

PHONETICS AND PHONOLOGY ENGAGEMENT: EVALUATION OF A PRODUCTIVE DISCIPLINARY ENGAGEMENT APPROACH

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ABSTRACT

Students' engagement is defined as a meta-construct that includes behavioural, emotional and cognitive dimensions. This study assesses the levels of engagement in undergraduate Linguistics students taking the courses of Phonetics and Phonology. Informants were part of experimental and control groups. The experimental group undertook an 18-month pedagogical intervention aiming to introduce students to Laboratory Phonology by following an instrumental approach to phonetic study using electropalatography. Activities intended to foster disciplinary engagement by problematizing content, asking questions, and planning and carrying out investigations. Measures of Phonetics and Phonology engagement were taken from both groups through a survey comprising indicators of behavioural, emotional, cognitive and social engagement. Results obtained from both groups show that innovative pedagogical intervention seems to have had an impact on the students that undertook the intervention indicating that it had a positive impact on them.

Keywords: student engagement, productive disciplinary engagement, teaching Phonetics, EPG.

1. INTRODUCTION

When it comes to research on educational practice, student engagement is regarded as an important indicator to assess students' outcomes and dropout rates, among others [9]. Student engagement has been presented as a meta-construct that is composed of several dimensions [8]. There seems to be agreement in the body of literature on three dimensions: *cognitive*, *behavioural* and *emotional* (also referred as *affective* [13]).

Cognitive engagement is concerned with investment in learning, considering aspects such as being thoughtful, strategic, and willing to make efforts for comprehending complex ideas [9, 17]. Behavioural engagement studies participation, effort, attention, persistence, positive conduct, and the absence of disruptive behaviour [2, 8]. Finally,

emotional engagement looks at the extent of positive reactions to teachers, classmates, academics or school [4, 9, 15].

Recent research by Fredricks et al. [10] has called for the inclusion of a *social* dimension. This focuses on students' prosocial behaviour in classroom and the quality of interactions with peers around instructional content [7].

A wide body of research on engagement can be found at school level and higher education, but not so much related to specific scientific practices. In this sense, and as pointed out by Fredricks et al. [10], it is important to consider that most of research has looked at engagement from a general perspective rather than at engagement on specific areas. In consequence, more research in different contexts and levels of education and in specific subject areas is welcome, and so, novel perspectives that look at the proposed new dimensions (e.g. social).

This paper investigates the levels of engagement in undergraduate Linguistics students taking the modules of Phonetics and Phonology, areas where there is no-known research on engagement. The objective is twofold: first we seek to identify how engagement to Phonetics and Phonology can be permeated by a specific innovative approach to teaching. Secondly, we hope our research contributes to a better understanding on how engagement behaves in other specific scientific areas; namely, phonetics and phonology.

We address the issue by implementing a *productive disciplinary engagement* (PDE) approach to classroom practice [5, 6]. According to Engle and Conant [5], student engagement becomes *disciplinary* when "there is some contact between what students are doing and the issues and practices of the discipline's discourse". It has been proposed that a learning environment structured in a way in which certain pedagogical strategies are adopted can foster disciplinary engagement [5]. These strategies are (a) student problematizing of the subject matter; (b) authority to address content problems; (c) accountability to others responsive to shared disciplinary norms; and, (d) making resources available to students [5]. Engle [6] states that student

engagement is the core of PDE; for that reason, this research adopts such perspective by amalgamating both student engagement and PDE. Appleton, Christenson and Furlong [1] propose that student engagement is malleable; therefore, it has shown potential to be used as a target predictor when evaluating interventions. The latter view was also considered by developing a didactic intervention in which the major contemplations of PDE were embedded into classroom practice in order to evaluate its effects on students' engagement.

A last motivation is that Colombia, where this research was based, has a unique undergraduate programme in Linguistics. The country is linguistically rich, with more than 60 spoken languages including indigenous, creole and gypsy tongues. Many of these languages are understudied; therefore, any efforts made into the direction of evaluating student engagement to linguistic study would be highly appreciated.

2. METHOD

2.1 Participants:

16 students of Linguistics at university level participated as informants. Students were classified into two groups: 8 experimental and 8 controls. Participants in the experimental group were first-year students (mean age of 20.5) who would undertake the Phonetics and Phonology courses in the first and second semester of their programme, respectively. Control informants (mean age of 21.9) had undertaken the same courses during the two years immediately preceding the experimental group and had no special intervention. They did take the classes with the same professor as the experimental ones to ensure there were no other didactic dynamics (different from the intervention) which would interfere with students' perceptions. Because of the high dropout levels of this programme, it was verified with the registry office that informants in both groups were active students in order to rule out a broad disengagement to the area of linguistics.

