective in other engineering and undergraduate degrees, whether from the Coara or other entities of the Autonomous University of San Luis Potosí [Uaslp], (2016a).

Materials and methods

Target population

The subject Sustainable Development has been taught in nine semesters and has had a direct impact on 102 students enrolled in the courses (see table 1), as well as indirect impact on another 200 students who participated or observed the evidence portfolio, the activities carried out by the students enrolled inside and outside the Coara facilities or the social environments where the final projects are carried out (parks, social care and social assistance centers, schools, etc.).

The contents of the subject and the actions of the students, on the other hand, contribute to the achievement of the mission and vision of the Institutional Development Plan (PIDE) 2013-2023 of the UASPL (UASPL, 2013), to the Development Plan [Plade] 2014-2023 of La Coara (UASPL, 2014) and of the indicators of Mexico for the United Nations Decade of Education for Sustainable Development (Unesco, 2009), despite the fact that in each school year there is only less participation of 5% of the student population of COARA.

Tabla 1. Historial de admisión de la materia Desarrollo Sustentable en los programas educativos de la Coara (Ingeniería Mecatrónica [IM], Ingeniería Mecánica Administrativa [IMA], Ingeniería Química [IQ], Licenciatura en Enfermería [LE], Licenciatura en Mercadotecnia [LM])

Año	Semestre	Ciclo escolar	Alumnos	Alumnos por programa académico				
				IM	IMA	IQ	LE	LM
2016	II	16-17	40	0	2	11	27	0
	I	16-17	0	0	0	0	0	0
2015	II	15-16	21	0	0	3	18	0
	I	15-16	3	0	0	3	0	0
2014	II	14-15	17	0	0	0	17	0
	I	14-15	11	0	2	9	0	0
2013	II	13-14	0	0	0	0	0	0
	I	13-14	0	0	0	0	0	0
2012	II	12-13	10	1	7	2	0	0
	I	12-13	0	0	0	0	0	0

Fuente: elaboración propia.

In this sense, the present project is in tune with education for sustainable development in Mexico, since it seeks to promote the achievement of the achievements of the strategies embodied in the United Nations Decade of Education for Sustainable Development (Unesco, 2009) when seeking to generate, through the portfolio, knowledge and motivation activities towards the care of the environment and sustainable consumption.

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Development

In this context, since 2013 a portfolio with activities was designed with the purpose of deepening the topics seen in class. However, to encourage the use of ICTs -and to evaluate student performance in different scenarios and dynamically-, in 2014 that portfolio was redesigned using the Wikispaces Classroom platform where the course activities were planned and They added various resources, such as links to electronic pages and articles or videos to guide each of the exercises.

In subsequent years some minimal modifications have been made to the contents that sought to present the instructions in a clear manner for the members of the wiki. Students have used this platform from 2013 to the present (2017) each time this subject has been taught (see table 1).

The subject Sustainable Development comprises five learning units: impact of human activities on the environment, values and environmental ethics, sustainable development and evolution of environmental legislation, quality of life and sustainable development, and promotion of sustainable development (Uaslp, 2016b). In the wiki, each unit was assigned a page (pages) for the students to enter and participate (see figure 1).

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Figura 1. Portafolio de la materia Desarrollo Sustentable en la plataforma virtual Wikiespaces (a la derecha se presenta la organización del portafolio)

Fuente: ventana del portal Wikispaces Classroom diseñado por los autores para impartir esta asignatura.

