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Design and Development of a Science Literacy Material on Vaccination as an Intervention Campaign for Parents of High School Students in the Philippines

Jenny J. Casiño[1,*], Angelo Mark P. Walag[1,2]

[1]Department of Science Education, University of Science and Technology of Southern Philippines, Cagayan de Oro City, Philippines
[2]Center for Human Development Studies, University of Science and Technology of Southern Philippines, Cagayan de Oro City, Philippines
*Corresponding author: casinojenny77@gmail.com

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Abstract The Philippines had an alarming rise in measles cases for the past few years, and one of the reasons for this is the parents' hesitation in having their kids vaccinated. For this reason, this study aims to formulate and design a science literacy material on vaccination as an intervention campaign for parents of one high school in the Philippines. The study utilized a pre-experimental pre-test-posttest research design with 100 randomly selected parents of the Grade 7 students enrolled for the academic year 2018-2019. A standardized test on parents' knowledge and perception of vaccines with internal consistency value of 0.7185 was used. In the pretest, respondents scored low on vaccine knowledge. However, a significant improvement was shown in the levels of knowledge on vaccines before and after the conduct of the symposium and the distribution of the brochures. There was also a significant difference between the parents' perception on vaccination before and after the vaccination intervention campaign. Based on the study's findings, it is recommended that the school, in cooperation with the DOH and the local government unit, must conduct a massive educational or information drive to the parents to reduce the number of hesitant parents.

Keywords: *education awareness, measles vaccination, parents' attitude on vaccines, parents' vaccine knowledge, vaccine education*

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1. Introduction

There are as many as 18 individuals that can be infected for every case of measles. An early report by the Philippines' Department of Health (DOH), 33% of the confirmed measles cases belonged to the 1- to 4-year old age group [1]. While death rates have been falling worldwide as more children receive the measles vaccine, the disease still kills more than 100,000 people a year, most under 5. This is attributed to the lack of access to affordable and safe vaccines.

Vaccines are some of the most efficient public health tools for promoting health and reducing the burden of infectious diseases, like measles. They also translate into significant socioeconomic returns not only in child health and lower child mortality but also in poverty reduction, equity, production, education, and strengthening health systems as a whole [2]. Vaccines are very safe and are not just administered to children but everyone. The use of vaccines varies as a recommendation based on age, health, and lifestyle [1].

The World Health Organization strongly supports school-based immunization. Immunization in the Philippines has been focused on infant and child vaccination, especially with implementing the Expanded Program on Immunization (EPI). DOH uses vaccines approved by WHO, which is safe, effective, and used worldwide. The DOH, together with the Department of Education (DepEd) and the Department of Interior and Local Government (DILG), has been implementing nationwide the "*Bakuna para sa Kabataan, Protekyon sa Kinabukasan*", a free immunization program for students in public schools. As part of the government's commitment to eliminating the emergence of vaccine-preventable diseases, DOH partners with DepEd to vaccinate boys and girls in Grades 1 to 7 against measles, rubella, tetanus, and diphtheria. The immunization will be given to students with parental/guardian consent [1].

Even with the government's efforts to increase the number of vaccinated children, the Department of Health

(DOH) reported that the Philippines has to catch up on immunizing children as a defense against measles. Vaccination has been proven to be the most significant public health intervention. In fact, since the last measles mass immunization campaign in 2014, this resulted in a substantial reduction in measles transmission. However, measles cases have again begun to spread in the previous quarter of 2017, leading to some significant outbreaks [3].

Also, a measles outbreak took place last January 2014 in the Philippines, which has affected over 20,000 people in three months. In light of the measles outbreak, it's only apt to clear up the recurring concerns, some perpetuated by rumors and unfounded fears regarding the measles vaccine. Controversy over vaccine safety has achieved high visibility over the past years. Vaccine hesitancy is a relatively new term used in research over the past few years to describe anyone who is doubtful about vaccinations or who chooses to delay or refuse immunizations even when they are readily available [4].

However, vaccine safety receives public scrutiny. Refusal of vaccination was found to reflect multiple factors including family lifestyle; perceptions about the child's body and immune system; perceived risks of disease, vaccine efficacy, and side effects; perceived advantages of experiencing the disease; prior negative experience with vaccination; and social environment [5]. Other factors could be religious reasons, personal beliefs or philosophical reasons, safety concerns, and a desire for more information from healthcare providers [5]. Further, refusal of vaccination may be influenced by fears of vaccine components, low perceived likelihood and severity of the infectious diseases, and a trusting relationship with a natural healer or another respected person who doubts vaccination safety and effectiveness [6]. More so, it was also showed that some parents fear an overload of the immune system caused by combination vaccines [7]. Additionally, the perception that vaccination is riskier than non-immunization and issues of harm, distrust, and access might play a role in refusing childhood vaccination. Parents who refused vaccination made a well-considered decision based on assessing the benefits and the risks of vaccination, the child's susceptibility to the potential disease, and the acceptance of responsibility for that decision [8].

