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Educating Through Inquiry in Initial Teachers Training

Adevailton Bernardo Santos [1] https://orcid.org/0000-0002-3918-4201
[1] Universidade Federal de Uberlândia

ABSTRACT

Nowadays science and technology are evolving at a great speed, but the implementation of discussions about these developments in Basic Education do not evolve in the same way. The main problem is the difficulty of teacher training to overcome the simple reproduction of information, quite often within a classical context, and encourage students to education through inquiry. This text reports didactic activities, in initial teachers training, based on the proposal of "educating through inquiry", and the results of a research carried out in this context, aiming to understand students' conceptions about the proposal and the future perspectives of its use. The research used a methodology based on the content analysis of the open answers of the students who concluded the subjects, obtained through a questionnaire applied in an online platform. The results indicate the future teachers have a positive view on the use of the research in the activities to be developed in Basic Education, and pointed out the possibility of using similar activities in their future practice. The final analysis shows a positive evaluation of the activities carried out and pointing to the fact that future teachers have better perspectives to use and carry out research in their future teaching practices when it permeates their training process.

KEYWORDS

Teacher education. Research methods. Teaching methods. Education through inquiry.

Corresponding to Author
[1] Adevailton Bernardo Santos
E-mail:adevailton@yahoo.com.br
Universidade Federal de Uberlândia, Uberlândia, MG, Brasil
CV Lattes
http://lattes.cnpq.br/1605668451459011

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RESUMO

No mundo atual a ciência e a tecnologia evoluem em velocidade cada vez maior, apesar das discussões e aplicações destas evoluções na educação básica não terem a mesma rapidez. A problemática que se coloca é a dificuldade de formar professores que superem a mera reprodução de informações, muitas dentro de um contexto clássico, e passem a utilizar metodologias que incentive os estudantes a uma formação pautada na pesquisa. Este texto relata atividades didáticas, em um curso superior de formação inicial de professores, alinhadas na proposta de "educar pela pesquisa", e os resultados de uma pesquisa realizada neste contexto com objetivo de buscar entender as concepções dos estudantes sobre estas atividades e as perspectivas futuras de seu uso. A pesquisa realizada utilizou metodologia baseada na análise de conteúdo das respostas abertas dos estudantes que concluíram as disciplinas, obtidas por meio de um questionário aplicado em plataforma online. Os resultados indicam que os licenciandos passaram a ter uma visão diferenciada sobre o uso da pesquisa na educação básica, e veem de modo positivo a possibilidade de utilizarem atividades semelhantes na prática futura. A análise final mostra uma avaliação positiva das atividades realizadas e aponta para o fato que os futuros docentes têm perspectivas melhores de utilizar e realizar a pesquisa em suas futuras práticas docentes quando ela permeia seu processo de formação.

PALAVRAS-CHAVE

Formação de professores. Metodologia da pesquisa. Metodologia de ensino. Educar pela pesquisa.

Educar por la Investigación en la Formación Inicial de Profesores

RESUMEN

En el mundo actual la ciencia y la tecnología evolucionan a una velocidad cada vez mayor, pero las discusiones y aplicaciones de estas evoluciones en la educación básica no tienen la misma rapidez. La problemática que se plantea es la dificultad de formar profesores que superen la mera reproducción de informaciones, muchas dentro de un contexto clásico, y pasen a utilizar metodologías que incentive a los estudiantes a una formación pautada en la investigación. Este texto relata actividades didácticas, en un curso superior de formación inicial de profesores, alineadas en la propuesta de "educar por la investigación", y los resultados de una investigación realizada en este contexto con el objetivo de buscar entender las concepciones de los estudiantes sobre estas actividades y las perspectivas futuras de su uso. La investigación realizada utilizó metodología basada en el análisis de contenido de las respuestas abiertas de los estudiantes que concluyeron las asignaturas, obtenidas por medio de un cuestionario aplicado en plataforma online. Los resultados indican que los licenciandos pasaron a tener una visión diferenciada sobre el uso de la investigación en la educación básica, y ven de modo positivo la posibilidad de utilizar actividades similares en la práctica futura. El análisis final muestra una evaluación positiva de las actividades realizadas y apunta al hecho de que los futuros docentes tienen perspectivas mejores de utilizar y realizar la investigación en sus futuras prácticas docentes cuando ella permea su proceso de formación.

