

# Standards and best-practice cases

Balancing standards and a diversity of practices  
in the astronomy education community

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# Problems with standards and quality control

This can be a touchy topic.

Many of us have been doing astronomy education for a long time, and are by now very experienced.

**“I know what I am doing is working, why should I waste my time with evaluations”?**

...also, for many of us, astronomy education is volunteer work. We have too little time as it is. Why spend some of that on evaluation? Why not use all the time we have for astronomy education *activities*?

# Reviews: Dealing with criticism is not that easy

Criticism sometimes feels like a personal attack.

Many of us are enthusiastic about what we do – makes it harder to separate criticism from person

Criticism is not always about facts – e.g. peer review often includes subjective judgement (“how important is this?”)

Criticism is not always in good faith, cf. “Reviewer 2”

In a world where there is still systemic racism and sexism in many countries, as well as a heritage of colonialism, criticism can have triggering/disturbing overtones.

# Standards as exclusionary/gatekeeping?

- Standards restrict what people can do
- If you are too specific, you will exclude good ideas that just don't happen to fit your preconceptions
- We need to take care to leave room for diversity

# Different kinds of standards

## What should children learn (at a certain age)?

→ For education authorities to decide; regional variations, but: Big Ideas and sample curricula can support decisions

## What learners need to know in order to understand concept X

→ which misconceptions to avoid, what similes to use etc.

## How to teach (astronomy) effectively

→ methodology (active learning etc.), evaluation

## How to teach astronomy teachers effectively

→ methodology, evaluation

# Standards are a means to an end

...so what are our goals?

Put bluntly:

Those who invest their time and effort in astronomy education should not **waste** their time and effort

(because we need all the time and effort we can get)

We want to **help avoid errors that can be avoided**

# Quality in astronomy education

## Good astronomy education

- communicate knowledge that is factually correct
- puts astronomy in context (STEM, society)
- uses teaching methods appropriate to the target group
- uses the allotted time/resources efficiently
- makes a long-term difference for learners
- defines and reaches specific goals

How do we get there? Care, experience, reviews, evaluation.

# Areas of best practices, standards

Standards can apply to...

- **Resources** – e.g. best way of introducing exoplanet transits
- **Curricula** – Big Ideas has started to define literacy, but we do not set countries' curricula
- **General teaching methods** – active learning, but also: evaluation, evidence-based teaching
- **Specific formats** – online teaching, teacher training events, using remote telescopes, or simple resources...



## ...so how to avoid the pitfalls?

- lay the groundwork first!
- make it easy for practitioners to stay up to date with evaluation methods, best practices (OAE Reviews)
- promote an evaluation-positive culture and review culture
- community discussion within C1: consensus on specific balance between craft and science, practice and evaluation?
- respect diversity – different ways of achieving the same end; no single, exclusionary “one approved OAE solution”
- diverse best-practice examples (“what works”)

## Constructive review culture

- use reviewers from the community for OAE best practice selection (e.g. resources)
- finding reviewers is becoming a problem for regular research journals, as well (cf. astroEDU)
- let's set about building a pool of potential reviewers for astro-education activities (database including specializations)
- NAECs and wider OAE networks: many promising potential reviewers!
- explicitly talk about review criteria – reduce arbitrariness

# From best practices to standards

From our point of view, logical progression:

**First**, collect best practices, make evaluation techniques accessible, disseminate teaching methods, collect high-quality resources

**Secondly**, initiate community (C1) discussion about standards – that way, many people will be on the same page of the discussion

# Resources

- Activities specifically: peer-reviewed on **astroEDU**
- Should the community set **Open Education Resources** as best-practice? (What about good copyrighted stuff?)
- Selection of **best-practice examples** for common topics (cf. Big Ideas) on OAE pages – peer-reviewed how?
  - Proposals from anybody?
  - Send out for review? (Visible or not?)
  - Localization? (Works in some contexts, not in others?)
  - Ranking?

# Curricula

- Defining astronomy literacy  
→ Big Ideas Working group
- Beyond that, needs of different nations will be different – recommendations yes, standards no
- Advice on age-appropriateness
- Important for evaluation: How do we test for understanding of the Big Ideas?



# Teaching methods

- General methods: active learning & Co.
- Providing evaluation tools: **concept inventories** for standardised before-after comparison (cf. Light, Force)
- Specific methodology e.g. for online teaching

“Minimal set of standards” – avoid common mistakes

- be aware of what students bring to class
- make your teaching evidence-based

# Schools for Astronomy Education (SAEs)

- OAE Review on best practices in teacher training activities
- Review includes “must have” criteria and recommended best practices
- Training activity to be certified as SAE must demonstrate that “must have” criteria are satisfied
- Recommendation by OAE Steering Committee

**What do you think?**