Pro (Motion) Based on Qualitative Data Analytics: Appropriation of Scientific Knowledge between Children and Young People

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Abstract:

*Objectives: A research/diagnose based on data analysis was carried out to identify how to motivate children and young people to intensively participate in science activities. The data collected should be a reference for an effective promotional program in the library. **Methodology**: A mixed methodology highly supported on qualitative information was developed. Files and databases from 2014-2016 were analyzed (activity reports and trajectory reports of young leading scientists). Fieldwork consisted of 381 questionnaires, 14 interviews, 2 focus groups, 3 research-action activities, and a portfolio of 949 photographs, 16 audio and video recordings). **Key findings**: The scientific practices for youth and children in this case study are of excellent quality. The leaders are so committed that they are regarded as Knowledge Ambassadors. The activities encourage the interest in science and the improvement of scientific vows (69%); moreover 95% of girls and boys who have attended the activities would like to understand science profoundly (and more than half of them would be engaged in pursuing a scientific or technological profession). Building greater awareness of science issues is possible thanks to advocacy activities (75%) but target audiences said that information about events has permeated only in a few schools and not in other citizen spaces (75%). **Conclusions**: The research's findings were taken as a model for a library´s **pro (motion)** initiative. The strategy integrates data gathering, contents plan, communication, collaboration, awareness, and advocacy for innovative services.*

Keywords: Qualitative data; Library Advocacy; Youth and Children Libraries; Users; Data Analysis.

A library without users

The *Central Public Library Rafaela Suárez*, founded in 1981, is the most important in the State of Colima, Mexico. There, people can find reading material for the whole family. For many years, it was frequented by many visitors; in fact, fifteen years ago, the library attracted an average of four hundred users daily. However, since the arrival of the internet and social media, the library attracts only sixty-two visitors a day, these visitors only use the digital services module.

Other libraries around the country are also facing comparable situations and are asking similar questions like: How can libraries get more people interested in information and knowledge activities? How can libraries better communicate? How can they promote and mobilize communities? And how should this promotion be delivered?

With that challenge in mind, the library team developed a project to improve its impact in the community. Significant investment has been made for the building renovation (currently under development) to offer a comfortable and pleasant atmosphere; however, this won´t be enough to motivate the users' attendance or to stimulate reading among the citizenship. For this reason, they decided to review a model generated by the State Council on Science and Technology whose objective was to answer the question of why the population does not attend scientific dissemination events; as well as to find solutions and take the necessary steps for effective pro-motion.

Colima

Colima is positioned in Western Central Mexico. It has a population of "713,612 inhabitants, with 88% in urban zones and 11% in rural areas. Colima grants public primary services whose rates are above the national average, having citizens quite satisfied […]. Colima is ranked 6th rank on the *Human Development Index* (HDI) in the country, also above the national average and Latin American countries average […] even though, in educational matters underdevelopment persists, secondary education is lagging, […] the average grade of school attendance is 9.5 years, and 3.9% of the population is illiterate." (Colima. Gobierno del Estado, 2016).

Therefore, the current Government Administration Development State Plan states the foundation of a *Knowledge Economy* is to promote better changes for children and teens; this is supported in a strategy to encourage innovation, strengthen links with entrepreneurs, enhance knowledge creation, improve connectivity, as well as overcome educational gaps and correspond education plans with labor market requirements. Under the current development plan for 2016-2021, the II.3.4.1.2 goal emphasizes particularly in "expanding scientific and technology dissemination in secondary and high school levels". (Colima. Gobierno del Estado. *Ibidem*).

The 'Invisibility' of Workshops and Science Clubs

One way to address that strategic goal is the Science Popularization activities program. Among the more significant are the Science Week and the Sciences Clubs in charge of the State Council of Science and Technology (Cecytcol). Both of them consist of finely structured activities, carefully planned, based on educational and pedagogical methodologies that make them enjoyable and attractive. Young scientific facilitators fully conscious of their

role as "Science Ambassadors" organize the activities, prepare the materials and equipment, and teach the workshops. However, society doesn't seem interested, and there is not a strong communication strategy (or conceivably it is no worth it because there is not enough information).