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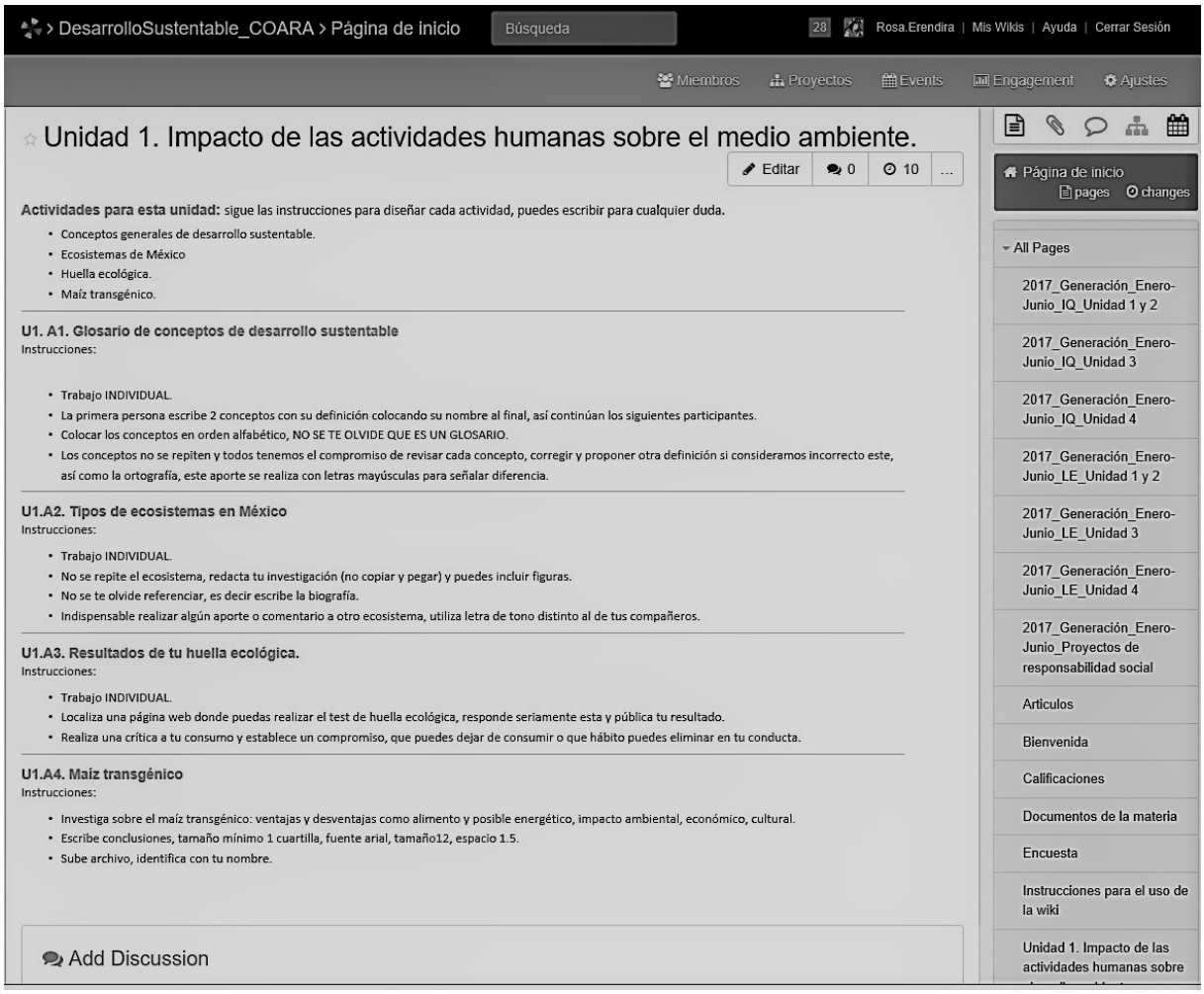
In the portfolio, other sections were integrated to facilitate interaction with the student and offer different materials: welcome section, discussion blog, articles section and support material in class. At the beginning of each session the student had to identify the assigned activities (see figure 2).

Figura 2. Organización e instrucciones para cada una de las actividades de la unidad del portafolio virtual de la materia Desarrollo Sustentable (recuadro central).



Fuente: ventana del portal Wikispaces Classroom diseñado por los autores para impartir esta asignatura.

The portfolio consisted of 15 activities with their respective instructions (see table 2). The activities were carried out by consulting the internet and were registered in the portfolio through the wiki.

