

## Introduction

Participatory, problem-based and experiential learning are some of the most successful methods of education that engage and challenge students in classroom and field-based experiences, help to build analytical skills, confidence and foster creativity and linkages with nature<sup>1,2</sup>. A focus on girls and young women in STEM topics is particularly necessary to develop a larger base of future female engineers or scientists<sup>3</sup>.

A discussion-based and hands-on approaches are rarely used in Belize's public schools and yet are key to increasing the understanding and stewardship for the sea and its fauna. "Kids Meet Sharks" (KMS) was developed as a thought-provoking, participatory and experiential marine-oriented educational program aimed at late primary students ages 11 through 14 to foster stewardship of sharks and the marine wildlife. Launched in Belize in 2011 KMS complements the national education curriculum.



## Methods

- KMS begins with a 90-120 minute class-based presentation, discussions and participatory activities, that gauge knowledge and preconceptions and subsequently introduces students to the marine world and key concepts of data collection and analyses, sustainable fishing, responsible consumption, protected areas and plastic pollution through the lens of sharks and rays, their ecology, and critical habitats.
- Pre- and post-presentation rapid participatory surveys involve students and are based on a modified Likert scale using Emojis and simple binary Yes/No (and opt out Don't Know) are used to assess participant knowledge and perceptions of sharks, and national laws.
- With marine-based work representing the highest cost of the program, creative competitions (storytelling) help to select top students for the field components. Chosen students are taken to a marine protected area where they learn and practice a range of marine field skills. Most sites host nurse sharks and stingrays and provide students with the opportunity to encounter these species and help them to overcome fears while gaining experiential knowledge of marine field science.