2.2 Procedures:

The research was conducted as follows. First, a productive disciplinary engagement approach was designed by a Phonetics and Phonology professor to be incorporated as a sequential process within both classes. Then, after giving their consent, participants in the experimental group undertook the intervention for a period of 18 months. This was settled to take place while coursing first Phonetics and later Phonology (one semester each) plus an additional

semester of laboratory practice. Following the intervention, overall student engagement measures and also evaluations for each dimension of engagement (i.e. behavioural, emotional, cognitive and social) were taken. Results obtained from the two groups were compared.

2.2.1. *Productive disciplinary engagement innovative pedagogical intervention*

In order to problematise the subject matter and give students the opportunity to get involved into the scientific practice, as proposed by the PDE approach, the chance to work in a laboratory setting with electropalatography (EPG) was given to students in the experimental group. They worked with a dentist in the making of artificial palates and interacted with the software that can be used to record and analyse acoustic and EPG data.

EPG was chosen to be the centre of the pedagogical intervention since it would meet the needs of both courses from a scientific practice perspective. During the Phonetics class, by learning about the features and uses of EPG in speech research, students would reinforce basic concepts of phonetic theory (e.g. places and manners of articulation). Whilst in phonology, after being introduced to the methods and practices of Laboratory Phonology, students would be given the authority to problematize content by forming their own questions and propose a research project. To that end, the Laboratory Phonology approach was a perfect bridge to help students link their discussions on EPG methodology to experimental practice. This approach proposes that only with greater attention to fine detail in our empirical studies will we be able to develop adequate models to understand the complexity of phonological behaviour [3]. After having finished their courses, students attended laboratory sessions in which they could pilot their proposed research. At the laboratory, students had access to the actual sources involved in EPG research, and more importantly, they engaged in real scientific activities such as producing EPG palates for specific informants.

2.2.2. *Student engagement measures:*

Student engagement was measured by a survey that evaluated behavioural, cognitive, emotional and social engagement. After reviewing a series of past studies on engagement measurement (e.g. [9, 10, 12, 13, 16]), the survey proposed by Fredricks et al. [10] was adopted. The decision was made based on two major factors. First, the survey measures engagement in specific areas (math and science).

Second, one of the objectives of its development was precisely to determine if the items proposed were important indicators in other academic or scientific areas [9]. In order to evaluate the appropriateness of these items, three researchers and professors of linguistics were requested to review the content of the items. The researchers considered the items acceptable. After a final revision by the authors, a total of 35 items (11 behavioural; 10 emotional; 8 cognitive, 6 social) were included in the survey (see Appendix for illustration). Participants were asked to indicate their agreement to each of the 35 statements on a 6-point scale, with 1 for totally disagree, 2 for agree, 3 for more agree than disagree, 4 for more disagree than agree, 5 for agree and 6 for totally agree. High scores indicated high levels of engagement.

3. RESULTS

Prior to conducting the main analysis, we first checked the internal reliability of the instrument. Cronbach's alpha of the item scores was extracted using SPSS 25.0 [11] and a satisfactory level of internal consistency was demonstrated ($\alpha = 0,805$). Subsequently, and bearing in mind the ordinal nature of the data, we applied a normality test which confirmed responses were skew. As a result, the Mann-Whitney U test was conducted to test for significant differences between experimental and control groups. Finally, in order to describe the results in a clearer manner, the scale was condensed to three levels as follows: 1-2 represents low engagement (negative answers); 3-4 imply neutrality, and 5-6, indicate high levels of engagement (positive answers).

3.1. Overall results

Overall results showed that both groups had high levels of engagement. The majority of answers from both groups fell within the positive answer range, 85% experimental, and 73.6% controls (79.3% mean) which represent high levels of engagement in all informants. In order to test for the effects of the intervention, we compared the scores from both groups. A Mann-Whitney U test indicated that students' engagement was greater for the experimental group (Mdn = 5.19) than for the control group (Mdn = 5.02), $U = 35.212$, $p = 0.021$. Although all participants showed good levels of engagement, there is an important difference between groups. First, if we compare the positive scores, it becomes noticeable that the experimental group had a better response by selecting their answers on the higher scale 85% of the times,

compared to the 73.6% controls obtained on the same measure. Moreover, when we looked at the scores that represented neutrality (levels 4 and 5) it could be seen that the controls had a higher percentage of neutral answers 25.4% compared to the experimental ones; 12.9%, which shows control informants were somehow less engaged and more willing to give a neutral answer than their counterparts. Table 1 illustrates these results.

Table 1: Percentage of responses from both experimental and control groups overall.

		Experimental		Control	
1	Negative	0.4%	2.2%	0.7%	1.1%
2		1.8%		0.4%	
3	Neutral	1.1%	12.9%	5.0%	25.4%
4		11.8%		20.4%	
5	Positive	45.0%	85%	37.5%	73.6%
6		40.0%		36.1%	

It is important to mention that although both groups completed the survey at the same time, the control group had finished their phonetics and phonology courses earlier. Obtaining prior access to their answers was a limitation of this study and could account for the higher percentage of neutral answers given by control informants. Finally, although negative answers were very low in both groups, we hypothesize that the experimental group had a slightly higher percentage of negative answers due to the fact that they had to carry out a lot more extra work (lab practice and seminar readings) than their counterparts.

