
The influence of puerto rican physics teachers' political beliefs in their pedagogical practices

La influencia de las creencias políticas de los maestros de física puertorriqueños en sus prácticas pedagógicas

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Abstract

The purpose of this article is to research to what extent the physics teachers' ideological ideas are perceived to affect the integration of local cultural and contextual information in their class. The hypothesis that guides this study is that there should be no relationship between physics instruction and the teachers' personal political beliefs. After an exhaustive analysis of 21 interviews conducted with physics teachers, it is concluded that teachers' opinions about this topic are mostly divided. However, data suggest a tendency of most teachers to see physics and physics education with an ideological lens, especially when they argue that teachers that believe in commonwealth and independence status options are more likely to include local cultural and contextual information to their classes compared with teachers who believe in statehood as a status option.

Key words: commonwealth, independence, teacher beliefs, culture, colonialism, multicultural education.

Resumen

El propósito de este artículo es investigar hasta qué punto las ideas políticas de los maestros de física pueden o no afectar la integración de aspectos contextuales y culturales de procedencia local en la clase. Este artículo está guiado por la hipótesis que no debe existir relación entre la enseñanza de la física y la posición ideológica de los maestros. Luego de un extensivo análisis de entrevistas realizadas a 21 maestros, se concluyó que los maestros tienen una opinión dividida acerca de este tema. Sin embargo, se observa en ocasiones una tendencia por parte de los maestros a ver la física y su enseñanza con un lente ideológico, en particular cuando argumentan que maestros estadolibristas e independentistas son más propensos a añadir aspectos contextuales y culturales comparado con maestros de ideología estadista.

Palabras clave: independencia, creencias de los maestros, cultura, colonialismo, educación multicultural.

INTRODUCTION

Research in science education has pointed out that a number of developing countries have decided to use Western curricula and textbooks in their school. In most instances, there is no adaptation of this material to the specific needs and experiences of local students or the adaptations are merely superficial (COBERN, 1998). This practice is inconsistent with current practices in science education that promote a connection between the educational system, the cultural context and society in general if we want science education to be meaningful and effective (COBERN, 1998; WILSON, 1981).

The local use of foreign educational materials and textbooks have occurred in Puerto Rico throughout its colonial history, being a colony of Spain from 1493 to 1898 and a colony of the United States from 1898 to 1952. Some scholars even argue that Puerto Rico is still a quasi-colony of the United States under its Commonwealth status (TRÍAS-MONGE, 1997; CARR, 1984; JOHNSON, 1980). Even though the Commonwealth status allows Puerto Rico to have an autonomous form of government, which makes decisions about the educational system, there is still evidence of the influence of the United States on puerto rican education (SOLÍS, 1994; NEGRÓN DE MONTILLA, 1990; ELIZA-COLÓN, 1989). In recent years, some countries have moved to develop contextually realistic programs (GRAY, 1999). Unfortunately, the development of local science curricula and textbooks has not been extensive in Puerto Rico, especially at the high school level.

Educators generally agree that education is not an objective system, but a rather complex interaction that takes place in a specific socio-cultural context (PAI & ADLER, 1997). In other words, culture and education are interrelated, and act reciprocally upon each other (HALLS, 1990). One of the

most important aspects of the puerto rican culture is political beliefs. There seem to be no research data that explore the relationship between the inclusion of local contextual and cultural aspects, the teaching of physics, and the ideological beliefs of the physics teachers.

The purpose of this paper was to determine whether the teacher's conceptions of ideology and political beliefs influence their willingness to modify their instruction so that physics become meaningful to puerto rican students. By meaningful, I mean contextual and culturally relevant to the puerto rican culture.

METHODOLOGY

The sampling strategy consisted in visiting as many public high schools as possible in a five-week period. On the first visit, physics teachers were identified and contacted. Also, teachers received a brief explanation of the purpose and procedures of the study, and a questionnaire was provided if they decided to participate on the study. Schools were visited a second time to gather completed questionnaires or leave a self-addressed stamped envelope for teachers to send their completed questionnaires to the researcher's work address. During the last three weeks of data collections, 21 teachers were visited a third time for them to be interviewed using a structured-interview approach. The criteria for selecting which teachers to interview were both their responses to the research instruments and their geographical location. It is the interview data from these 21 teachers that is discussed on this paper. Quantitative findings from this research have been reported elsewhere (GONZÁLEZ-ESPADA and OLIVER, 2001).