Recently, due to the Dengvaxia controversy in the Philippines, the Department of Health (DOH) has made a pronouncement that since January a more than 900-percent increase in the number of measles cases throughout the country due in part to the public's fear of vaccination [9]. Based on data from the DOH's Epidemiology Bureau, there were 2,843 confirmed cases of measles nationwide from Jan. 1 to Oct. 6, or a 926-percent increase from a year ago, when there were only 277 cases. This year's alarming rise of measles cases is attributed to parents' hesitation to have their kids vaccinated. It is then the study's objective to formulate and design a science literacy material on vaccines as an intervention campaign for parents of high school students.

2. Objectives of the Study

The main objective of this study is to formulate and design a science literacy material on vaccination as an intervention campaign for the parents of Puerto National High School. Specifically, this will seek to determine:

1. How do the parents' levels of knowledge on vaccines differ before and after the vaccination intervention campaign?
2. How do the parents' perceive vaccination differ before and after the vaccination intervention campaign?

3. Materials and Methods

The study utilized a pre-experimental pretest and post-test research design. In this design, the inclusion of a pretest to determine baseline scores was undertaken on both the parents' knowledge and perception using a survey questionnaire to be followed by a post-test after exposing the parents to a symposium and brochure on vaccination.

The study populations were the parents of Grade 7 students. During the academic year, the total population of parents was presumed to be equal to the number of enrolled students. Four hundred ninety students were coming from 8 classes in Grade 7, with 60 students per section. The sample size of 100 was calculated using a method from the literature [10]. The parents were randomly selected, representing the different sections in Grade 7 an average of 15 respondents per class. The respondents were chosen from among the parents of Grade 7, dependent upon the respondents' availability and their willingness to be the respondent in the study.

The study used the following inclusion criteria in choosing participants: the participants are parents of Grade 7; the participants are aware of the vaccination or vaccination in Puerto National High School; the participants are aware that the study aimed to formulate a design and development of science literacy materials on vaccination for an intervention campaign for the parents of Puerto National High School; and, they must be willing to be respondents of the study.

The study adopted a questionnaire from the literature [11] as the primary research instrument. Series of procedures were taken into consideration to ensure the validity and reliability of the instruments. In validating the instruments, face and content validity were considered by invited experts (a sociologist and a medical doctor). Their main objective was to evaluate whether the questions in the instrument effectively capture the topic under investigation. After revisions were made based on the validators' comments, the instruments were floated to the parents of Grade 8 students to measure the instrument's internal consistency using Cronbach Alpha. Cronbach Alpha values range from 0 - 1.0 where a value from 0.60 to 0.70, which is considered acceptable. The Cronbach Alpha value of the revised instrument in the study is 0.7185, which signifies its reliability.

The school principal of Puerto National High School's approval to conduct the study prior to the conduct of data gathering was first sought. When the necessary permissions were granted, the pilot testing and data gathering were conducted to parents not involved in the study. A pretest was then given to the parent respondents of the Puerto National High School. Based from the gathered data from the pretest, science materials were developed particularly

a symposium training matrix and brochure. During the symposium, the medical practitioners of the school district and barangay were invited to be the resource speakers on vaccination. The speaker openly discussed to the parents the significance of immunization and the medical facts about it. An open forum was held thereafter to answer the parents' queries and shed light on some confusion regarding vaccination. The respondents were given a post-test two weeks after their exposure to the symposium and brochure,

After the retrieval of the post-test, data were categorized and analyzed through descriptive analysis. Statistical treatments include simple cross-tabulations involving frequencies and percentage and as well as computation of means. The data were processed, analyzed, and interpreted using the following statistical tools: frequency and percentage distribution, and paired t-test. The frequency and percentage distribution described the parent's knowledge and perceptions towards vaccination. The paired t-test determined if there is a significant difference between the pretest and the post-test. In a paired sample t-test, the observations are defined as the differences between two sets of values, and each assumption refers to these differences, not the original data values.