PALABRAS CLAVE

Formación de profesores. Metodología de la investigación. Metodología de enseñanza. Educar por la investigación.

People's daily lives have become increasingly dependent on science, technology and information. The rapidity with which scientific information is produced, transmitted and incorporated into society is visible, many of them without at least having its seriousness and veracity verified.

Currently, the population has easy access and consultation to a huge amount of information, mainly due to the scientific and technological evolution of the informational tools. Basic Education students, mostly young people, mainly because of their greater curiosity and predisposition to innovations, use these tools at great intensity. To get an idea, Tas (2008), in a text about new informational tools, emphasizes that for a good use of these tools it is necessary to observe the children and makes a historical context about the speed that the changes have been taking place:

> ... how long each media, throughout history, took to reach 50 million users. The phone, for example, took 74 years to reach 50 million users; the radio, 38 years; the personal computer, 16; the television, 13; the mobile phone, 5; the World Wide Web, the graphical internet, 4 years, and Skype, only 22 months. Thus, society increasingly assimilates new media and communication tools. That is, each time a new tool is launched, it reaches a crowd of 50 million more quickly. (TAS, 2008, p. 203)

The issue that arises from these considerations is that basic school, especially the part related to teaching Natural Sciences, cannot keep up with the way in which science and new technologies evolve and become part of students' daily lives. On the other hand, mainly because of the amount of new knowledge, it is almost impossible to execute a curriculum that addresses all parts of the information that is constantly produced. So, the school, in its practices and methodologies, often fails to keep up with the speed of innovation, it lags behind in content and information. One possible and important impact that can be produced is the loss of interest in formal education on the part of the students, who are discouraged in relation to the school, and in many situations do not build the necessary knowledge.

With an aim to improve basic education, especially considering Natural Sciences, Demo (2014) proposes an approach that considers science education as part of the student's education. The proposal, called "Education through inquiry" (GALIAZZI & MORAES, 2002; DEMO, 2014), is based on educating through research, while researching education, and being able to motivate the construction of authorship and autonomy in both teachers and students, "in such a way that the formative process is generated in the process of knowledge construction itself" (DEMO, 2014, p.11). According to the author, for the proposal to succeed, certain conditions are necessary: 1. Educational institutions should favour teaching approaches that are not instructional and reproductive; 2. Particular attention should be paid to the teacher, especially in the training and professional development; 3. The school should be able to produce knowledge, similar to research laboratories; 4. Students should be trained to become researchers. The author has a sentence that is presented as a summary of the proposal: "research begins in childhood and not in the master's degree" (DEMO, 2014, p.14). It is important to relativize scientific production for each level of education, and it is

necessary to have a basic school education that encourages students' curiosity and builds the necessary knowledge to enable the search and critical analysis of information, as well as the construction of hypotheses, answers and arguments.

In a similar discussion but considering the development of research projects in basic education and focusing on the presentation of science fairs, Santos and Nascimento (2014) indicate that activities that lead students to produce knowledge and authorship of texts contribute to training, including the evolution of society facing scientific and technological advances.

Another important consideration in this discussion is a problematic characteristic of the initial teacher training for basic education, which Pimenta and Lima (2012) point as "imitation of models". The authors, from the perspective of the internship module and informing that this form of training is not sufficient and it is limited, mention that the teacher's professional practice, similar to several other practical activities, has a way of learning according to the perspective of imitation. In agreement with this point of view, Bonadiman and Nonenmacher (2007), in a study related to the initial formation of physics teachers, mention that the teachers, mainly the graduate ones, teach as they were taught and not as they are told to teach, reproducing the content they learned in their regular school as it gives them greater safety in daily practice. The same authors point out one side of the issue:

> In this perspective, our understanding is that, in the initial training of the teacher, the simple fact of being discussed certain methodological procedures, unrelated to the pedagogical practice applied to the specific contents, although important and necessary, would hardly give the future teaching professional the security to implement them in the classroom. (BONADIMAN e NONENMACHER, 2007, p. 200).