Although six questions were originally used, only the two questions related to the relationship between the teachers' political beliefs and their inclusion of context and cultural relevance will be discussed in this paper. These questions were:

- Do you think that a teacher who has a pro-statehood ideology will be less critical of the physics textbook actually used because it was made in the United States?
- Do you think that teachers who believe in commonwealth and independence will include more aspects of the puerto rican culture in their physics class?

The analysis of the interview data was as follows. Each audiotape received a code number to preserve the participant's confidentiality and was transcribed in Spanish into a single word-processing document for each participant. The data were subsequently rearranged and classified according to each of the structured interview questions. All the answers to the same questions were placed on a single file, providing the opportunity to study, compare and contrast all the responses to the same question. This process revealed both common responses and contradicting perspectives, which created the categories and patterns that are presented in the next sections. The diversity of answers created a large number of categories, but these were collapsed into those that were more meaningful and informative, as recommended in the qualitative research literature (CRESWELL, 1998; MERRIAM, 2001; RUBIN and RUBIN, 1995). Representative quotes that supported the emerging categories were carefully translated from Spanish into English. All reported names are pseudonyms.

Findings for Question 1

The majority of the teachers (12 out of 21) said that their ideological/political beliefs are independent of their teaching. However, eight participants believed that some pro-statehood teachers, especially those considered "fanatic" and "close-minded" would be less critical of the textbook. The two main categories for this question are explored in the following sections.

Pro-Statehood Ideals and Teaching are Independent

Twelve participants reported that the political ideology of pro-statehood teachers should not influence or inform their teaching practices. For example, Berta proposed the qualities of objectivism and professionalism as the ones who might determine whether a pro-statehood teacher will be less critical of the American textbook translated for use in Puerto Rico:

If [the physics teacher] is an objective person, committed to what he is doing [teaching], I think he will separate his political ideology from what he is doing [professionally].

Maria also mentioned professionalism as a quality that might affect the teachers' beliefs and actions, in terms of his or her pro-statehood ideals. In addition, she used the term open-mindedness in a similar fashion:

If the person has an open mind, whose academic preparation has reached its goals, then I do not think that [his political beliefs] are

going to influence [his teaching]. However, if it is a person that, despite his academic preparation, has a closed or narrow mind, then it is definitely going to influence.

Ofelia believed that the problems associated with physics teaching and political ideology are incompatible. She used the words "real teacher" to describe teachers who are not professionally affected by their pro-statehood beliefs:

I do not think so; one thing does not have anything to do with the other, independent of the teacher's ideology. Once the teacher see the problems associated with [teaching] his students, I do not think he is going to relate [ideological beliefs and teaching] ... For a real teacher, ideological issues do not affect his teaching.

Leonardo is more general in his statement, arguing that political ideology, regardless of what status option defends, have no place in education:

I have talked with colleagues who are pro-statehood, pro-independence, and pro-commonwealth and most of them do not like the textbook. The criticisms to the book develop because it is a poor educational instrument, independently of the teachers' ideology.

Although most teachers are reluctant to disclose their political beliefs, Nicolas and Pablo admitted that they believed in statehood, but that does not affect their teaching. Nicolas said:

I am pro-statehood and I do not mix politics with education. If I am an educator, I am here so that students can receive an education, and I am effective at that, regardless of my political beliefs. I think that if we can adapt this textbook to the puerto rican reality, we will have better academic achievement.

And likewise with Pablo:

It is indifferent for me. What is important for me is the material the textbook has, its level of difficulty, and I compared that with the students' academic level, high, regular, low. If I believed in statehood, I would not see teaching from that perspective. If I am going to evaluate a textbook I need to do it based on what the textbook says.