National reality is not very different, as there is low attendance in information and knowledge spaces. As it is observed in the National Survey of Public Perception of Science and Technology (ENPECYT), one of the indicators is the citizens' involvement in Science and Technology. For example, data in this Mexican survey shows that Science Week is one of the less attended by the families (Inegi. Conacyt, 2015).

For all those reasons, Cecytcol decided to examine citizen perceptions and to identify the impact of social appropriation of science among communities and schools. The study had three goals: to show the impact of workshops and clubs; to motivate efficient promotion actions to invite citizens to attend science activities, and to share the scientific dissemination experience as a basis for other similar projects.

The main research question that guided the study was: "Why don´t the children and young people from Colima attend those scientific activities?". A working outline of six dimensions was drawn up; it consisted of a blended methodology of desk research, qualitative field research through interviews with key actors (teachers and facilitators), ethno-photography, participant observation, focus groups and a quantitative component through survey questionnaires. As a part of the process, hundreds of databases and official files dated from 2014 to 2016 were analyzed (reports, trajectories of facilitators, budgetary exercises); ethnographic fieldwork was executed (14 interviews, 2 focus groups, 3 conferences, 949 photographs, 16 audio/video recordings), and 381 questionnaires were completed by children attending the workshops.

The Science is boring. Myth or reality?

Both *Science Week* and the *Science Clubs* improve their attendance rate annually. The number of facilitators increases, even though the budget presents ups and downs. Information about these activities is only disseminated in some schools. As a result, only students of those schools attend, while the rest of the population doesn't know their benefits. The good news is that 95% of children and young people who have attended the activities have an outstanding interest and want to learn more about Science. Also, it is remarkable that more than half of them would be interested in pursuing a scientific or technological career. (Colima. Gobierno del Estado. Consejo Estatal de Ciencia y Tecnología, 2018).

When questioning children and young people about the reasons why they participate in these types of activities, over 40% mentioned it is because they were taken by their school, 30% said it was due to the invitation of their teachers, about 20% said because of their personal interest, and less than 5% indicated it was because they were taken by their parents (Colima. Gobierno del Estado. Consejo Estatal de Ciencia y Tecnología. *Ibidem*).

Almost all the active participants said that they enjoy going to the activities. Before going to the workshops, 10% of participants considered that science was boring; 15% didn't care, and 75% thought it was an attractive topic. Interestingly, 95% of the students would like to learn more about science and technology; the remaining 5% did not show interest in these topics. More than half of the students who have participated in scientific outreach activities

affirmed that they would be interested in following a career of scientific or technological nature (*Idem*).

In the period under study, the demystification of Science was possible thanks to the popularization of events (75%). However, the activities only reached schools and no other citizen spaces (75%). Some of the reasons that these activities were more prevalent in schools may be because of the connections between activities and official study programs (38%), the workshops favored the interest in Science and the promotion of scientific vocations (69%), and the programs achieved impact on the quality of life (63%) which interested parents (31%). Attention must also be given to promote the activities in remote communities (75%) (*Op. cit*).

Knowledge Ambassadors

Facilitators, who are in direct contact with the community, have become a significant factor. Most of them (76%) have full undergraduate studies, while the rest have postgraduate studies (*Op. cit*). This agent is fundamental in the process of social appropriation of knowledge. They do the following:
- Stimulate scientific, technological, humanistic and innovation thinking
- Participate in scientific literacy and appropriation of Science
- Develop and apply ideas and activities related to scientific culture
- Promote interest for scientific vows
- Support ongoing training as a member of the *Network of Facilitators in Science*
- Organize conferences, meetings, and events for scientific, technological and innovation dissemination for the specialized and non-specialized audience.

The facilitator becomes a Knowledge Ambassador – playing a key role and creating powerful interconnections between themselves and the receivers. Such a responsibility is typical of Knowledge Workers (KW) as defined by Peter Drucker in *The Coming of the New organization* (1988). A KW works within all types of institutions, directly impacting on the way they operate through the application of technology, information processing, and coordination of people, regulations, and methodologies.