From the mentioned discussions and references, mainly considering the fact that the incorporation of scientific and technological evolutions in teaching curricula is not fast, and that the proposal of "Education through inquiry" can contribute significantly to the improvement of pedagogical approaches in basic schools, but which requires special attention to initial teacher training, where one of the problems is learning through "imitation of models", the following question arises: How to act in the undergraduate courses of higher education so that different pedagogical approaches from the traditional ones, such as the proposal of "Education through inquiry", can be more effective in basic education schools? The answer to this question is not unique and it is not simple, but one feasible, and perhaps one of the best possible approaches, is that the lectures and activities of the undergraduate course of teacher training add teaching approaches different from the traditional ones and focus on teaching through research. Lectures of undergraduate courses, including those working in both specific technical knowledge and pedagogical training modules, should not only discuss methodologies, theories and practices that the future teacher can base him or herself, but also incorporate pedagogical approaches that are different from the traditional ones, in their daily practice.

The question of the above paragraph guides the report of this paper, which is divided into two parts: 1. Description of didactic activities in a physics undergraduate course based on the proposal of "Education through inquiry", as well as the difficulties found and the results obtained; 2. Description of a survey related to these activities, which aims to identify the perceptions students have built about the pedagogical approach used, and whether the use of this proposal is capable of generating changes in future teaching practices.

Implementation of the Proposal to Educate by Research in Higher Education

The didactic activities that will be reported in this paper are based on the proposal of Galiazzi and Moraes (2002). The authors cite in their study activities that are implemented through the use of a research cycle constituted by questioning, argumentation and validation; being that the principles addressed and defended are autonomy to learn how to learn, the exercise of writing to think and evaluation by the students' production.

Here we will report three moments corresponding to modules of the undergraduate course of physics: 1. In the first semester of 2014, in a module called Integrated Project of Educational Practice (PIPE), with the whole class involved in a project addressing the problem of teaching modern physics in high school. 2. In the second semester of 2014, again in a module called Integrated Project of Educational Practice (PIPE) and with the whole class involved in a single project, but now addressing the issue around the criteria that are used by teachers for the selection of physics contents that will be taught. 3. In the first semester of 2016 in a module called Research Methodology, now with the simultaneous development of several projects having as a requirement a relationship with the discipline of physics.

This procedure is consistent with what Galiazzi and Moraes (2002) report in the proposal of "Education through inquiry", which says that it can be implemented in several ways, and gives three examples: 1. Involving the whole student group in a single project; 2. In the simultaneous development of several research projects in smaller groups; 3. Dividing a theme among the students, each of them having to research and put their study of a specific part up for questioning from the whole group.

1st report

This report refers to the Integrated Project of Educational Practice (PIPE) module, taught in the first semester of 2014, in the undergraduate course of Physics. The module is part of a group of 6 similar disciplines that are developed with different themes. This specific case involved the PIPE V discipline, addressing the theme of teaching Modern and Contemporary Physics (FMC) in basic education, with 13 students participating until the end of activities. The whole module was directed to the production of a single research project, its execution, the analysis of the results and the writing of a text. These activities are related to the research cycle, according to Galiazzi and Moraes (2002), constituted by questioning, argumentation and validation.

The activities began by reading texts on Modern and Contemporary Physics teaching in basic education, the focus of the discipline, and in a second moment were made discussions and defined the question that would be used in the research activities: "What are high school students' conceptions about Modern and Contemporary Physics?". The following meetings were devoted to writing an initial text on the research subject and focus of the discipline, and the elaboration of the research project. Next, the research instrument was developed (questionnaire) and defined that each graduate student should obtain answers from at least three high school students of free choice. After obtaining 43 responses from high school students to the questionnaire, the results were compiled and the data analysed. Finally, an article was written with the participation of the whole group, being the same presented in an event of national scope. (SANTOS, A. A. M. *et al*., 2015).

The results, in addition to confirm what the literature reports, pointed to previously unknown information, such as the fact that most students are unable to name important scientists associated with Modern and Contemporary Physics, and perhaps, due to the way in which teachers usually present physics content in elementary school, consider Isaac Newton a modern and contemporary scientist. With the result, the undergraduate students had close contact, and in a practical way, with information that they had previous Avaliable only in papers of other authors or by information of the lectures about the problems involved in teaching modern and contemporary physics.