One of the reasons mentioned to explain why ideology and teaching are not related is the perception that science in an objective, rational, and unbiased endeavor. For example, Cesar implicitly suggest that scientists and science teachers are objective enough not to combine their pro-statehood ideology with their teaching:

I never thought about questioning my teaching from a partisan perspective. I have never seen that perspective with other [science] teachers as well. If they are scientists, they will not go to the fanatic extreme of analyzing a book based on political ideology, unless the teacher is a fanatic that sees everything from the point of view of a color [political parties are identified by colors].

Contrary to Cesar, Virginia is explicit about her belief that science cannot be tainted by the subjectivism of ideology, pro-statehood in this case. She also enumerated three aspects that will determine to what extent a teacher might combine his or her pro-statehood ideas with physics teaching: teacher professionalism, teacher commitment to the subject area, and textbook quality:

As scientists, we tend to be more neutral in terms of our identity as people; we see ourselves as more global ... Believing in statehood is a concept that is completely separated, divorced, [of my teaching]. [What is important is] how I am as a teacher, how committed I am teaching physics, and how practical is the textbook, based on what I want to transmit to my students, independently of being pro-independence, pro-statehood or whatever.

One of the participants mentioned a potential conflict that some pro-statehood teachers might have between their political beliefs and their puerto rican identity. It can be summarized in four rhetorical questions:

- To what extent are puerto ricans like people from the United States?
- To what extent are puerto ricans different from people from the United States?
- To what extent are puerto ricans like people from other Latin American countries?
- To what extent are puerto ricans different from people from other Latin American countries?

A percentage of pro-statehooders might see themselves as American as anyone from the continental United States. Others believe that puerto ricans are different, but as American citizens, puerto ricans have most of the responsibilities and benefits of any other American citizen. This is definitely an identity conflict that is, in my opinion, common among pro-statehooders.

Pro-Statehood Ideals and Teaching are Interrelated

Eight participants reported that the political ideology of pro-statehood teachers might influence and inform their teaching practices. For example, Ismael relied on his knowledge of other teachers to form his opinion about the question:

Yes, I believe so, I am completely convinced about that [the fact that some teachers include their ideological beliefs in their teaching]. I know a lot of colleagues who defend the book quite much.

The book Ismael is talking about is a Spanish translation of ZITZEWITZ and MURPHY (1990).

Hortensia, on the other hand, blame the actual political status (which some people see as ambiguous and temporary) for the way some pro-statehood teachers might be teaching physics:

Based on the political reality of this country, I think so. A pro-statehood teacher will not be critical at all [of an American textbook] because of the political status we have.

Gustavo presented a more philosophical argument, suggesting that it is almost impossible to act independently of our belief system. He also mentioned that pro-statehooders might believe that the textbook in English is a better option for students:

In my opinion, I think so. We must see things from a reality perspective. Our beliefs influence on practically all of our activities and our life. A pro-statehood teacher will be less critical of the textbook. Furthermore, a pro-statehood teacher might argue that the textbook should not be in Spanish, but in english.

Josefina made use of the language issue and of the descriptor fanatic, one more time in this section, to acknowledge that some pro-statehood teachers might be less critical of the textbook they use:

I think that a pro-statehood teacher will be less critical of the textbook compared to teachers who believe in commonwealth or independence. For example, we just receive some books in english. I know that a fanatic pro-statehood teacher might say: 'very well, we have the textbook in english so students can learn english'.

Frances qualified some pro-statehood teachers whose teaching is molded on their ideological beliefs as narrow-minded. However, she also pointed out that teachers with ideological beliefs other than statehood might also be narrow-minded too:

You can find both statehooders with closed minds and "independentistas" with closed minds. They see everything with blinders ... that make them see things the way they want to see them. Sometimes just because something come from the United States they stamp it and say: 'this is the greatest, an American did this. Most statehooders have this type of vision.

Rosa pointed out to a "self-esteem" problem that some pro-statehooders might have. She also mentioned that although education and ideology might not be related in theory, in reality the story is different:

Unfortunately, I think so. The tendency is to find people who, because of his political ideology and way of thinking, believe that the United States is better, and it is not always that way. When we go to the praxis, even when we do not want to see education politicized, there will be teachers who will reflect his political beliefs to the students.