Key recommendations for most reliable Pro-motion practices

In the search for solutions, and based on the findings of the study, a few variables emerged. In addition to the need for logistical support and funding, three main variables emerged:

- Children and youth like science and technology
- Good professional marketing is a must
- Facilitators are key actors, Knowledge Ambassadors

There is a need for re-engineering how to communicate and to whom (to "speak the language" of the recipients), as well as an exchange of achievements and indicators with other government agencies, to improve collaboration efforts. As they work with some educational bodies and municipalities, what other solid alliances could be fostered? As for consciousness (and advocacy), the facilitator/ambassador is essential, but the level of responsibility (attitudes/aptitudes) is heterogeneous. It would be good to reproduce the

success of the best practices of the most committed facilitators. In summary, some areas for improvement were found: Communication, Collaboration, Awareness, and Advocacy.

1 COMMUNICATION

It is not enough to have a good product; it should also be promoted strongly. The study recommended developing a creative strategy and responsible marketing, based on innovative methods, supported by youth and social influencers, directed not only to schools but also to civil society, authorities, and private initiative. Any project of this kind should involve parents, as they are sensitized when they see the positive impact on their children. Among the achievements that workshops and clubs have already had are:

- Science is presented in an entertaining and enjoyable way, which demystifies subjects such as Chemistry and Physics; and they manage to build views in favor of Science and Technology and even stimulate scientific vows.
- Communication links are promoted between facilitators, children, and young people. The educational authorities and teachers value Cecytcol's work positively; they also consider that the topics are totally related to the official study programs.

Collaboration

Beyond libraries, scientific events, museums, coffee shops, youth and children's spaces, concerts, fairs, parks and playgrounds, and schools should be included. It is also recommended to review other successful national and international initiatives to attract visitors, strengthen work with local and regional knowledge agents, and build on previous experiences such as:

- The ethno-photographic coverage made it possible to identify that the majority of those who attend the events are sincerely interested in the activities, especially in the schools of rural and semi-urban areas, where even parents participate in preparing lemonade and some snacks for children and facilitators, and attend the workshops and scientific talks.

- There is a substantial expansion of interest in schools, but not in other places where other kind of advertising are required. Sometimes advertising it is directly assisted by authorities and officials who present the activities and raise awareness. In two counties, the communication has been made through the website of the town hall and by going to the board of schools, promoting through flyers and announcements generated by the municipal presidency itself, but facts show that it is not enough yet.

Awareness - Advocacy

Consciousness is an essential factor to strengthen the team's identity, improve their ability to make a change, and make them aware of the commitment of facilitators as ambassadors. In this respect, it should be noted that:

- The "Knowledge Ambassadors" have been previously trained but almost all who completed the diploma course to develop professional skills as facilitators have migrated to other jobs. Some of them have had experience in leading groups and

teamwork but some others lack the didactic techniques or have other activities that occupy their time and attention.

- Throughout the research study, a difference of perceptions was observed between facilitators and Cecytcol authorities. The former desire a greater motivation, although those who were interviewed openly expressed their commitment and their vocation for Science dissemination, so much so that one of the biggest stimuli as facilitators is when children are surprised and grateful. The coordinators, meanwhile, also identified that passion, but also some behaviors of tardiness and reluctance.

- It works quite well with the scientific instrument (microscopes, robots, 3D viewers, binoculars) of the Cecytcol, mainly because this kind of equipment doesn't exist in public schools. However, when there are not enough inputs, the function of the facilitator is diminished, and the intended impact is not fully achieved.

The exceptional component of an efficient Pro-Motion focuses on a single concept: *Advocacy*. According to the *Merriam Webster Dictionary* advocacy is defined as "the act or process of supporting a cause or purposal: the act or process of advocating for something" (*Merriam-Webster Online*); it is a verb that means to speak or to declare oneself in favor of a person or thing, for example, to advocate someone in a trial. Its etymology starts with ad-'to', and *voco*-'call', which has to do with 'to go to the call'; it is also related to the vocation and the condition of sustaining that cause. At present, *Advocacy* will be understood as a deep feeling which in turn entails dedication, commitment, will, tenacity and passion; this is fully linked to an identity factor detailed in subsequent paragraphs. *Advocacy* is a fundamental component for best practices in science popularization, as it was observed in the results of the study (Feria Basurto, 2015).