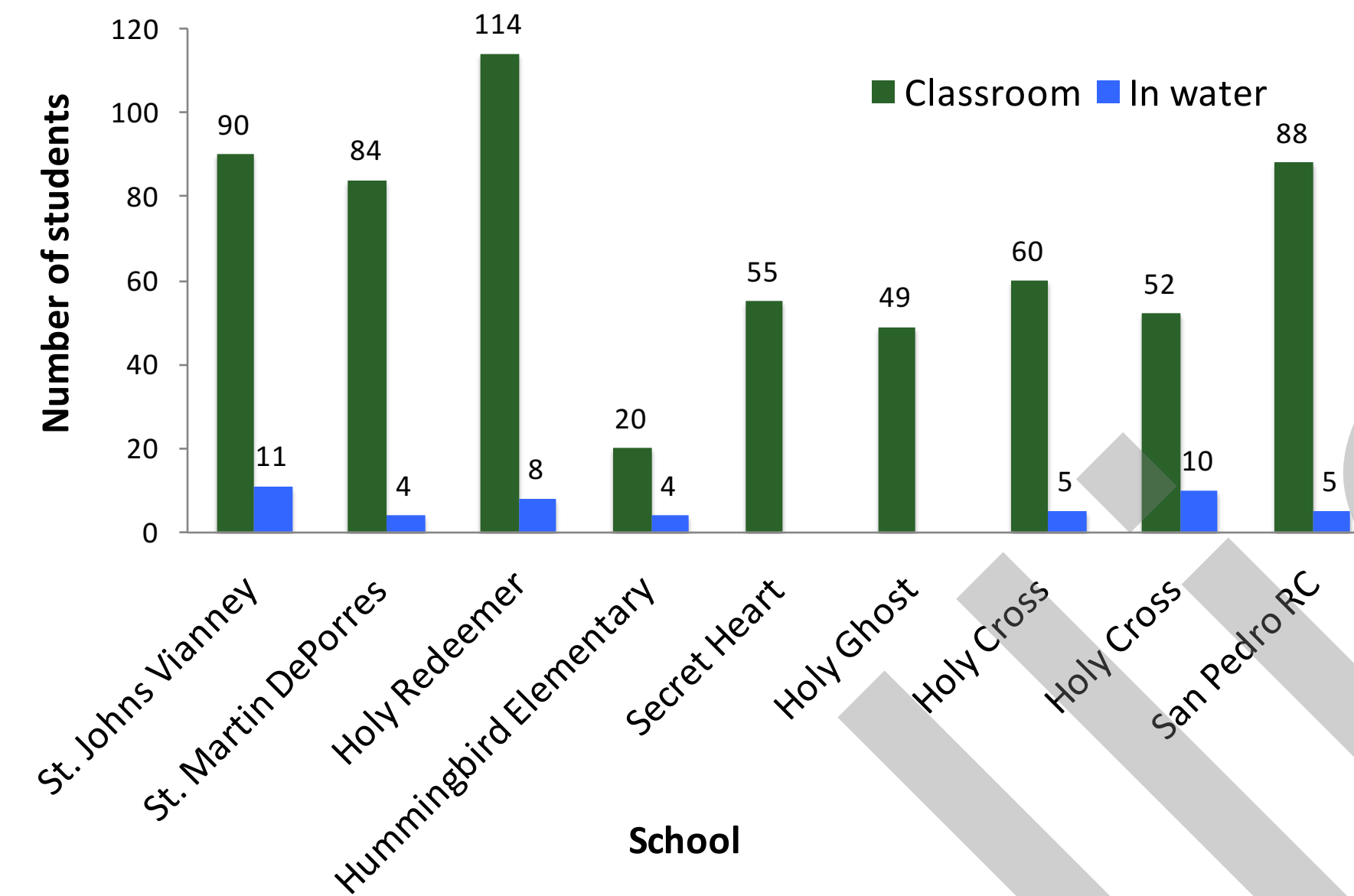


Figure 1. Number of students reached through classroom and in-water KMS activities in 2017-2018 by school

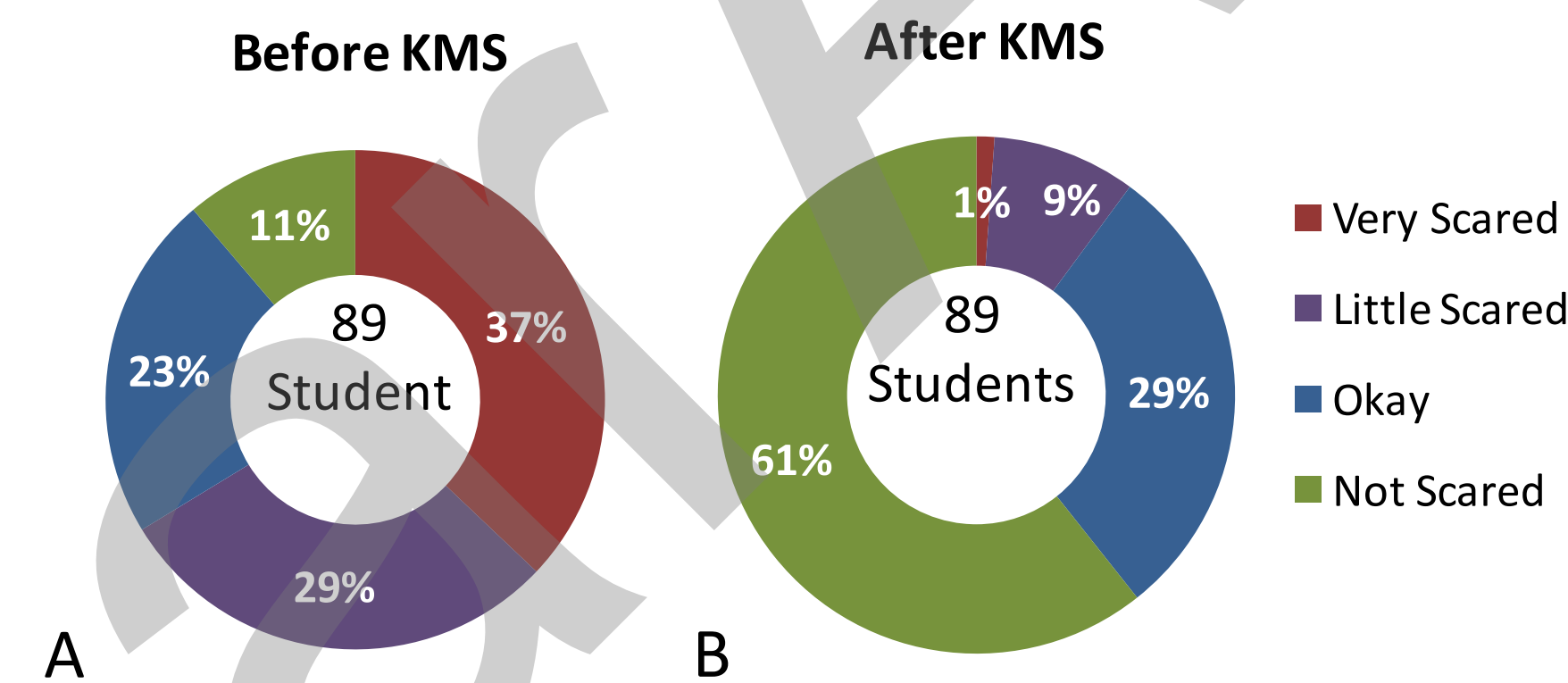


Figure 2. Change in level of fear of sharks reported by students after classroom presentations.