2nd report

Again, the activity was implemented in the Integrated Project of Educational Practice (PIPE) module in the undergraduate course of Physics, but now the content of the module was related to the practice of the physics teaching in basic school, more precisely electromagnetism. In this case, the module was PIPE IV and the theme of the research project elaborated was to investigate which criteria are used by practicing teachers for the selection of physics contents. It was delivered in the second semester of 2014 and had 13 participating students until the end of the activities. It is reported that the students are not the same as the one mentioned in the first report.

Differently from the first report, the elaboration of the project had a longer discussion, with more time applied, since the contents of the module were broad and allowed a greater freedom of choice of the problematic to be approached. The texts that were read and discussed initially addressed more diverse topics, such as initial conceptions in electromagnetism, use of textbooks and didactic transposition. The following activities were performed in a similar way to what happened in the first experiment, except for the subjects of the research, who were now practicing physics teachers. Twenty-six responses to the questionnaire were obtained, and again a text, in scientific article format, with the results and analyses was elaborated. The work was presented in a national event in an expanded abstract format (SANTOS, A. B. *et al*., 2015).

In addition to the fact that the undergraduate students developed and discovered knowledge about what the practicing teachers use as reference in the selection of physics contents, this experience had an interesting result for the teacher training: during the discussion of the papers and the elaboration of the project the undergraduate students hypothesized that most teachers would use the National High School Exam (ENEM) as a criterion for the selection of physics content. However, the results pointed out that most teachers working in public schools use official documents, such as National Curricular Parameters (PCN), and only private school teachers prioritize the selective exams. In the final discussion, the graduates realized that the research results pointed to the fact that there is not much space for teachers to ponder their opinions in the curriculum content choices, and most of the time, there are external rules (official documents or selective processes) that are followed when selecting the contents that will be taught.

3rd report

The activity was developed along the research methodology module, of the undergraduate course in physics. It was taught in the first semester of 2016, had 27 students who completed their activities, and the methodology favored work in smaller groups, which led to the elaboration of six research projects, together with their respective executions, analysis of results and the preparation of texts. The main requirement was that the theme of the project had to be related to physics. Two of the projects were given practical laboratory classes; a third project dealt with the scientific knowledge of university students; there was a fourth project addressing the teaching of astronomy in early grades; a fifth project addressing a comparative study of the curricula of physics courses from the Preliminary Course Concept (CPC) notes; and a final, sixth project, addressing the difficulties of teaching physics faced by teachers who work in the Teaching of Youth and Adults (EJA).

The course program was developed in four parts: 1. Presentation of norms and rules for the elaboration of scientific texts and theoretical references for the elaboration of scientific research, including discussions on the development of research projects in basic education; 2. Definition of the topic to be researched, search and reading of theoretical references associated with the research question and the writing of a research project; 3. The execution of the research project elaborated with the consequent analysis of the obtained data; 4. The writing of a report or an article about the research carried out. These activities, as well as previous reports, are related to the research cycle, according to Galiazzi and Moraes (2002), consisting of questioning, argumentation and validation.

The studies produced were evaluated by the professor, by the students of the class and by the authors themselves in a self-evaluation practice. From the evaluation there was an incentive for the results, in article formats and after the appropriate adjustments, to be submitted for presentation at scientific events. As a result, two of them were approved and the articles, after corrections and considerations, both of the professor of the discipline and of the scientific committee of the event, were published (ANDRADE *et al*., 2017, MELO and SANTOS, 2017). Finally, one of the papers was presented at an event at the institution and

there was no publication in proceedings (9th SEFIS - Physics Week of the Federal University of Uberlandia).

Reports' analysis

The execution of the modules using the proposal of "Education through inquiry" was considered successful, and proved effective so that the principles listed by Galiazzi and Moraes (2002) - autonomy to learn how to learn, the exercise of writing to think and evaluation by the production of the students - were implemented and guided the actions. The results obtained in the three cases were object of reports in articles, both in full texts and in expanded abstracts, which after external evaluations were approved for publications in external scientific events and internal at the institution, confirming the success of the methodology and the activities carried out.

Despite the positive evaluations of the activities performed, some problems were detected and it is necessary to report some observations. Since the studies and research projects elaborated in the modules were objects of group activities, some students did not participate in an effective way, being noticed several manifestations about this fact. Still considering that the studies were carried out in groups, it was noticed that some texts, especially those that were elaborated in the beginning of the discipline, had characteristics of "patchwork quilt", since each student elaborated a part and the group only got the different parts together when writing the final text, without observing continuities and concordances. Both issues, objects of evaluation during the process and carried out in a continuous way, were discussed with the class and solutions were created, which resulted in new postures of some students, so much that the final texts already had an organization very different from the initial ones.