Leadership, identity, and advocacy were presented in narrative elements of the interviews. The narrative elements were expressed, perhaps, as a shadow of the collective conscience of the facilitators who intuitively sought to strengthen their identity as a community of practice/learning equipped with sufficient capacity to innovate and contribute to development. As a concrete example of this, it is worth highlighting some testimonies of the many that emerged from the interviews (Colima. Gobierno del Estado. Consejo Estatal de Ciencia y Tecnología. *Ibidem*):

"For the child to be excited, we must all be excited".

"I've met guys who, for example, have gone to their high school starting in 2011 and now they are studying for a degree or bachelors' degree in Science, and they tell me: 'I remember that I became interested in Science because you went to my school to promote the activities".

"I [as facilitator] said, at least… for this I came into the world, I came to motivate interest in Science"

"Young people want to participate, in the beginning they are very skeptic and suspicious when they are watching you… they look apathetic, but after some time they are very interested and thankful… they ask you questions like: 'teacher how can I do that?... When they came for their first session, I ask 'What is Chemistry?', and nobody answers but at the end of the workshop everyone wants to be a chemist"

Lessons for the library, get to work!

In the introductory paragraph of this document, a significant decrease in the library attendance indicator was already mentioned. The offer of the digital environment and applications such as Google, Wikipedia, YouTube, and others have exceeded the use of printed books and traditional libraries. Thus, as part of a proposal to rehabilitate the physical infrastructure of the library building, a reading program to promote reading, supported by technological tools that favor the creation of contents, stories, and knowledge has been designed. For this, the Cecytcol study directed the library authorities and staff to identify two relevant routes:

a) Data Gathering and Contents Plans;
b) Communication, Collaboration, Awareness, and *Advocacy* Actions.

Route 1. Data Gathering and Contents Plan

The library plan is planning a data survey tto undersetand the use of digital content by children and young people. Variables such as "how many hours are dedicated to the consumption of digital platforms?", or "what contents do children and young people see the most?", or "why do they use them and what kind of devices do they have access to?" will show inequality gaps. Data will support decisions about what to do and how to solve it.

As the project progresses, measurements will be made, based on indicators that allow contrasting the original Cecytcol data with those produced in the development of the library's project, such as:

- Increasing the attendance of people to the library in the short and medium-term
- Increasing training of digital creators/readers (considering that the main objective is reading as the basis of creation)

On the other hand, the feasible indicators of measurement would be:

- Number of trained readers
- Number of digital products generated
- Number of participants who became aware of being a reader (disaggregated by qualitative details such as, testimonies, interviews, frequency of mentions in the narratives, terminology coincidences, and conglomerates, among others)

Furthermore, a plan is prepared to integrate learning and knowledge in a pleasant way to develop children's and teenagers' pleasure for reading. The plan also will focus on motivating them to create consistent and prepositive digital designs based on classic books and providing enlightening readings that help to generate awareness and to delight them with stories and learnings about Literature, Science, Philosophy, and Arts. The objective is to design a plan using creative tools such as animation and cinematography for electronic media, whether fixed or mobile. Workshops will be structured to stimulate the habit of reading and the creation of digital content in such a way that it would be accessible and understandable to users. The availability of open access platforms on the internet will allow free interaction.

Route 2. Communication, Collaboration, Awareness, and Advocacy (CC-AA)

As it is in Science Workshops and Science Clubs, the old perception of the library as a tedious space will likely be modified through the process of instructional learning using the digital tools, empowering children to express themselves through a playful design where arts and literature inspires diverse and imaginative formats.

Therefore, it is a responsibility to communicate the library's project efficiently and effectively before, during, and after each activity. A main component of the project will be training and updating librarians to motivate reading habits and the use of technology to promote reading. This professionalization of staff will encourage the appropriate attention of users, favoring quality services to increase visits to the library. Special attention will be given to *Advocacy*, acknowledged as a critical element.