Tabla 2. Actividades propuestas por unidad en el portafolio virtual de la materia Desarrollo Sustentable

Unidad 1. Impacto de las actividades humanas sobre el medio ambiente
Conceptos relacionados con el desarrollo sustentable: glosario
Tipos de ecosistemas en México: investigación
Resultados de tu huella ecológica: visita a liga y resolución de una encuesta
Maíz transgénico: lectura y argumentación
Unidad 2. Valores y ética
Valores y actitudes sobre la contaminación ambiental en México: lectura y debate
Mujeres que cambian el mundo: investigación, sensibilización y argumentación
Empresa socialmente responsable: investigación y debate
Unidad 3. Desarrollo sustentable y evolución de la legislación ambiental
Dimensiones del desarrollo sustentable: investigación y cuestionario
Dimensiones ambientales: mapa conceptual
Análisis de ciclo de vida: investigación
Unidad 4. Calidad de vida y desarrollo sustentable
La historia del desarrollo sustentable y las reuniones que dieron pie a este concepto: línea del tiempo
"Río+20", Conferencia de las Naciones Unidas para el Desarrollo Sostenible, 2012 ¿qué paso?: investigación y ensayo
Índice de desarrollo humano de la comunidad y otra región
Unidad 5. Fomento del desarrollo sustentable
Practicando la sostenibilidad en una comunidad: práctica de campo y video
Informe técnico y evidencias de su proyecto practicando la sostenibilidad en la comunidad

Fuente: elaboración propia.

The preparation of the portfolio has required not only to review the design and proposal of the activities, but also to update the teaching practice for the mastery of this digital tool as an evaluation instrument. Students, on the other hand, have shown that they lack the basic knowledge to master this technological tool and to work collaboratively on it, so they have had to get used to using this virtual space. This shows that they use digital resources mainly for informal interaction.

Now, although it is true that Wikispaces par of tes® is a free access platform, it is also true that it currently presents some difficulties in using the portfolio, such as the lack of tools to facilitate the design and follow-up of the activities of the participants, properties that are

incorporated in portals such as Moodle, in which the activities of each participant can be followed in a synchronous or asynchronous manner.

To remedy one of the previous problems, the teacher accompanied the student in his entry to the virtual portal to support him during the fulfillment of his first activity. For this, the operation was explained and the benefits and advantages of this instrument were pointed out, as well as the evaluation process (research and support of references, argumentation, writing, spelling, respect and punctuality).

In 2015, this process was strengthened by adding at least two activities to try to improve their research processes and channel their efforts for the final project, which usually benefits third parties.

The wiki allowed observing the entry record and the actions performed by each student, which preserved evidence of their participation. In this portfolio, to determine the autonomous learning of the student, the depth of interpretation of the information consulted, the critical participation in the debate and the argumentation in the topics raised during the development of all the activities, which were carried out in the wiki and, in some occasions, when starting classes in person.

To measure the effectiveness and efficiency of the portfolio, a semantic differential was applied, which is a numerical arrangement ranging from the minimum presence or intensity to the maximum presence or intensity of the element or criterion evaluated (Undersecretariat of Higher Secondary Education [Sems], 2012) . The proposed criteria were adjectives related to the degree of satisfaction towards the portfolio, placed in a bipolar way to quantify the meaning that the object had for the student (see table 3). This instrument has been applied to each one of the students, but only in the last four years, almost ending the semester.

Tabla 3. Diferencial semántico utilizado para la evaluación del portafolio virtual de la asignatura Desarrollo Sustentable

1	Útil						Inútil
2	Malo						Bueno
3	Fácil						Difícil
4	Agradable						Detestable
5	Desarticulado						Coherente
6	Satisfactorio						Insatisfactorio
7	Confuso						Claro
8	Sin valor						Provechoso
9	Importante						Innecesario
10	Estrecho						Amplio
11	Consistente						Inconsistente
12	Optimista						Pesimista
13	Falso						Cierto
14	Relevante						Irrelevante
15	Débil						Fuerte
16	Profundo						Superficial
17	Pasivo						Activo
18	Reducido						Prolongado
19	Informativo						Desinformativo
20	Práctico						Impráctico
21	Aburrido						Interesante
22	Rápido						Lento
23	Formal						Informal
24	Imaginativo						Convencional
25	Desalentador						Estimulante
26	Actual						Anticuado
27	Falso						Auténtico
28	Vinculante						Desvinculado
29	Irresponsable						Comprometido
30	Atractivo						Desagradable

Fuente: elaboración propia.