In summary, these teachers believe that pro-statehood teachers have a difficult time teaching physics from an apolitical perspective. Different causes for this phenomenon are proposed, like the political status of the Island, the puerto rican culture, the teachers' attitude toward their ideology, or the fact that our belief systems control, to a certain extent, our personal and professional decisions.

DISCUSSION

Although the majority of the teachers think political ideology and science education should not be related, this majority (60%) is far from conclusive. The main reasons reported by teachers who believe that ideology and education should not be combined are: (a) political decisions

might not be sound educational decisions; (b) politics and education have disparate goals, and (c) the perception that science education should be an objective endeavor, while politics are not.

On the other hand, a group of teachers believe that politics is influencing educational decisions at the teacher level. They argue that our beliefs guide all aspects of our life, including our professional decisions. There are historical reasons that support this practice. Because of our colonial (or post-colonial) relationship with the United States and the role of this country as a world power and economy, some puerto rican teachers believe that if the physics textbook comes from the United States, it *must* be excellent, compared to any local effort in producing a local textbook.

Something I noticed when analyzing these data was that some teachers gave answers to two slightly different questions: (a) Do you think that a teacher who has a pro-statehood ideology will be less critical of the physics textbook actually used because it was made in the United States? and (b) Do you think that a teacher who has a pro-statehood ideology should be less critical of the physics textbook actually used because it was made in the United States? The teachers' responses suggest that ideology and politics is being combined on some occasions, especially by more right-winged teachers, but it should not be combined because it might jeopardize their students' learning.

In summary, the majority of the interviewed teachers believe that, as scientists, there should be no relationship between political beliefs and teaching practices for science teachers. They feel that their main objective is to create an adequate environment for students to learn physics. Political evangelization and biased educational decisions based on ideology should not find a place in puerto rican schools. Furthermore, these teachers believe that only narrow-minded teachers will try to combine both. On the other hand, a number of teachers argue that the reality is that some teachers do make educational decisions based on their political beliefs, arguing that beliefs guide everybody's actions, including their professional judgment and teaching philosophy.

Findings for Question 2

In contrast to the previous question, this time most of the teachers (12 out of 18) believed that pro-commonwealth and pro-independence ideologies can be interrelated with physics education without much opposition. Interestingly, these teachers see this inclusion as a natural consequence of being a puerto rican teacher, and not necessarily as an ideological or political issue. On the other hand, six teachers still believe that political ideology and teaching should be kept independent of each other, regardless of political beliefs.

Pro-Autonomy Ideals and Teaching are Independent

For example, Berta argues that since the prescribed high school physics curriculum does not include aspects of our local culture, teachers should abstain from teaching physics using their pro-commonwealth or pro-independence lens:

I do not see many [ideological] situations from our everyday lives that can be brought [to the physics class] ... Neither the textbook nor the physics curriculum say we should include political issues ... the curriculum was not designed to include political ideologies or political issues in the classroom. I can see it for a history class, but not for a physics class.

Dolores said that "truly professional" teachers would not let their pro-commonwealth or pro-independence ideology influence their teaching:

It is possible that [a pro-commonwealth or pro-independence teacher] might be more conscious [about the puerto rican society and culture]. Again, if the teacher is truly a professional, I doubt [that ideology and teaching might be combined]. If you are a professional, you must work within your work area, regardless of political matters. Education should be our politics; that should be our political party. You must start from the deficiencies and needs you see in your students.

Frances statements implied that those teachers who include aspects of the puerto rican culture into their physics classes are teaching physics from a narrow, insular perspective, when in reality physics teachers should provide universal examples to promote an increased global culture:

What is the difference between applying physics here or in the United States? It is the same thing. We must have a broader culture. We cannot teach physics from a narrow perspective. Physics is for everybody, not just for Puerto Rico or the United States, but for Mexico, Italy, or England, it is the same. If people were mature enough [intellectually], there will not be any problems in teaching or using a translated book.

So what if the textbook is a translation from the United States?

Virginia expressed that politics and education should not be related, although, unlike Frances, she believed that science teachers should make science more contextual:

I think [politics and education] are independent. They have nothing to do with each other. I think that all teachers who love science must add our context and reality to our teaching, not just in physics but in all sciences ... independently of our political ideas, we must live the realities of our country.

