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Interrogating Dilemmas in the Primary Level Science Classrooms in Ireland: Outreach and Education

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1. Introduction

In this day and age, science has become economically very important. The European Union (EU) and different EU countries, such as Ireland, stress that science and technology graduates are fundamental for economical growth. Consequently, it is being stated the need for further action to encourage students to pursue science degrees [1], [2]. One way in which this is being pursued is through informal science programs, henceforth denominated as science outreach programs, designed predominantly by Universities and other organizations, e.g. Industry, for primary and second level students [3], [4]. Recent reports highlight the potential that science outreach can have in improving student engagement in science and also as a direct vehicle in assisting science education in the classroom [5], [6]. This valuable partnership between schools and science outreach providers [1] [7] cannot be overemphasized, and as such forms the basis of this research. This research aims to analyze the critical reflections and proposed solutions from both classroom teachers and science outreach practitioners, in response to dilemmatic cases that they face at primary level, when developing inquiry learning activities.

2. Introduction

Changing science education to make it more engaging and meaningful for students is not a new objective. Models that favored inquiry learning instead of a transmissive model have existed for decades now [8]. Since then, inquiry learning has been exhaustively researched and different models developed [9].

In recent years, a decline in the number of students taking science has been identified as a concern [10], with Ireland not being an exception [11]. Henceforth, there has been a renewed call for change in science education, and as a response, a move towards inquiry-based learning methods [12], [1]. This is in line with science curricula and standards in several countries, including Ireland [13], [14], [15]. Nevertheless, inquiry-based learning strategies have yet to popularize in terms of teaching practices in Ireland, where teachers continue to rely on the transmissive method of teaching [16], [17]

The lack of support for science teaching is even more pressing at primary level. The majority of primary level teachers in Ireland do not have a background in science [18]. Adding to this, the science curriculum at primary level has less than ten years of existence, with a large number of the practicing teachers not having professional development in science education [19]. The difficulty in long term change towards inquiry learning is not an isolated Irish problem and it is well reported in the literature [9] as are primary teacher's challenges in implementing meaningful inquiry learning [20], [21].

With the widespread calls for change in science education, the number of science outreach programs for primary and second level students, developed by Universities and other organizations, are increasing [4], [6]. These outreach programs have been argued to have the potential to bring more inquiry based learning to science education [23], [24] and increase interest in science, i.e., to be a catalyst in changing science education [1]. Stocklmayer, Rennie, & Gilbert [7] argue that science outreach, if incorporated into daily school work, can foster a third space in science education, one in which the formal school science and these informal programs merge, thus improving science education for students.

In spite of the positive effects argued, problems in science outreach have been identified. One of the reported issues is that outreach practitioners are often not aware of what happens in a classroom and of curriculum content/sequence, and therefore see themselves as not having the skills/professional development to deal with the students [4], [22]. This study will focus on exploring this issue, as it is argued that in order to contribute adequately to the creation of a third space, science outreach providers need to further develop connections with the curricula and schools.

Although there are concerns regarding student engagement and teaching methods, at both primary and secondary level, the author chose to focus on primary level for three reasons. Firstly, the literature shows that by the end of primary level education, most pupils have already ruled out science as a future career choice [25]. This is, therefore, considered a core time to motivate students for science [1]. The second reason has to do with teacher training/professional development in science

education, or lack of, creating a valued opportunity for science outreach to intervene. And finally, there is already a great number of science outreach programs designed specifically to target the primary level students in Ireland [3], so suggested changes from this research could result in a substantial impact.

3. Research Questions

- What conceptual and pedagogical challenges do teachers and science outreach practitioners face in the primary level classroom when developing an inquiry learning hands on curricular approach?
- What are the different solutions primary level teachers and science outreach practitioners offer to address these challenges?
- What is the reasoning and belief system behind the various solutions presented?

4. Research Design and Methodology

The research method used builds on previous research which used classroom and dilemma cases to investigate challenges faced by teachers [26], [21]. This previous research focused on having teachers illustrate and explain dilemmas they face in practice [21]; or on the analysis of selected dilemmas throughout a methods course [26]. In the case of this research, the methodology will involve presenting contextualized and specific dilemmatic cases to teachers and outreach practitioners. The cases will follow the classic definition of dilemma in which two conclusive arguments will be presented against an opponent [27]. Through an interview process, the choices made and reasoning behind them will be pursued. Dilemmas have the potential of producing contextualized reflection [21] as the dilemma framework can lead the research participants to interrogate their own beliefs and question institutional routines [28]. The use of dilemmas, and the method of confronting practitioners with them, stems from the fact that this study follows a dialectical approach. This research will aim to unravel the tensions and contradictions faced by practitioners, when having to make choices during their practice in science education and outreach. The dialectical view presented in this research is one which acknowledges the fact that new knowledge is a constructed synthesis which resolves the inevitable contradictions arising during the course of interactions between individuals and their surrounding environment [29].

The dilemmatic cases will be based around inquiry learning/hands-on type classroom situations, taking into account dilemmas reported by primary level teachers in the literature, and from the curricular guidelines. As science outreach is becoming a relevant and valued presence in primary schools [1],

this study aims to further enhance these practices through the analysis of these dilemmatic cases from the perspective of both teachers and outreach practitioners. Two main reasons justify this. First, science outreach practitioners can offer valuable new views on dilemmas in science education [22]. Second, by identifying and understanding these dilemmas, science outreach practitioners can incorporate new insights in the development of their programmes to promote science to youngsters [7]. These insights can potentially assist in the effective creation of the aforementioned third space in the context of primary level science education and science outreach in Ireland, enabling the formation of a collaborative community of elementary science education.

10. References

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