The evaluations of the modules were carried out at the end of each activity and in a procedural way, including possibilities for adjustments, followed by reassessments when necessary. It emphasizes that, due to the fact that they were formal curricular subjects, it was necessary to assign a quantitative value to the evaluations, and thus the evaluation practice included the presentation and discussion of the evaluation value with the students after four stages: consultation, discussion preparation of an introductory text on the chosen topic; construction of the research project; execution of the project and analysis of results; construction of the final text in scientific paper format. This form of evaluation was adequate, and no problems were registered that could not be solved during the modules.

Finally, it is important to note that a few students, perhaps accustomed to traditional practices, were not effectively involved in the activities, including criticizing the professor "who did not explain the subject", and some of them would complete the module only with enough grade to pass. What can be deduced and commented is that these few students were not sensitized by the proposal, and thus did not take advantage of what can be considered one of the goals of the activities, that is making students become protagonists of their own learning.

Survey on the Activities of the Proposal to Educate by Research in Higher Education

The research was conducted with students who participated in the activities of the three modules reported above. The objective of the survey was to verify the students' perceptions of the pedagogical approach based on the proposal of "Education through inquiry", and whether the implementation of this proposal can generate possibilities for changes in future teaching practices.

The research was carried out through online questionnaires, with discursive questions, in a platform of forms available in the internet network, in free mode. A questionnaire was elaborated for the students of the PIPE classes (1st and 2nd reports) and another one for the students of the Scientific Methodology module (3rd report). The forms with the questionnaires were sent by e-mail to all students who participated in the activities of the subjects, and their response was voluntary. The number of responses obtained was six for PIPE V (1st report), three on PIPE IV (2nd report), and 11 for the research methodology module (3rd report).

Opinions and considerations were asked in a way that privileged the person's possibilities when responding to them to describe their perceptions about the learning process. The questions were:

1. Describe your opinion about the methodology (construction and execution of a research project) used in class.
2. Does conducting research during the course of the module, as an integral part of it, motivate student participation? State your opinion.
3. In the case of the study that was performed during the module, the question that problematized your research was adequate and related to the undergraduate course in Physics? Explain your answer.
4. At the end of the module, did your research result offer any information you did not know? Describe your experience.
5. What reflection do you make on the influence of the research results of your professional training?
6. Do you consider yourself able to use a similar methodology during class as a teacher of basic education? Justify.
7. In your opinion is it possible to carry out research projects in basic education similar to that developed in this module? Justify.

For the analysis of the answers it was used the qualitative analysis perspective, by content analysis, based on a categorization process as described by Bardin (1977). The process involved: first performing a reading and a pre-analysis of all the answers obtained; then, from what was obtained, categories of analysis were assembled and the material was

properly separated; and lastly, analysis and discussion were carried out. The categories listed were:

1st category: evaluation of the modules by the undergraduate students

The assessment of the modules in almost all the answers was indicated as positive. There were indications of the difficulties of working in groups and the difficulties related to the fact that some of the activities were carried out outside the classroom, but without mentioning facts that disturbed the learning or the methodology used.

About the coherence and importance of the proposal stands out some statements:

> *The methodology used was in a "ladder" mode. We begin by understanding what a research project is and how it is done. The initial focus was to identify which question we wanted to answer with the project. Following the creation and application of the questionnaires. And lastly analysis. What is important is to understand that in order to do a research project, it is necessary to study and understand what we really want from it. The methodology that was used in class, sometimes I found it boring, but today more mature, I understand that it was necessary for students to really understand how each stage works. PIPE V student (1st report).*
>
> *Very important for my training. Writing the article together made it possible to know a little more about research methodologies, structure of an article and to know more about the subject. PIPE V student (1st report).*
>
> *The methodology used was coherent, since initially we held some in-class discussions about the survival of knowledge and didactic transposition, to then define the problematizing question that would guide the research, and then develop the questions that would be asked for the teachers, the research project was being developed in stages until reaching the final objective that were the results. PIPE IV student (2nd report).*
>
> *It is of great importance that we perform the research in stages as it was done. We can learn more easily how to know what it is and to be able to apply it by conducting research. Research methodology student (3rd report).*

The answers and transcribed statements point to a positive evaluation of the methodological proposal used in the development of the modules. It is still noticeable the coherence with the methodology of "Education through inquiry", and how the presence of the cycle questioning, argumentation and validation was perceived by the students, mainly in the possibility of influencing positively in the process of knowledge construction (GALIAZZI & MORAES, 2002).

