Innovative Education and Classroom Design at Colegio Técnico Profesional de Santa Ana

Abstract

Innovation in schools provides new means to keep educational offerings up to date. Identifying unique and effective educational methods not currently utilized is an important first step in effective innovation. This project worked to initiate this process at Colegio Técnico Profesional de Santa Ana (CTPSA), a technical high school in San José, Costa Rica. We assisted in developing a Knowledge Management Center (KMC), a sustainable new building on campus that will provide space and resources to support student collaboration and connection beyond CTPSA. Through interviews, focus groups, and observations, we identified how collaborative teaching methods, flexible classroom design, and innovative resources outside of CTPSA can be implemented through the KMC to improve students' education.

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Problem Statement

Innovation is vital in schools because it keeps educational offerings up to date with the demands of the world (Dlugash, 2014). Teachers and students are changing class structures to fit with the development of information and communication technology (Tamo, 2014). Schools are accessing larger collections of resources, both digital and physical, to innovate teaching and improve learning.

Colegio Técnico Profesional de Santa Ana (CTPSA), a Costa Rican technical high school in San José, is planning a new building called the Knowledge Management Center (KMC) to house space for student collaboration and resources for distant educational connections. The school is working to set an example for public technical high schools in Costa Rica by making the KMC innovative, environmentally sustainable, and inspirational to students.

The idea for this project originated when personnel associated with CTPSA identified that modern developments in education require that schools across the world are connected and benefiting from each other. Our project group had the opportunity to work closely with CTPSA to identify the best classroom resources, teaching methods, and design considerations that would further their educational mission and vision through the KMC.

Background

Three areas were of specific interest to our project: educational practices, learning resources, and environmental sustainability, which are outlined below.

Evolving Educational Practices

The traditional classroom is based on the Teaching-Centered Paradigm, where a lecturing instructor transfers knowledge to passive, note-taking students (McManus, 2001). In contrast, modern teaching ideas center lessons around students by letting them guide discussions and collaborate with each other. Collaborative learning improves communication skills by providing opportunities to formulate and share ideas, which is a vital step in real world preparation.

Student and teacher roles in the modern style of teaching and learning are changing in that students are becoming more involved in the learning process, and teachers are viewed more as support for students.

Misión
El Colegio Técnico Profesional de Santa Ana forma profesionales técnicos, con valores éticos, morales, sociales y culturales que logren integrarse en el mercado laboral, de manera eficaz y responsable, para así generar movilidad social.

Mission
The Colegio Técnico Profesional de Santa Ana forms technical profesionas with etical, moral, social, and cultural values that integrate successfully in the labor market in an effective and responsible manner to generate social mobility.

Visión
Ser una institución de excelencia en el ámbito técnico y académico para la formación integral de profesionales que enfrenten con eficiencia y calidad su incorporación en el mercado laboral.

Vision
To be an institution of excellence in techincal and academic scope for the training of professionals that face with efficiency and quality their incorporation into the labor market.

CTPSA's Educational Mission and Educational Vision

Originally in Spanish and translated into English

Developing Appropriate Educational Resources

Modern schools require various resources to facilitate a diverse range of activities used to prepare students for college and the workforce. In particular, modern libraries serve as a centralized location where students can access databases of reading material, relevant software, and technological hardware to connect with students around the world.

Modern classrooms also need to be flexible and accommodate many different activities. Flexibility aids the learning process by allowing a space to quickly be set up for any given activity, satisfying the needs of all students

Sustainable Development

Costa Rica has made a commitment to carbon neutrality by 2021,

Flexible classroom at Monterrey Institute of Technology and High Education, a school in Mexico City, Mexico (Thelmadatter, 2014)

and it is important for schools across the country to commit to sustainability in designing and evolving new facilities (Edwards, 2014). Sustainability can be implemented into building design without compromising the functionality of the building, and can also focus on involving students to positively impact future generations ("Teaching Sustainability," 2016).

Project Objectives

The goal of this project was to develop the framework for a sustainable and flexible collaborative learning space at Colegio Técnico Profesional de Santa Ana (CTPSA) that would encourage students to learn and expand their educational possibilities. To achieve this goal, we developed and completed the following four objectives:

1. Determine classroom resources and teaching methods currently in place at the school and evaluate student and teacher satisfaction with them

2. Investigate effective educational and sustainability initiatives already being implemented both in Costa Rica and internationally

3. Assess various educational and sustainability options in the scope of CTPSA's financial conditions and curricular goals

4. Develop a comprehensive plan that identifies subsequent steps the school can take to realize their flexible and sustainable learning space

Outline of our investigative methods

Methods

Our group used action research which involves social engagement and challenging what is accepted as normal with the intent of improving a social issue. The data for this problem solving includes interviews, focus groups, observations, participant observations and accounts (Marelli, 2016).