In summary, six teachers defended the position that pro-commonwealth and pro-independence ideologies should not be used as a pretext to include aspects of the puerto rican culture into the physics class. Various rationales were provided to support their stance including teaching professionalism, the fact that the actual curriculum does not prescribe this inclusion and the idea that including the local culture in a physics class might be limiting and misleading.

Pro-Autonomy Ideals and Teaching are Interrelated

Twelve of the teachers interviewed said that the teachers' pro-commonwealth and/or pro-independence ideology might help them in making the physics class more pertinent to local students by including more aspects of the local culture and context. For example, based on her experience, Maria acknowledged that pro-commonwealth and/or pro-independence teachers do include more local examples in their class, but that they do it spontaneously because they want physics to be as real for their students as possible:

The tendency is affirmative, they [pro-commonwealth or pro-independence teachers] tend to do it [include more aspects of the puerto rican culture in their physics classes]. At least, that is my experience. They know what is more pertinent to their students.

Cesar believed that pro-commonwealth and/or pro-independence teachers have the knowledge to make deeper connections between physics and the local culture:

Surely. It is not that they will add more [aspects of the puerto rican culture], but they will go deeper into our culture. For example, instead of calculating the height of the Statue of Liberty, they will use a native tree. The topic is the same [but the example will be local].

Teresa agreed with Cesar in that pro-commonwealth and/or pro-independence teachers know more about Puerto Rico and its culture and context compared to physics teachers from other ideologies. She also mentioned that they might know about local research or local realities that can be easily incorporated into the curriculum:

I think so, at least I expect so, that they have a more ample concept [of physics and puerto rican culture] ... [Here in Puerto Rico] we are doing good research work in many [science] areas, that can be incorporated [in the physics class], what is our reality.

Josefina agreed with other teachers about the knowledge of both physics and the local culture that pro-commonwealth and/or pro-independence teachers have:

Of course. I think that they would add 100% puerto rican examples, with puerto rican renowned people, physics teachers, and outstanding [local] people in the sciences. I think that a teacher who masters physics well will use many examples from the puerto rican culture.

Ismael admits being one of those pro-commonwealth and/or pro-independence teachers who include the puerto rican culture into his class. His reason for doing this is that it helps students in their development as puerto ricans, not just in the area of science:

Yes, I think so. I am totally convinced about that, I even do it myself. When I am teaching physics I exhaust all resources to do it [include more aspects of the puerto rican culture in their physics class] because I believe in the development of the individual as a whole.

Leonardo's experiences and actions in affirming the puerto rican nationality and creating meaningful context for his physics students are evident in his statement:

Definitely yes. The reason is very simple. When you want to affirm your nationality, you find the time to do it. In the context of a class, a teacher projects his ideology. My ideology is to make students aware of the importance of their history, their self-esteem and worth as a

nation, so I introduce [in class] a number of examples and contexts that affirm their nationality, their identity ... You do it on purpose, because you know that the physics course is not marginal to, but embedded in a context.

Similarly, Hortensia believe that pro-commonwealth and/or pro-independence teachers have more patriotic consciousness and that it is reflected in how they teach physics:

We do [include aspects of the puerto rican culture in my physics class] because we have more patriotic consciousness, above all. Pro-statehood teachers might have a perspective of puerto rican problems or things that impact the country, but teachers who believe in independence have a different way of thinking. I do it myself. I do not use examples from things that happen in the United States, but local examples, things that are happening now.

According to Gustavo, pro-independence teachers are much more prepared to include components of the local culture into the class:

Definitely. A pro-commonwealth teacher either will leave [the textbook presentation of the content] as is, or will add some cultural aspects. A pro-independence teacher will add much more elements [of the local culture], will make much more changes to the textbook and its contents.

In summary, teachers believed that pro-commonwealth and/or pro-independence teachers might be more prepared to include local cultural aspects into their physics class and are perceived as being more knowledgeable about local examples and situations that can enrich their course.