Results

In the nine semesters that Sustainable Development has been taught, a portfolio of activities has been used as a support tool for learning. This portfolio was used using some ICT in 2013, but then it was redesigned by uploading all the activities to a virtual platform known as Wikispaces part of tes®, where the students were integrated and carried out the activities. So far, this subject has been taught to 102 students from four different careers: Mechatronic Engineering (IM), Mechanical Engineer Administrator (IMA), Chemical Engineering (IQ)

and Bachelor of Nursing (LE). This means that the groups are heterogeneous, since the students - when taking this optional and non-serial subject - have different ages and belong to different careers, which could justify why in the diagnostic evaluation they have shown different perspectives on the concepts of the program (environment, ecology, ecosystem, climate change).

Indeed, in this initial exploration it was evident that students do not link with reality or appropriate strategies to support sustainable development; in other words, they are not perceived as social entities of change and decision. For this reason, the subject has been a contextualization that was contemplated in the design of the portfolio activities to try to involve them in the dimensions of sustainability and to observe the degree of participation that society has had in each of these , either to impact negatively or to seek compensation for damage caused in the environment.

The virtual portfolio, in other words, has made it possible to strengthen autonomous learning, by making it more interesting and interactive thanks to the resources it offers (eg, audios, videos, links to governmental and non-governmental organizations, opinions of experts and leaders). worldwide, scientific and technical articles on the subject, sustainability works promoted by society or by individuals with their own initiative, etc.).

These activities sought to structure critical participation and promote awareness through debate; an example of this is activity 3 of unit 1 (Results of your ecological footprint) (see figure 2). This contained several links to questionnaires about the ecological footprint, so that each student could visit and answer the questionnaires, as well as upload a result in which they demonstrated the impact that their lifestyle generates. The analysis of the list of all the students tried to promote the discussion and raise awareness, since it was designed with the purpose of comparing the impact of their actions and reflecting on their future responsibility (see figure 3).

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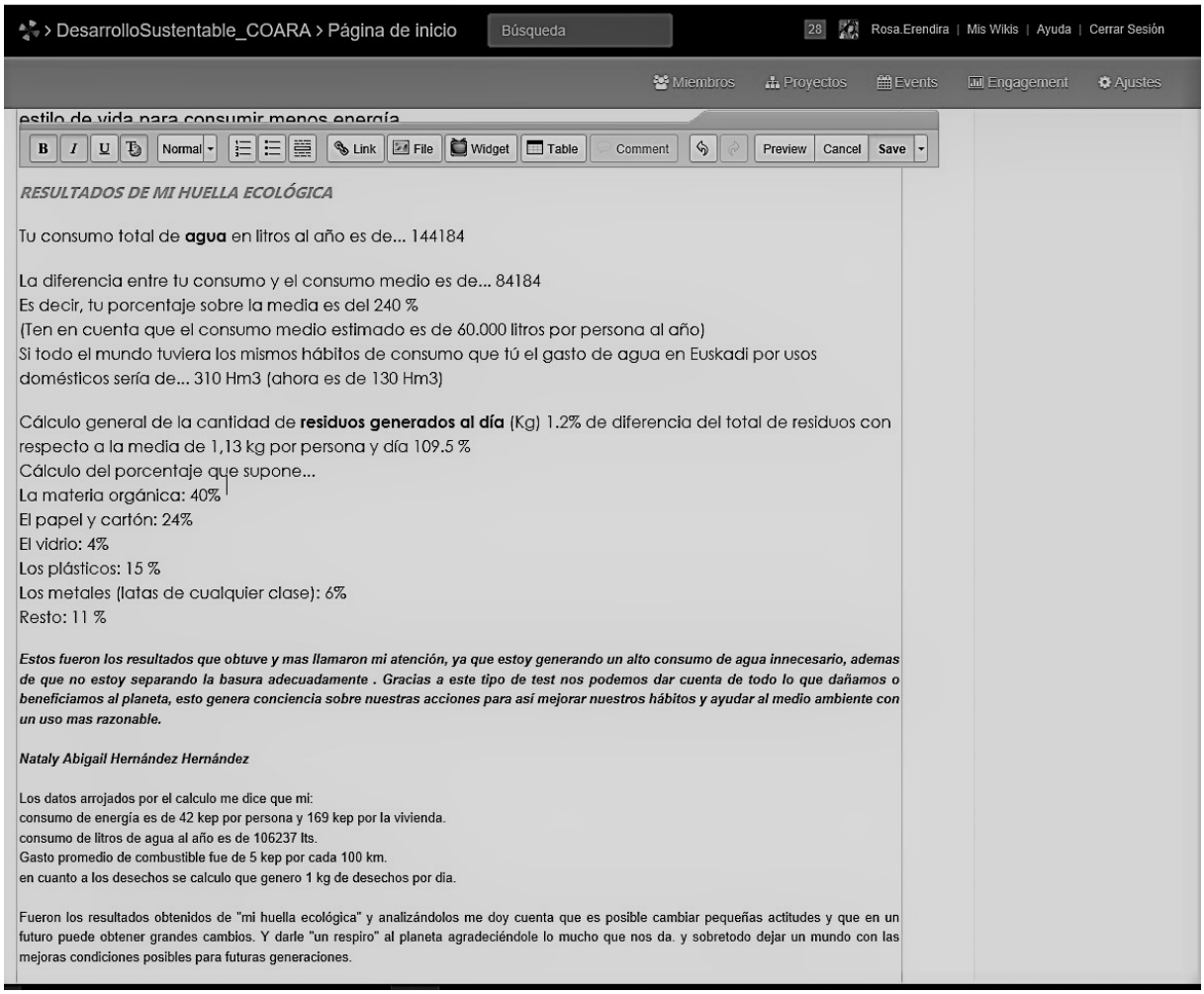
Figura 3. Actividad *Huella ecológica* realizada por alumnas del semestre 2017.



