UNITED NATIONS TRANSFORMING EDUCATION SUMMIT 2022

# Knowledge hub
# -
# Collection of best practices

## Summary of the best practice

1. Title of the best practice (e.g. name of policy, programme, project, etc.) *

Science Bits

2. Country or countries where the practice is implemented *

English and Spanish speaking countries

3. Please select the **most relevant** Action Track(s) the best practice applies to *

- [ ] Action Track 1. Inclusive, equitable, safe, and healthy schools
- [ ] Action Track 2. Learning and skills for life, work, and sustainable development
- [ ] Action Track 3. Teachers, teaching and the teaching profession
- [x] Action Track 4. Digital learning and transformation
- [ ] Action Track 5. Financing of education

4. Implementation lead/partner organization(s) *

International Science Teaching Foundation (ISTF) - Science Bits

5. Key words (5-15 words): Please add key descriptive words around aims, modalities, target groups etc. *

Digital Science Curriculum K6-8 Middle School STEM In-person, remote or hybrid instruction

6. What makes it a best practice? *

Effectiveness of Science Bits proven in scientific study

## Description of the best practice

7. Introduction (350-400 words)
This section should ideally provide the context of, and justification for, the practice and address the following issues:
i) Which population was affected?
ii) What was the problem that needed to be addressed?
iii) Which approach was taken and what objectives were achieved? *

The ISTF is a non- profit with a remit to improve STEM education. Research suggested a disconnect between practise and implementation in science education; the 5E Model although simple to understand and explain was difficult to implement in the classroom without well thought out and prepared materials. As a response to this , the ISTF proposed Science Bits, a fully digital science curriculum designed using the 5E Model and focused on Middle School (K6-8) for use in classrooms with more than 1000 hours of prepared 5E lessons available in a robust easy to use digital platform, replete with multi-media, interactive 3D lab simulations and more than 30 smart teaching tools to empower educators. The simple idea behind Science Bits is that teachers should be supported with the right materials, resources and training in order to ensure their time in the classroom with their students is effective and well spent.

8. Implementation (350-450 words)
   Please describe the implementation modalities or processes, where possible in relation to:
   i) What are the main activities carried out?
   ii) When and where the activities were carried out (including the start date and whether it is ongoing)?
   iii) Who were the key implementation actors and collaborators? (civil society organizations, private sector, foundations, coalitions, networks etc.)?
   iv) What were the resources needed (budget and sources) for the implementation?
   *

   Science Bits took more than 8 years to develop fully and counted on the collaboration of scientists, developers and educators across three continents, including the creator of the 5E Model, Dr Rodger W Bybee himself who acted as an advisor to ensure full alignment between the Science Bits curriculum and the 5E Model. A company was created to commercialise Science Bits worldwide and it is currently used in over 30 countries by more than 500,000 students and teachers.

9. Results – outputs and outcomes (250-350 words)
   To the extent possible, please reply to the questions below:
   i) How was the practice identified as transformative? (e.g., impact on policies, impact on management processes, impact on delivery arrangements or education monitoring, impact on teachers, learners and beneficiary communities etc.);
   ii) What were the concrete results achieved with regard to outputs and outcomes?
   iii) Has an assessment of the practice been carried out? If yes, what were the results? *

   While the 5E Model is easy and simple to follow, it is difficult to teach using the 5E Model in the classroom with most currently available or repurposed materials. Science Bits as a custom curriculum built on the 5E Model means that teachers have the material (curriculum), method (5E Model) and means (smart teaching tools included in Science Bits) to teach science better in the classroom and can dedicate time to their students rather than preparing classes and materials. The net effect of using Science Bits is that over time the student gains motivation, learns critical thinking skills and becomes more involved in their education. Additionally, teachers are liberated from much mechanical work like grading, prepping etc. and can better invest time and effort in their students. With over 1000 hours of prepared lessons, extensive teaching guides, lesson sequences etc. Science Bits makes teaching using the 5E Model easier. Commitment is needed from both teacher and student but long term scientific studies show clearly that students in schools that use Science Bits have better understanding of key scientific concepts and obtain better grades.

10. Lessons learnt (300 words)
    To the extent possible, please reply to the following questions:
    i) What were the key triggers for transformation?
    ii) What worked really well – what facilitated this?
    iii) What did not work – why did it not work? *

    The main trigger was a lack of adequate materials for teaching science following the 5E Model. Many materials claim to adhere to the 5E Model but do not follow the structure or apply the correct methodology in their approach. The 5E Model requires rigor and without well though out materials it is easy to slip back into the traditional transmissive teaching model and rote learning. The ISTF recognised that to improve science teaching a better approach was needed and the participation of the 5E Model creator, Dr Rodger W Bybee helped ensure that Science Bits was not just aligned to the 5E Model but that it was the backbone of the project itself.

11. Conclusions (250 words)
    Please describe why may this intervention be considered a “best practice”. What recommendations can be made for those intending to adopt the documented “best practice” or how can it help people working on the same issue(s)? *

    Science Bits as an educational project has been shown to be effective and improve student outcomes in long terms studies with a remarkable improvement in understanding of key scientific concepts. To those wishing to implement Science Bits, we would underline the importance of support for teachers and students alike. The change requires effort on both sides and we recognise that better training and mentoring is key to the most successful implementations and the best results.

12. Further reading

Please provide a list and URLs of key reference documents for additional information on the “best practice” for those who may be interested in knowing how the results benefited the beneficiary group/s. *

Science Bits Effectiveness
Summary
https://science-teaching.org/en/teaching/new-scientific-study-supports-effectiveness-of-science-bits
Original article
https://www.tandfonline.com/doi/full/10.1080/09500693.2021.1918354

How the 5E Model Mirrors Natural Learning
Summary
https://science-teaching.org/en/teaching/the-cognitive-principles-of-learning-underlying-the-5e-model-of-instruction
Original Article
https://stemeducationjournal.springeropen.com/articles/10.1186/s40594-022-00337-z

Press note
https://science-teaching.org/wp-content/uploads/2022/05/student-learning-gains-nearly-double.pdf