We used focus groups of faculty and students and classroom observations to learn about CTPSA's current teaching methods and identify the use of collaboration and technological learning materials in the classroom. To gain a perspective of teaching methods and specific materials students use in classrooms outside of CTPSA, we toured and interviewed administration at another technical high school in Costa Rica and held interviews with teaching and learning personnel from Worcester Polytechnic Institute. Lastly, to investigate sustainability considerations for the KMC, we toured a sustainable campus in Costa Rica and interviewed individuals who specialize in implementing sustainability into buildings in tropical climates.

Outcomes

Assessment of CTPSA Reveals Potential for Improvement

The first work we did in Costa Rica was to familiarize ourselves with CTPSA's current educational practices, resources, students, and faculty. Speaking with our focus groups revealed that students and teachers are grateful for CTPSA's educational offerings but also ambitious in wanting to make improvements. Students and teachers identified that their classes are impeded by a lack of sufficient computers, audio recording and playback equipment, and books.

We recommended that CTPSA contact companies and institutions that donate relevant resources, and we outlined the process for contacting many of these specific organizations.

Mark discussing sustainability with a Special Projects Engineer at EARTH University

Proper Use of Resources Outweighs Quality of Resources

State-of-the-art resources serve no purpose if they are not used properly. We saw resources at CTPSA being used to their fullest potential even though they could be deemed obsolete, but also observed inefficient use of technology at multiple schools. The KMC is going to have innovative and valuable resources for teachers and students, but they will only be effective if they are used appropriately by the school.

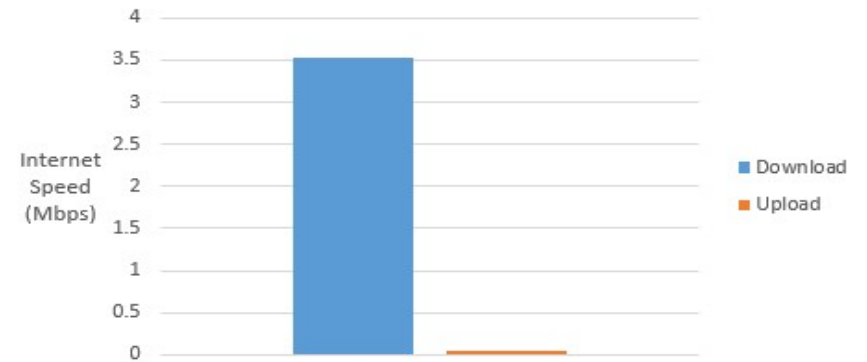*Student desks arranged collaboratively at CTPSA*

Improved Internet Promotes Innovation and Facilitates Connections

Internet is already an important resource at CTPSA, and it will become even more critical with the addition of the KMC. The quality of the current internet connection at the school is limiting the ability of teachers to incorporate online resources into their classes and the ability of CTPSA to make connections with other institutions.

CTPSA has the potential to improve its internet. Nationally, Costa Rica is continuing to improve internet for its citizens, and short term and long term improvements to internet infrastructure at CTPSA are possible as the school progresses towards the KMC (Agüero, 2016).

Multifunctionality is Key in the KMC

Average internet speed at CTPSA taken with 16 tests over 3 hours

The KMC will differ from academic classrooms in that it will be used by every student and teacher, so it has to have features that are adaptive and useful for a variety of activities. The spaces should benefit each student equally although they use the space differently.

Lightweight and movable yet sturdy tables and chairs make it easy for teachers and students to manipulate a space to fit their needs, and a variety of workspaces allows for easy student cooperation. Since the KMC will have limited space but house many activities, multifunctionality is essential in its design and operation.


*Multifunctional auditorium at Colegio Técnico Profesional de Educación Comercial y Servicios*