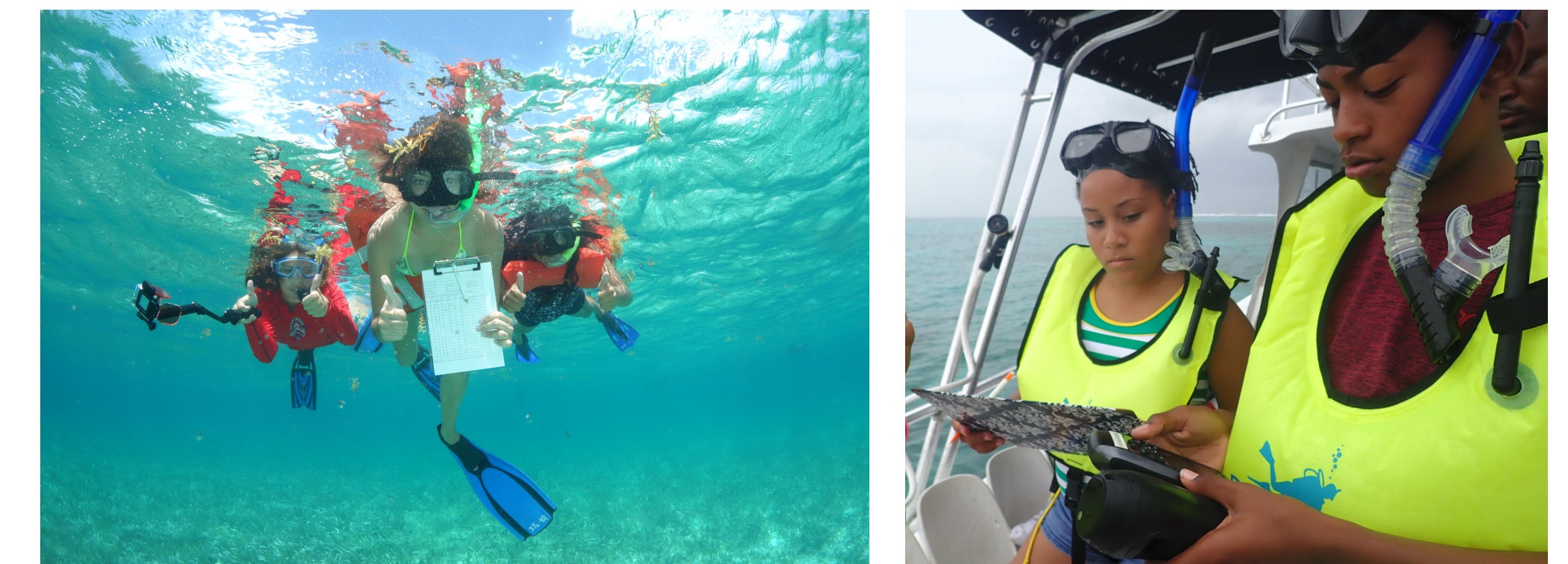
## Results

- From October 2017 to January 2018, presentations were held in 8 schools reaching 612 students and 27 teachers. The storytelling competitions yielded hundreds of creative stories leading to the selection of 47 students participating in the in-water activities (Fig. 1).
- Class demographics indicate that X girls and X boys took part in KMS with girls accounting for X & of the in water activities.
- A total of 89 students participated in the pre-post surveys with 37% of them being scared of sharks and rays prior to the class-based activities (Fig. 2A). Post surveys indicated a reduction of 97% in fear revealing that only 1% were scared (Fig. 2B).

## Discussion

Environmental education that integrates participatory and experiential components is a proven means to engage students, foster creativity and strengthen ties to nature<sup>4</sup>. KMS demonstrated an increase in positive attitudes and knowledge towards the sea and sharks after the class-based presentation. However, age plays a major role in obtaining positive connections with nature<sup>4</sup> and we found students of Standard 5 and 6, ages 11-14, considered ideal for classroom presentations.

If marine and wildlife conservation and stewardship goals are to be met in the next 50 years, a dramatic in thought-provoking, creative, engaging and experiential educational opportunities that complements traditional educational curricula will be needed. An substantial increase in funding to provide these educational opportunities and strengthen the STEM pipeline, especially for girls, will be needed. KMS can provide a helpful template to guide these efforts in tropical countries and in partnership with educational authorities.



## Conclusions

KMS increases positive environmental attitudes and knowledge and provides a STEM conduit for girls. Successful expansion and adaptation of the KMS has taken place to multiple sites in Honduras, Panama and Cabo Verde (West Africa), yet demand supersedes supply. Longer-term engagement of self-selecting students is needed to reinforce learning and stewardship of the sea. This is being developed as a next stage of the KMS through social media portals and the creation of site-specific and activity-rich marine clubs.

### Acknowledgements

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