3.2. Individual dimensions results

For each of the dimensions, we found that all participants showed high levels of engagement. The social engagement dimension had the lowest score of positive answers with a mean of 70.85% for both groups. In contrast, the emotional dimension scored the highest, 88.6% mean for all informants. For the subsequent individual-dimension analysis, we left out inferential statistics measures because of the size of the sample. Table 2 (below) illustrates these results.

For the behavioural dimension, in charge of evaluating effort and persistence, positive scores were higher in the experimental group in respect to the controls by 11.4 points. Also, neutral answers were higher in the control group (27.3%) in contrast to the experimental informants (14.8%). For the emotional dimension, which looked at students' feelings while learning, again, the experimental group scored higher (91.3% positive answers) than

Table 2: Percentages of responses to questions in all dimensions from both experimental (1) and control (2) groups.

Response	Behavioural		Emotional		Cognitive		Social	
	1	2	1	2	1	2	1	2
1 - 2	1.1%	0.0%	1.3%	3.8%	3.1%	0.0%	4.2%	0.0%
3 - 4	14.8%	27.2%	7.5%	16.3%	10.9%	28.1%	20.9%	33.4%
5 - 6	84.1%	72.7%	91.3%	80.0%	85.9%	71.9%	75.0%	66.7%

control informants, who got 80% of positive answers, making it an 11.3-point difference. Additionally, neutral answers were higher in the control group (16.3%) with experimental scoring only 7.5% at this level. The cognitive dimension measured the answers were higher than the ones of the experimental group (28.1% vs. 10.9%). Lastly, the social dimension checked on informants' prosocial behaviour in classroom and the quality of their interactions. Positive scores were also higher in the experimental group in respect to the control by 8.3 points (75.0% vs 66.7%). Neutral answers were higher in the control group (33.4%) in contrast to the experimental informants (20.9%).

4. GENERAL DISCUSSION AND CONCLUSION

Results obtained from both groups show that the PDE innovative pedagogical intervention seems to have had an impact on the students of phonetics and phonology that undertook the intervention. Higher levels of positive answers for the experimental group compared to the control ones, both overall and at each of the individual dimensions, seem to support this claim. One fact that appears of salient importance to us is that independently of engagement levels being already high, these can be taken to a deeper level by means of implementing a pedagogical practice that is focused on scientific experience, such as the PDE approach [5, 6].

With regard to the individual dimensions, results concord with what was found at the general level. At each of the dimensions, we identified a positive impact after the intervention; however, different levels of permeability were observed. The one dimension that reached the deeper levels of positive answers was the cognitive one, with a 14-point increase difference. Bearing in mind that the PDE approach seeks to problematize the subject matter and gives students the authority to address content problems, it seems feasible, and comes as no surprise that the cognitive strategies adopted by students during the learning process took on the biggest impact. Conversely, the social dimension had the lowest rankings of positive answers for both groups. Moreover, it showed the lowest increase in the answers of the experimental group in respect to

the control participants. The reason why this is so is still of great interest to us and should be the focus of future research. In the light of the results, we suggest that the social dimension should continue to be measured within the construct to further investigate its impact by correlating it to external factors and to the other dimensions.

Concerning students' engagement in other disciplines, the full-scale item measure showed internal reliability in our research and the results obtained from each of the subscales also seem consistent. This suggests that the survey items proposed by Fredricks et al. [10] to measure students' engagement in math and science can be adapted for other disciplines and, seemingly, at other levels of education. We are in the process of taking more students to the laboratory to pilot their EPG projects so that we can retest the present results, for both the full scale measure and each of the dimensions in the light of a bigger sample.

Finally, we wonder about the role EPG played within the intervention. EPG was chosen, firstly, because of its practical nature and its ability to adapt in an interesting manner to the proposed laboratory practice. Secondly, because it clearly illustrated how phonetics and phonology bond within the Laboratory Phonology frame. We wonder whether similar results could be obtained if choosing other instrumental techniques.

5. APPENDIX: ITEMS ILLUSTRATION

Behavioural: I don't participate in class (Reverse coded); **Emotional:** I often like to be challenged in phonetics and phonology classes; **Cognitive:** I try to connect what I'm learning to things I've learnt before; **Social:** I try to work with others who can help me in phonetics and phonology classes.

6. ACKNOWLEDGEMENTS

This research was supported by Universidad Nacional de Colombia: Dirección Académica and Dirección de Investigación y Extensión - Sede Bogotá. We thank Rafael Gutiérrez and Joan Gutiérrez for their research assistance and also the anonymous reviewers for their insightful feedback.

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