



Enhance a student-scientist partnership through a collaborative approach

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Purpose & Problem

According to some existing results identified in the literature, the partnership between high school students and scientist involves several challenges, such as time management, lack of equipment, communication barriers, organization, complexity of the scientific language and scientist availability.

The purpose is to address these problems and identify effective ways that can enhance the partnership between the scientist and high school students during their internships.

Research Content

The internship was held from January to July. The first five months the students went every Saturday for 3 hours to UTEP, in which 2 hours were focused for the internship and the last hour was dedicated to implement Cogenerative Dialogues. The last two months the students attended the internship 8 hours every week day, in which one hour from Tuesdays and Thursday were specially for Cogenerative Dialogues. During the whole internship the students had to present a proposal presentation and a final presentation where they were evaluated by judges.

Inside the lab:
The main scientist created a team formed by 2 post doctoral members, 1 doctoral, 4 undergraduate students and 3 scientist from other laboratories including the lab from health science, the physics lab and another chemistry lab.

Data Analysis

Ethnography

"Ethnography is the study of social interactions, behaviors, and perceptions that occur within groups, teams, organizations, and communities" ... "The central aim of ethnography is to provide rich, holistic insights into people's views and actions, as well as the nature (that is, sights, sounds) of the location they inhabit, through the collection of detailed observations and interviews." (Scott, Kuper, & Hodges, 2008)

Thematic analysis

"Thematic analysis is a method for identifying, analyzing, and reporting patterns (themes) within data. It minimally organizes and describes your data set in (rich) detail. However, it also often goes further than this, and interprets various aspects of the research topic." (Barum, & Clarke, 2006)

Data Source

The data was analyzed through ethnography data collected from the internship.

- Field Notes
- Photos
- Video recording
- Interviews

Cogenerative Dialogues

Requirements before starting:

- People should be sitting around a table where everyone can easily see each other and participate.
- Everyone should have a copy of the Cogen Rules and a piece of paper where they can write down their experience along with issues or problems they want to discuss during that session.

Cogen Rules

- Equal turns
- Show respect and listen to others.
- A plan for action to be implemented in further practice.
- Video clips of collective practice are available for discussion.

Heuristics

- (5) There is a place for me to speak. Therefore, I speak as much as others in my group.
- (10) The members of my group show respect for one another.
- (14) When others talk they build on what I have to say.
- (22) Others value my contributions to group dialogue.
- (38) I value different perspectives.

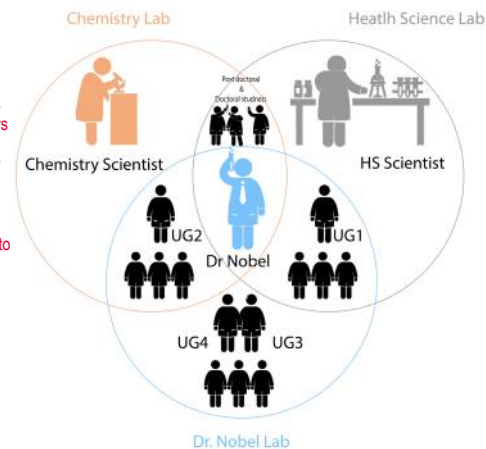
First, the students have around 5 minutes to write down their issues or/and concerns they have experienced.

Then, all the participants start ranking and discussing the problems and concerns of the previous Cogen session, if they were not solved, then find another solution for those issues.

After that, participants start the discussion about the actual issues and/or problems and find a solution.

Finally, three volunteer persons would read one Heuristic about how the Cogen was performed and ranked it from 1-10, in which the number 10 is the highest score.

Collaborative Team



Comments from high school students

Student A

"Uh, also, like, how I--we went to, by the way, in the chemistry lab, but also the biology lab, and we've learned about, like, bacteria. And then, we have, like--not only that, but we just learned a bunch of chemistry in general to help us, and that was cool. Or, UG1, he's super cool [laughter]. I mean, UG1 was like nice, yeah."

Student B

"It was cool working in the lab, like with everybody, like all the scientists and the TAs and stuff."

Student C

"A scientist is someone who just has a passion for science and is always trying to look for new ways to make the world better..." someone who is willing to teach other people about science. Like, I think, consider the students that I consider undergrads and post-docs that were helping us with the lab. I consider them, like, really motivated to be a professor or scientist."

Student D

"it's really easy to work in a team, 'cause everybody is, like, more than willing to help. Like, everybody in the lab, even if they weren't with their project, and then everybody is, like even though technically, we're kind of in competition with each other [chuckles], an like, even with the graduates and undergraduates, like, they're doing so much stuff that it's, like, everybody is willing to work with each other."

Student E

"I learned a lot about the chemistry, like, people, isn't that bad after all [laughter]. But, yeah, I made friends. I learned a lot from UG2, and from UG3, and from UG4, and everyone in the lab that helped us. Yeah. It was a fun experience. I got a lot out of it."

Conclusion

In conclusion:

1. The scientist created a collaborative team formed by undergraduate, graduate students, post-doctoral members, and scientists from other laboratories, which helped him to cover all aspects of the partnership with the high school students. The staff members of the scientist's lab also contributed to create a bond between the scientist and the high school students by simplifying complicated chemistry terms, and by getting the high school students more involved in lab.
2. The scientist used Cogenerative Dialogues in order to address all the issues that the high school students faced in the lab.

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	Existing Results Identified in the Literature	Solutions Identified in the Partnership
Motivation	The engagement of the scientist is really important during the internship because it is easy for the high school students to lose the motivation or enthusiasm during their research projects. (Masson, Klop, & Osseweijer, 2014)	<ul style="list-style-type: none"> • Cogenerative Dialogues • Scientist let the students chose their research topic • The scientist was supported by very complete team • The scientist were always passionate about the investigations • Scientist work in collaboration with other scientist from other departments
Communication	The most important tool to solve problems between individuals is the communication. Finding the correct method to communicate with students is a challenge every scientist needs face, in order to create a comfortable dialoging environment. (Masson, et al., 2014)	<ul style="list-style-type: none"> • Cogenerative Dialogues • The scientist was supported by very complete team • Involment of undergraduate RAs • Weekly meetings to the advances of the studnets projects
Time Management	According to Clendening, (2004). The investment of time can always be more reasonable when undergraduate students are involved as the assistants of the main scientist.	<ul style="list-style-type: none"> • Cogenerative Dialogues • The scientist was supported by very complete team • Weekly meetings to the advances of the studnets projects
Complexity	For high school students the scientific language and techniques are to advanced and complex. Scientist need to remember that high school students do not have the same level of knowledge as their college students. (Clendening, 2004)	<ul style="list-style-type: none"> • Involment of undergraduate RAs • The scientist used different methods to explain the concepts and information to the students. • The scientist was supported by very complete team
Organization	Guidance of the scientist is really important during the internship, without guidance and organization, students will not be able to know what to do or which procedures should be follow. (Masson, et al., 2014)	<ul style="list-style-type: none"> • Cogenerative Dialogues • Scientist conducted weekly meeting • The scientist was supported by very complete team • Scientist work in collaboration with other scientist from other departments
Bonding Experince	"Learning about science requires the coordination of a complex set of cognitive, affective, communicative, and motivational strategies and skills." (Anderman, 2012). Creating a bonding relationship with the scientist and their peers will help to increase the outcome of the research because it improves the motivation and communication between the group.	<ul style="list-style-type: none"> • Cogenerative Dialogues • Scientist conducted weekly meetings • The scientist was supported by very complete team • Involment of undergraduate RAs