Fuente: ventana del portal Wikispaces Classroom diseñado por los autores para impartir esta asignatura.

The contents of the subject and the actions of the students contribute to the achievement of the mission and vision of the 2014-2024 Pla de la Coara (UASPL, 2014) and of the indicators of Mexico for the United Nations Decade of Education for the Sustainable Development (Unesco, 2009), even though less than 5% of the student population of La Coara participates in each school year.

The portfolio has made it possible to demonstrate the scope of the general objective of the subject, Uaslp (2016a), that is, to get the student to promote "sustainable development from its professional, labor and social scope, by understanding the importance that it has. the human-nature interaction and the effects of this relationship on the environment and the economic development of their region "(p.1), activity incorporated in the last courses of unit

five (Practicing sustainability in the community). In this, the students have focused on attending, according to their possibilities and competencies, a problem of the educational institution or the region related to the dimensions of sustainability (social, economic and ecological), for which they designed a project that they developed throughout the semester (Fosado, Martínez and Hernández, 2017). In this sense, the scope of each work and the vision of the students have turned out to be very satisfactory, although this, in some opportunities, was far from their professional environment. Here are some of these initiatives:

- Engineers in Administrative Mechanics: They focused on the waste of dyes and hair. They offered as a solution the proper management of solid waste and managed a process to collect waste (gloves and dye containers) with cosmetic companies and the garbage collector.
- Nursing graduates: They reforested a community kindergarten. They contributed as a measure the management of trees and the promotion of care for the environment through interaction with children and teachers. They planted 15 trees and proposed to plant one each week, making each child responsible for their care.
- Chemistry Engineers: They have been involved with the university community generating a program for the management of solid waste and the training of the community through electronic media (Facebook and YouTube), where they also promoted this process.

