

Student-Centered One-Health Modules: An Innovative Mobile Platform for Teaching Science Concepts

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Introduction/need for innovation or idea

Students begin learning basic science concepts in early elementary school; however, the emphasis on education centers on reading, writing, and mathematics. The Pew Research Center consistently finds that US students lag behind other countries in science, regardless of the test used (Desilver, 2017). Science is tested even less often than math, resulting in even less focus on the subject. Ironically, when the world is in a pandemic, Americans find it difficult to decipher fact from fiction, in part due to general lack of scientific knowledge (Funk& Goo, 2015; Segers, 2020).

This five-year project is part of a NIH-SEPA funded grant (<https://nihsepa.org>) to develop student-centered online modules for real world One-Health topics that are engaging and focused on topics that are interesting to students. The One-Health modules provide rural middle school teachers with student-centered instructional strategies and resources for teaching life science in the motivating context of One-Health (the integration of human, animal, and environmental health). This project focuses on rural schools because they have large numbers of underserved Hispanics, have fewer teaching resources due to under-funding, and have difficulty in recruiting highly trained science teachers (ERS, 2020). This project also addresses student motivation by making it relevant to their personal life, presenting it in technologically appealing format, and by using a student-centered design that allows them to have some control over what and when they study.

How it works/ methodology/program phases/steps

Aims of the project include:

Aim 1. Develop and assess student-centered One Health modules, with an online platform that middle school students will use on mobile devices, tablets, and computers. Our Curriculum Development Team collaborated with software developers to create bilingual curriculum modules that incorporate motivational student activities and study aids. All curricula adheres to Next Generation Science Standards (NGSS). This approach engages students in curricular activities as individuals and groups, leading to classroom experiments, discussions, and presentations.

Aim 2. Structure the hosting PEER website to accommodate the new modules and to make specific resources easier for teachers to find. The site currently serves a world-wide teacher audience (57,857 downloads each year by 2,201 teachers in 50 states). The website links have been restructured to make it easier for teachers to find what they need.

Aim 3. Provide professional development for middle school teachers. Teachers have participated in two summers of workshops related to implementation of the modules. This summer, the workshops are online, utilizing synchronous sessions through Zoom with asynchronous activities. We are also piloting asynchronous micro-credentials so that teachers can explore the modules most of interest on their own time. Because of COVID-19 and subsequent school closures, we were unable to pilot the modules in spring 2020. We are currently reaching out to

the teachers who have completed our workshops to pilot the modules in their teaching next year. We have also asked teachers to review the modules this summer and will use their feedback to further refine the modules and activities.

Results to date/implications

To date, five modules have been completely developed on the following One Health topics: Cell Biology, Stress, Infectious Diseases, Ecology, and Clinical Trials. Each module has a motivating tool kit of cohesively integrated learning activities. The learner can select the order in which many of the activities are completed. Each module has pre and post tests and the following integrated learning activities: Essential Knowledge-slide show of academic content that meets Texas Knowledge and Skills Standards and NGSS; Backpack Adventures-science fiction story based on each module's theme about a time-traveling group of middle-school students; Meet the Scientist-short biography of a research pioneer in the topic area; Scientist Video Presentation-video on the topic from a scientist; Real Science Review-published research report that is rewritten at middle-school grade level. Students conduct a simulated peer review, just as scientists do with real science; Make a Note of That-advice to help students organize notes on the academic content; Practice-mnemonic advice to help students remember the information presented in the various learning activities and engaging digital games to reinforce learning of essential knowledge; Teacher Guide-an overall lesson plan of the module including TEKS/NGSS, background information, required resources, as well as classroom activities in which teachers can utilize to guide their students through the module. The Essential Knowledge, Backpack Adventures and pre and posttest sections have also been translated to Spanish.

The modules are built as Sharable Content Object Reference Model (SCORM) packages and can be delivered online or in a learning management system (LMS). We are also able to host the modules through a university based LMS (Moodle or the SCORM packages in school's own LMS). This would be useful to home-schooling parents who might not have access to a LMS. Teachers are able to see student progress, time spent in particular parts of the module, and pre and post test scores. The project team is also able to use this information to determine level of engagement with the module and determine differences in pre and post test scores. To date, over 30 teachers have completed training on the One Health modules.

Future plans/advice to others

The primary objective over the next year is to ensure fidelity of a pilot test and compare students engaged with the modules to similar students who did not use the modules. Others who want to implement a similar program are encouraged to engage with stakeholders throughout the process and engage an interdisciplinary team of researchers who represent areas of interest to students.

Costs/resources needed

As a NIH-SEPA funded project, access to the modules is free for teachers to implement with their students. To gain access and for more information on the One Health Modules, please visit <https://vetmed.tamu.edu/peer/one-health>. This project requires significant staff and faculty engagement as well as technical support in the form of server space and LMS creation.

References

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