At this point, the identity of the librarian as Knowledge Ambassadors should be further strengthened both for the Cecytcol research findings as for being one of the priority areas in the profession. Since the 1970s, Wasserman (1972, p. 6) urged the guild to go beyond the role of custodians and organizers of collections to take the step that would not only offer traditional solutions but also strengthen innovation and "consider good common, information for the evolution of the human condition"; this is an argument that today is more relevant than ever. It goes beyond reading to be an obligation, but rather a way for the creation of meaning between the community.

The new project will invigorate the commitment of the team, and the intellectual capital of the institution will be raised. A knowledge management model—successfully applied in other information and library projects—will be adapted and adopted (see chart) (Feria Basurto, 2015. Its main objective is to raise awareness; strengthen team identity—oriented by the understanding of reality; and update of skills and tools so that the library team can effectively address the challenges and build their evolution in the Network Society.

COLIMA KNOWLEDGE MANAGEMENT MODEL			
Technology of things	**Technology of conversations**	**Leadership/Identity**	**Library strengths**
Design, development, and use of artifacts and products: software, computer platforms, infrastructure	Set of speeches and narratives, stories, languages, metalanguages, and everything related to communication skills and marketing initiatives. **Advocacy**	Commitment, teamwork, and leadership-oriented to the mission. ***Advocacy***.	It refers to the characteristics of the profession: - To preserve, systematize, organize, and link information; - To provide access - To foster the love for knowledge and its creation - To anticipate trends in information management
Includes:	Includes:	Includes:	Includes:
- Infrastructure - Products and services - Methodologies	- Advocacy - Communication - Interactive	- Advocacy - Strengthening identity in groups	- Information management - Active role in Long Life

• Applied research • Organizational structures • Instruments • Software • Technological observatories	Relationships • Dissemination • Publications • Active presence in media • Active presence in forums and events (*inside and outside the institution*)	• Leadership and commitment • Ego management • Communities of practice and learning	Learning • Media and Information Literacy • Consciousness Literacy

Chart 1. Knowledge Management Model
Source: Feria Basurto (2015)

The challenge to make the library more visible and to engage users to read more and to participate in their activities requires a great **pro (motion)**—beyond promotion, that contains the elements previously detailed. Why separate the word into two components? To reinforce its meaning because promotion is "the act or fact of being elevated in position or rank" (*Merriam-Webster Online)*, where the suffix "motion"—as an impulse or inclination of the mind or will, reinforces the meaning, and adds a sense of movement. A good **pro (motion)** will activate the life, dynamics, and action that the library had lost.

Conclusions

The traditional model used to assume that the communities should adapt to the library, to its services and to its spaces. At present, in an environment with multiple options of access to information, it is necessary to observe the users, their behaviors, their physical/virtual ecosystems. It is time to stop thinking in terms of collections only and instead begin to take steps toward more innovative actions to upgrade reading to the same level of acceptance as other media and make it more visible. For that reason, it is crucial to instruct the staff to think about the users and the non-users, to know the open culture, and the maker culture, and to provoke actions that inspire them (Connaway, 2016).

The analysis of data from scientific dissemination activities provided significant outcomes; among the most significant were: 95% of children enjoy Science; the facilitator function as Knowledge Ambassador is crucial; and *Advocacy* is a must for best pro-motion practices. Based on this information, a project for an innovative and efficient pro-motion of the Central Public Library of Colima is currently being developed.

These types of projects, in addition to empowering libraries and their communities, outline ways to achieve the Sustainable Development Goals (SDG) that the 193 country members of the United Nations signed and adopted on September 2015 so that poverty, hunger, illiteracy and diseases can be eradicated gradually. In this case, it will be possible to attend to two of them, SDG4, which aims to ensure an inclusive, equitable, and quality education and promote lifelong learning opportunities for all, and SDG 16, which is strongly committed to promoting societies that are fair, peaceful, and inclusive. Section 16.10, which emphasizes the importance of ensuring public access to information and reducing the digital divide, is completely in line with the vision of the Colima Project.

Libraries have been, throughout history, the place par excellence where creative thinking and knowledge discovery are fostered sustainably. They represent the place that assures every reader and every citizen access to information that empowers them. This responsibility is more valid today than ever and must remain so, because the mission of the library is to deal

with people and knowledge, and because "human beings are not built in silence, but in word, in work, in action-reflection" (Freire, 2000).

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