While carrying out the reported activities, in addition to the future teacher's learning about the discipline contents, it was also expected that there would be mobilization of knowledge that would enable the perception of pedagogical practices based on research. When the graduates identify and report positively the work done, it is possible to infer that a

step in this direction was given. Impossible to predict future impacts, however, if there is predisposition to use similar methodologies, even if it is considering the so-called "model imitation", as Pimenta and Lima (2012) cite, the feedback is positive.

2nd category: argumentation and validation of the work done

Several answers were given on the construction of arguments for describing the knowledge coming from the research carried out, mainly related to the initial questions, this being the object of the research carried out by the students throughout the disciplines. There are also descriptions that depart from the published article, showing that the evaluation by a scientific committee of an event helps to assure the arguments presented.

> *Many (teachers) have an interest in FMC (Modern and Contemporary Physics) topics, however, in the way that high school is taken in public schools, it is rare how much they discuss about. In short, as was done by undergraduate physics students, I believe that it was important for those who intend to practice the profession to think about the situation and try to do our part and not fall into the professional ease of teaching only what you think you should teach . PIPE V student (1st report).*
>
> *(The paper) Very well summarized all the discussion and results that we analyzed during our meetings. It also focused on the most important part, which is the fact that large-scale exams for access to higher education define the main content (SIC) to be worked in the classroom. PIPE IV student (2nd report).*
>
> *In my research, I found that students who were less motivated during high school in exact sciences were the ones who acquired the most taste for these areas of practice. I found it cool to get totally unexpected information. Student of research methodology (3rd report).*
>
> *Increased my ability to argue about famous "common knowledge" or even seek to know the reality of the students before. Research methodology student (3rd report).*

Perhaps the process of argument elaboration is the strongest link for effective knowledge building. The answers indicate that at the same time that the knowledge about the subject, object of the work carried out in the discipline, was elaborated and constructed, opinions, both on the problem studied and on possible professional impacts, are now being expressed. Although the testimonies do not allow to evaluate, it is possible to create hypotheses that these opinions are expressed with greater certainty, mainly because they are based on results of researches and own works, instead of readings and discussions of texts realized by third parties.

The methodology allowed that new knowledge was constructed and confronted with hypotheses that were cited and information that was present in publications previously referenced. This fact places students as active agents of their own learning, as well as generating conditions for them to become authors of information. Considering the large number of informational tools available to students of basic education (TAS, 2008), this

methodology has great potential for promoting interesting forms of integration, from the search for references, such as publication and dissemination of results.

3rd category: future professional practice

The fact that the reports make reference to future professional practice indicates that the results have been object of reflection by the students and agrees with the phrase: "disappearing the students-objects and emerging the participants-subjects." (GALIAZZI & MORAES, p. .239). Some notes in this sense are significant:

> *Some information resulting from the research was already expected. However, the research reinforces the need for future physics teachers to seek their autonomy in the classroom, since it is the teacher who identifies the deficiencies of students in certain areas of knowledge and can offer improvements in situations of this type, making use of certain methodologies. Student of PIPE IV (2nd report).*

> *The research has improved the way I see the influence of a teacher. It showed me how we are influential in the students' lives, and that made me better think about the posture in class. Student of research methodology (3rd report).*

These statements point to the change in the posture of the graduates, mainly from the position of simple reproducers of examples, which Pimenta and Lima (2012) calls "imitation", to professionals who reflect on their practice and have a differentiated view on the importance of teaching, including quotes about teacher - student relationship.

The graduates who answered the questionnaires pointed out that they would be able to use similar methodologies in their future classes in basic education, but in some cases, they also reflect that it would not be simply a repetition, and that they would consider other factors for the decision of use it. This detail shows the presence of learning by "imitation", but also the overcoming of simple imitation in order to optimize a model.