4. Results and Discussion

4.1. Parent's Knowledge of Vaccines

The respondents' pretest and post-test scores on vaccine knowledge are summarized in Table 1 discloses the comparison on parents' levels of knowledge on vaccines before and after the vaccination intervention campaign. Most parents committed mistakes in items #10 and #11. This indicates that parents are not familiar with how antibiotics work. This is not surprising since, as reported, there is a widespread misconception about antibiotic use [12]. To correct this, awareness campaigns and enforcing medication dispensing laws are required to avoid misuse of antibiotics [13]. For this reason, after the intervention campaign, the number of respondents who got this item correct increased significantly is not surprising.

The most number of respondents who got correct answers was on item # 10. This is noteworthy and good since most of them are already aware that vaccines help prevent death from different diseases. This knowledge could also help them decide whether they will vaccinate their children or not. Parent's knowledge of the side effects and other vaccines' details are essential factors whether they want to have their children vaccinated or not [14]. Also, it is good to note that a significant number of respondents know that vaccination is not a cure but a preventive measure.

Table 2 shows the difference in the pretest and post-test of parents' levels of knowledge on vaccines before and after the vaccination intervention. As shown, there is a significant difference in the parents' level of knowledge on vaccination before and after the vaccination intervention campaign. This implies that the symposium's conduct and the distribution of the brochure were indeed helpful in providing adequate information. The brochures that were distributed contributed to the knowledge acquired by the parents about vaccinations. The symposiums conducted extensively helps too because parents were encouraged to ask questions regarding their doubts and biases about vaccinations. This proves that disseminating brochures and the conduct of the symposiums intended to provide knowledge and information to parents' works. In a particular study [15], approximately one-third of parents indicated that they did not have enough access to sufficient information. The majority of those parents did not think their child's provider was easy to talk to. Many parents desire to have more detailed information regarding the side effects and benefits of vaccines expressed in a real way that does not appear to be trying to sway them one way or the other regarding vaccinating their child [15]. The result proves the success of the means used as an intervention campaign towards vaccinations.

Table 1. Comparison of the number of parents (*n*=100) who got correct answers on different vaccine knowledge questions before and after the intervention campaign

Concept	Percent responded correctly	
	Pretest	Posttest
1. Vaccination is not a cure but a preventive measure	80	96
2. Vaccination is good for my kid/s	79	97
3. Vaccinations prevent death from MR-German measles, tetanus and diphtheria.	83	96
4. It is always best to get vaccinated, even when you think the risk of infection is low.	77	97
5. Measles is one of the leading causes of death among young children across the world including the Philippines.	69	96
6. Immunization through vaccination is the safest way to protect against disease.	69	96
7. Measles is contagious and may cause death	77	97
8. Combined vaccines are safe and beneficial.	80	96
9. Vaccines do not cause autism.	71	93
10. If the disease is not "serious", it is not worth getting a shot to prevent it.	53	92
11. Vaccines cut down on antibiotics.	51	95
12. Vaccines train the immune system.	61	95
13. Vaccines are evolving.	69	96
14. Vaccines protect the community.	67	95
15. Vaccines are safe for most people	69	99

Table 2. The Differences in parents' levels of knowledge before and after the vaccine intervention campaign

Component	Pretest Mean	Posttest Mean	t	df	p-value
Parents' Knowledge Vaccine	10.55	14.36	-18.25	99	0.000*

*Significant at 0.05 level.

4.2. Parent's Perceptions of Vaccines

Understanding reasons for and against vaccination from the parental perspective is critical for designing vaccination campaigns and informing other interventions to increase vaccination uptake. More so, vaccination decision making is not merely a matter of two opposing viewpoints but includes a spectrum from complete refusal to confident acceptance. Parental vaccination decision making involves cognitive, psychosocial, and political factors influenced by current scientific, cultural, and media environments. There continues to be a knowledge gap in how to increase vaccination rates best [16].

The respondents' perceptions of vaccination before and after the intervention campaign are summarized in Table 3. As shown, respondents had a low perception of vaccines and vaccination. Vaccine hesitancy is related to a range of psychological and demographic determinants, such as attitudes toward vaccinations, social norms, and trust in science. The fact that deciding to vaccinate is a socially forced choice that concerns a child's health makes vaccine-related decisions highly important and involving parents. This high involvement might lead to parents overemphasizing the potential side effects that they know to be vaccine-related. By amplifying those, parents are more focused on vaccine-related decisions' possible outcomes, yielding a specific pattern of the outcome bias [1,17].