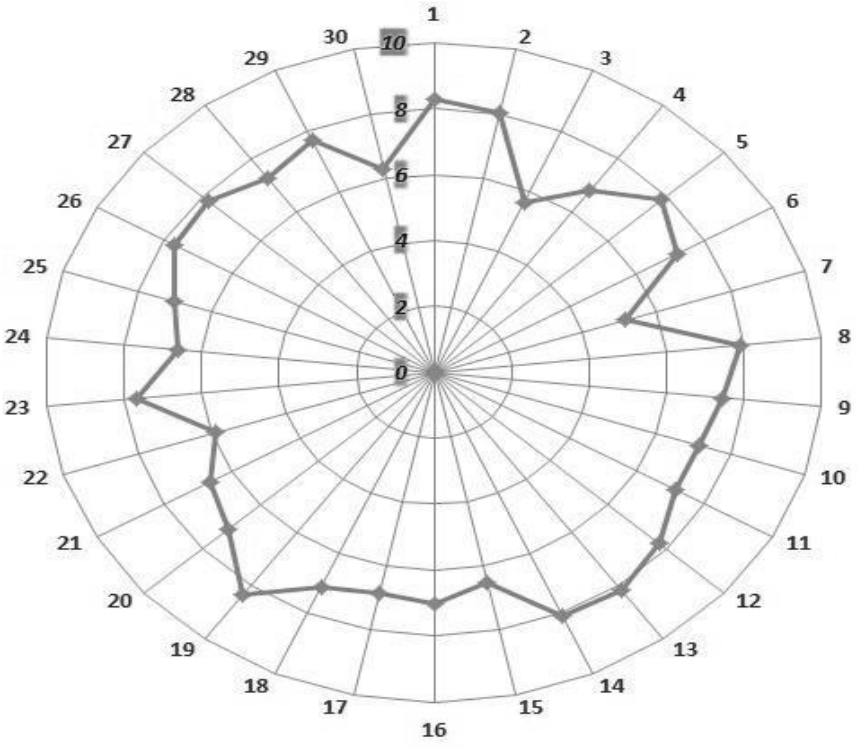
So far it can be noted that students have planted more than 100 trees in the community and have served more than five schools in solid waste management workshops. In the same way, social care has been given to elderly people and financial support for disabled or sick children, as well as activities to recover green areas, community parks, nursing homes, etc.

The portfolio, in other words, has facilitated the monitoring of the activities and the evaluation process, although it should also be mentioned that its design and implementation required a great effort, time and training of the students, since they were not used to using those resources in his academic life.

Finally, the usefulness of the virtual activities portfolio has been evaluated from the perspective of the students, who at the end of the semester answered a semantic differential, to which they assigned a maximum numerical value of ten, in intervals of two (see table 3). The students surveyed attended the last two years of the courses (these represented 35% of the population, approximately 290 students). The result was graphed in a radial process with the

average value (see figure 4). The general average on the virtual activities portfolio was 7.2; the concepts with the lowest scores were clear and easy, with 5.1 and 5.7, respectively (concepts 3 and 7 in figure 4), and those identified with the highest value were useful, true and informative, with 8.3, 8.1 and 8.3 , respectively (concepts 1, 19 and 13 in figure 4). Finally, it is emphasized that the students of the 15-16 and 16-17 school years selected the same concepts providing almost the same average score (the difference was ± 0.6).

Figura 4. Diferencial semántico para la evaluación del portafolio virtual de la asignatura Desarrollo Sustentable realizado por alumnos de los semestres 2015 a 2017. El número de cada eje corresponde a la pareja de conceptos bipolares de la tabla 2 teniendo como máximo el concepto *positivo*.



Fuente: elaboración propia.

Conclusions

The virtual portfolio, linked to the appropriate use of other ICTs, promoted assertiveness in the student's decision-making process and encouraged critical participation, awareness of the actions and active collaboration through different activities, since it allowed him to propose and execute tangible solutions to problems in their environment. This, in addition, served to develop competencies of teamwork, communication, management, bonding and social responsibility, which are related to the dimensions of sustainability. This tool, therefore, has enabled the facilitator to design, monitor and evaluate the level of learning achieved by the student, who, in turn, has been able to perform the tasks and self-assess.

On the other hand, the transversality of the subject itself has facilitated and strengthened the dynamics of these issues, while the portfolio has invigorated the socialization and interaction between the group. The project has not finished, because every educational process is feasible to be improved.

In addition, although the wiki is a free platform, it still does not offer the tools of other portals, such as synchronous collaborative interaction, automatic evaluation, among other features of flexibility that facilitate the teaching-learning experience.

This educational work has contributed to the incipient formation of leaders of change, since it has generated a greater environmental perspective within the community, as well as the participation of other students from outside the community. In fact, it has served to increase the stock of current teaching tools and the support of good teaching practices.

Finally, training in the subject of Sustainable Development should be considered as a mandatory and transversal subject, so that the strategies and skills necessary for future professionals and citizens to confront and curb climate change could be achieved. According to the millennium of education, virtual platforms will be the ideal option for learning, communication, as well as for continuous training, as they will be the axis that will drive the professional that requires and demands our context.

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