> *I believe that I have qualities that are required to develop something like that. But it would take a daily life at a school to understand the right time or how much it would be possible to apply. Student of PIPE V (1st report).*

> *I believe that the number of Physics classes are very few to have to approach Physics and still develop a research project. However, I believe it would work if at least the last two years of high school were used, for example by presenting a theoretical approach on what a research project is, what its purpose is and the constituent elements of the project in the 2nd year and then in the 3rd year, the methodology, the theoretical reference and carry out the construction of a project itself. Student of PIPE IV (2nd report).*

> *Yes, it is not only possible, but it is also necessary. Given the situation in which high school is nowadays in our country, teachers are required a great capacity for innovation in methodologies in order to overcome the difficulties found in the classroom. So in this perspective, research becomes a matter of extreme necessity. Student of research methodology (3rd report).*

The statements, especially the last one, seem to indicate that, apparently, the process experienced by the activities carried out, provided some security for future practices to be implemented. This is a step in the direction of Bonadiman and Nonenmacher (2007), when they mention that teachers, especially the graduate ones, use in their classes the methodologies that give them safety, especially those that they have experienced in their training process.

Still considering the fact that the methodology encourages reflection and a critical and political formation, some statements from students of the research methodology discipline (3rd report), when asked if they would be able to use similar methodology in classes in basic education, reported some difficulties:

> *Not yet. Because it demands a lot of knowledge. If I tried right now it would not be different from other teachers who give classes based only on their conceptions. For this I will seek more scientific texts. But it has already helped to guide me for future knowledge.*
>
> *I'm not sure. I have not yet had contact with a classroom, so I have no idea of the challenges involved in applying a similar methodology for other aspects of knowledge. However, I do not believe that the critical point is to apply to students of basic education, but to apply to the teaching of optics, or radiations, or universe for example.*
>
> *Sometimes, but it would lack the time and maturity of the students to conduct a full research as we did.*

What the undergraduates' statements show, although some of them also point to difficulties, is a concordance with the use of the proposal of "Education through inquiry" in the initial teacher training (GALIAZZI & MORAES, 2002) and its use in basic education DEMO, 2014), mainly seeking the training of research students. It can be noted in several excerpts from the answers to the questionnaires, speeches that refer to a better training when using research as a driving element of the teaching and learning process. Strengths to be highlighted are: obtaining a higher quality training, both in the aspect of the formal disciplines and in the aspect of citizen training; students becoming authors of their own knowledge and their own formation; importance of collective and participatory work; implementation of the cycle of questioning, argumentation and validation.

Final Considerations

The proposal to educate by research is a good alternative for implementation as a teaching methodology for initial teacher training in higher education courses. It is noted in the reports and the survey, that the undergraduate students have a good acceptance of different proposals besides the traditional ones and even with some resistance, provide high performance. Undergraduates also point to the possibility, despite some difficulties, of using similar activities in future practice. The positive impact on the training is seen in the increased ability to (re)construct arguments, the reflections on training and their future

professional activity, the ability to talk and put the student in a participant perspective and the perception of research as an important way to positively improve basic education. It is also important to point out that this methodology, when implemented in activities in basic education, besides encouraging students to produce knowledge, can help to reduce the difficulty that the school has to keep pace with scientific and technological developments, and consequently have a curriculum more modern and embracing.

This paper indicates possibilities of acting in the undergraduate courses of higher education, mainly having the research as the main driving force, in order to incorporate pedagogical approaches different from the traditional ones, mainly bringing out the role of the basic education teacher in the formation of future researchers.

The result of this research on the use of the proposal seems to indicate a concordance with that proposed by Demo (2014), and may constitute a way for teaching, including basic education, to approach research and collaborate with scientific development nationally. It is important to mention that the results of the researches carried out during the activities in basic education schools can be published and presented in a similar way as those reported in this paper. There are several scientific events aiming this purpose as mentioned by Santos and Nascimento (2014).

An important reflection is how to act so that more teachers of higher education courses use research in their curricular activities. What is idealized, even though it is not the focus of the research carried out, is that the theme is also the subject of continuous training, especially for professors who work at the initial teacher training, so that other initiatives and studies are developed.

Finally, modules planned in the methodology of "Education through inquiry", besides building a space for future teachers to experience professional activities that surpass traditional perspectives, allow reflection about their training process and about possibilities of future professional actions.

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