Vaccine hesitancy is related to a broad range of attitudes, most notably to lower compliance rates, which leads to drops in vaccination rates [18]. The choice of correlates is in line with the framework of vaccine decision factors proposed [17], and it is essential to acknowledge their interrelatedness. Since vaccination intention and hesitancy are multi-layered phenomena, chosen measures are narrowed to broadly cover the three following aspects: parent-specific factors (demographics, knowledge, etc.), vaccine-specific factors (perceived vaccine safety and efficacy, etc.), and external factors (values, norms, policies, requirements, etc.).

It is also noteworthy that parents have trust and confidence in the government and doctors regarding vaccination. This is good since previous studies have found that people with a higher level of distrust toward authorities are more reluctant to rely on official sources of information [19]. This could imply that this trust could be translated towards vaccine acceptance and result in their children having vaccinated. Also, parents who positively view the government are more likely to support vaccine policies and perceive them as beneficial rather than restrictive of their freedom [20].

Table 4 summarizes the comparison between the respondent's perceptions of vaccine and vaccination. As shown, after the intervention campaign, respondents had a better perception of vaccine and vaccination. The improvement of their perception could be due to the opportunity to initiate a dialogue about vaccines and provide the parents with take-home materials or direct parents to symposiums were they can ask questions and unveil their worries regarding vaccinations creating a relationship built with trust. This gives parents time to read and digest reputable vaccine information before the first and all future immunizations. And when parents have questions, you can build on the reputable information that they already have reviewed. With parents who have many questions, consider an extended visit to discuss vaccinating their child.

Nurses and other health providers play a key role in establishing and maintaining a practice-wide commitment to communicating effectively about vaccines and maintaining high vaccination rates: from providing parents with educational materials to being available to answer their questions, to making sure that families who may opt for extra visits for vaccines make and keep vaccine appointments. In brochures and symposiums utilized in this study helps the parents with their decisions regarding vaccinations. A successful discussion about vaccines involves a two-way conversation, with both parties listening, sharing information, and asking questions. These communication principles can help you connect with parents by encouraging open, honest, and productive dialogue. Besides, for these vaccines to be accepted people, public education programs that use tailored evidence-based communication strategies, like symposiums and educational materials, are thought to be essential [21]. This is important because one of science education roles is to have a scientifically literate community [22,23].

Table 3. The parents' mean perceptions of vaccination before and after the vaccination intervention campaign

Parent's Perception	Pretest Mean ± SD	Posttest Mean ± SD
1. Measles, tetanus, and diphtheria vaccinations are unnecessary because complications related to the illness are rare.*	2.55 ± 1.50	4.30 ± 1.03
2. Measles, tetanus, and diphtheria aren't dangerous and therefore vaccination is not really necessary.*	2.37 ± 1.39	4.21 ± 1.9
3. In general immunization is not very important as we have a high standard of living.*	2.62 ± 1.50	4.33 ± 0.92
4. I trust the advice of my doctor regarding if and when I should vaccinate.	3.68 ± 1.28	4.17 ± 1.16
5. I trust the advice of my family/ friends regarding if and when I should vaccinate.*	2.22 ± 1.33	2.20 ± 1.36
6. I trust the advice of the DOH regarding immunization.	3.94 ± 1.12	4.34 ± 0.84
7. Measles vaccination is unnecessary and only serves the pharmaceutical industries.*	2.39 ± 1.40	3.87 ± 1.30
8. Our government decides on vaccination recommendations independently of the pharmaceutical industries.	3.38 ± 1.51	2.28 ± 1.35
9. Measles vaccination may cause complications and I don't want to put my child at risk.*	2.32 ± 1.28	3.96 ± 1.21
10. I think it is better for my child if a vaccine can be swallowed than injected.*	2.22 ± 1.33	4.21 ± 1.06

*Responses for these items were reverse-encoded

Table 4. The Differences in parents' perception of vaccines before and after the vaccine intervention campaign

Component	Pretest Mean	Posttest Mean	t	df	p-value
Parents' Perception of Vaccines	2.77	3.79	-18.18	99	0.000*

*Significant at 0.05 level.

5. Conclusion

The parent's knowledge and perception towards vaccine and vaccination have increased positively after being exposed to science literacy material as an intervention campaign. This highlights the importance of developing research-based and evidenced-based communication strategies in addressing misconceptions towards vaccines and vaccination. More so, vaccine knowledge and perception could also be improved when parents are given opportunities to have a dialogue with trusted persons of authorities like teachers, nurses, and medical doctors through a symposium. When parents are provided with the information and allowed to interact and engage, they become more susceptive to new knowledge and develop a positive perspective. For this reason, a massive educational intervention campaign is suggested to improve the vaccination rate in the country.

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