DISCUSSION

On the question of whether teachers who believe in commonwealth and independence will include more aspects of the puerto rican culture in their physics class, the teachers interviewed were still divided. On one side, some teachers perceived politics and education as independent, arguing that the professional expertise, and not ideology, should guide teaching; that teachers must focus on the students' needs, and that physics is the same all over the world and should be presented with a global, objective perspective.

On the opposite position, teachers believed that ideology and education are interrelated, mainly as a way to contextualize physics teaching and to create consciousness about the students' nationality, history, culture and identity. Teachers who believe in commonwealth and independence are perceived as more capable of doing this.

The fact that participants reacted differently to the two research questions, even though they asked essentially the same is very interesting. Although some teachers were firm in their beliefs that politics and education should be separated, others conditioned their stance on the ideological viewpoint from which the question was presented.

On the other hand, Gustavo brought an excellent point, when he placed pro-commonwealth and pro-independence teachers in two different categories. Based on my experience as a puerto rican, I know that the puerto rican political reality is more complex, though. Among statehooders there are right-wingers, left-wingers, and centrists. Among the pro-commonwealth group, there are also right-wingers, centrists, and left-wingers (which sometimes agree with some pro-independence groups). Among independentistas, there are sectors that do not favor violence as a mean to achieve their ideal and those who prefer armed resistance against the United States.

I think it might be an interesting follow up study to explore this topic deeper. Unfortunately, people in Puerto Rico are very cautious in disclosing their real political beliefs (this may be the reason why about 20% of the teachers did not answer the ideology question in the written questionnaire). Interestingly, the evidence from this section suggests that pro-commonwealth and pro-independent teachers might be the best sources of information and knowledge about how to make the high school physics class more contextually and culturally relevant for puerto rican students.

CONCLUSIONS

The analysis of the questions showed that political ideology might affect professional decisions although, in theory, the "official" position of the local government is that ideology should not inform classroom decisions. Interestingly, depending on the ideology of a hypothetical teacher, as presented on the questions, the teachers' stance about the question changed significantly in favor of pro-commonwealth and pro-independence teachers as promoters of the local culture and values.

Data suggest that the teachers' ideological beliefs might be a factor that informs whether they make their teaching methodology contextual and culturally relevant. Teachers believed that pro-commonwealth and pro-independence colleagues might be more capable of modifying the physics content presentation to make pertinent to puerto rican students. Also, closed-minded pro-statehood teachers are perceived as making some educational decisions based on their ideology, for example, being less critical of the textbook because it originated in the United States.

Given the characteristics of the study, several shortcomings are apparent. First, there was limited time available to carry out field interviews. All interviews were performed during the teachers' planning period or after class. This time constraint prevented the researcher from going into detail about each of the interview questions. Also, teachers were interviewed from different municipalities, so travel between one town and another took precious time. Another limitation might be the selection of structured interviews to collect one of the qualitative data components. Although structured interviews provided the researcher with a parallel structure from which all teachers' responses were analyzed, the shortcoming is their rigidity.

The fact that I am a Spanish-speaking, puerto rican physics teacher who has opinions about the textbook and ideas about public education, politics, society and culture in the Island turned out to be an important advantage. I have the knowledge to understand the educational, social, linguistic, and cultural specificities that a foreign researcher would overlook. However, it is possible that researchers with different experiences and knowledge about the puerto rican culture, society, politics, and education might develop alternate explanations based on the same data.

Overall the findings of this study are consistent with research on the relationship between teachers' beliefs and classroom actions. Teachers hold many beliefs and attitudes that affect their attitudes and behavior in the classroom (BRUNNING *et al.*, 2004). These beliefs include ideas about knowledge, context, and teaching itself. In this study, it was observed many teachers' presentation of physics content is guided by their beliefs about whether contextual and culturally relevant examples should be used when teaching physics, their perception about the quality of the translated physics book they use, and their ideas about the future political status of Puerto Rico. In some cases, the result is a physics course where many local examples are used. In others, the result is a by-the-book teaching of physics where the curriculum is not questioned critically. Only future research will tell which option, if any, is better for puerto rican high school students.

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Received: 07.02.2005/ Accepted: 3.04.2006