Design Freedom Allows for Sustainability

As CTPSA works with Katia Marten Arquitectos on the design of the KMC, it has it has been given the unique opportunity from the government to formulate a unique and sustainable but still functional building design. Cross ventilation, natural illumination, and vegetation are sustainable design considerations that are appropriate for the climate in Santa Ana which work to reduce electricity usage and conserve natural resources.
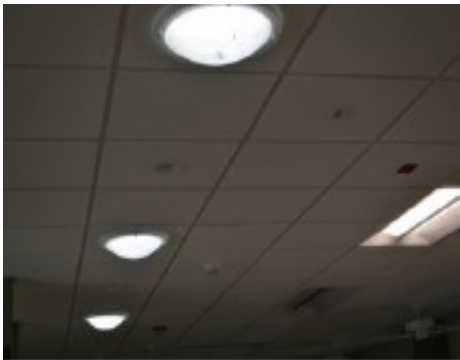
Passive solar lighting (left) compared to electric lighting (right)
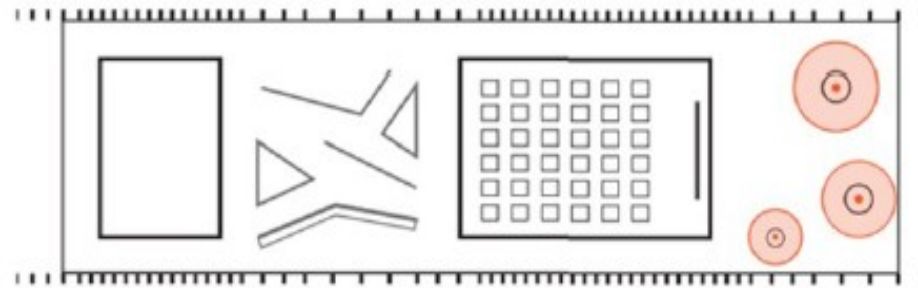
Katia Marten Arquitectos rough plan for the KMC
Property of Katia Marten Arquitectos

Alternative energy could be used to help power the KMC, while other design considerations will allow the building to passively benefit from the environment. Keeping these considerations in the forefront of the design of the KMC will not only preserve the environment but also benefit its functionality.

Conclusion

The importance of education has made this project an exciting opportunity for our group to make a difference in the education of a very special group of students. From the beginning of our research, our priority was to work successfully with Colegio Técnico Profesional de Santa Ana, allowing them to be involved in decisions regarding improvement of their school. As CTPSA continues to grow, the school seeks to have a building that can further strengthen their young professionals' practical technical capabilities. They wish to achieve it through a multi-functional learning space that incorporates local and distant collaboration to improve problem solving skills that will be known as the Knowledge Management Center. We hope that through our research and recommendations, CTPSA will accomplish their goal of designing the KMC to be geared to strengthen its students' education with practical, appropriate, and sustainable technology.

"School improvement is a process, not an event. It takes place over an extended period of time, usually several years" (van den Berg & van Velzen, 1985, p. 59). This is the case for the KMC. We came to Costa Rica knowing that we must work within a reasonable scope, and the work we have done will serve as a solid foundation for CTPSA to accomplish their goal of the KMC. We are confident that future work by CTPSA faculty and outside volunteers will extend our recommendations, ultimately ending in the successful implementation of a new innovative, sustainable learning space.

References

Agüero, M. (2016). Postes de luz llevarán Internet de alta velocidad a los hogares. http://www.nacion.com/nacional/servicios-publicos/Postes-llevarian-Internet-velocidad-hogares_0_1555044517.html Retrieved from http://www.nacion.com/nacional/servicios-publicos/Postes-llevarian-Internet-velocidad-hogares_0_1555044517.html

Bruney, G. (2012). *The Teacher-Student Relationship: The Importance of Developing Trust and Fostering Emotional Intelligence in the Classroom. (Masters), University of Toronto. Retrieved from https://tspace.library.utoronto.ca/bitstream/1807/35096/1/Glenda%20MTRP%20Complete.pdf*

Dlugash, M. (2014). Innovating Schools. *Kennedy School Review, 14,* 75.

Edwards, G., & Roberts, J. T. (2014). A High-Carbon Partnership? Chinese-Latin American Relations in a Carbon-Constrained World.

Marelli, F. B. (2016). Qualitative Research Methods and Methodology. Retrieved from http://atlasti.com/qualitative-research-methods/

McManus, D. A. (2001). The Two Paradigms of Education and the Peer Review of Teaching. *Journal of Geoscience Education, 49(5), 423-434.*

Tamo, D. (2014). The Effects of the Effective Use of the New Information and Communication Technology in the Classroom. *Journal of Educational and Social Research, 4(2), 298.*

Teaching Sustainability. (2016). Retrieved from https://cft.vanderbilt.edu/guides-sub-pages/teaching-sustainability/

Thelmadatter, L. (Photographer). (January 2014). Classroom Furniture [digital image]. Retrieved from http://www.office-interior-furniture.co.uk/wp-content/uploads/2014/07/classroom-furniture-ideas.jpg

van den Berg, R., & van Velzen, W. (1985). *Making school improvement work: A conceptual guide to practice: Acco.*

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