



How to use the online learning materials

Best practice guidelines for facilitation of citizen science learning



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The following reference is suggested: *Russell C, Sithole NSZ, Tshabalala G, Kotze D, Taylor J (2023) Citizen Science Online Training and Learning System. Project No. K5/00841. Water Research Commission, Pretoria, South Africa.*



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1) PLAN FOR YOUR PARTICIPANTS

Think about who your participants are, where they are situated, and what knowledge and skills they bring.



Setting up your online learning space

Things to consider:

- Who is your audience? What is their context? Do they live in a rural or urban setting?
- How will they access the online materials? How can you support them to get full access?
- Will you be able to visit them in-person, to help them to sign-up to your course, or to offer in-field practical support?
- How are you going to enable connections between the participants to facilitate social learning?

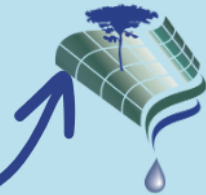




2) DOWNLOAD OR LINK TO THE ONLINE LEARNING TOOLS

These can be found in the following places:

- On the [GroundTruth](#) website
- On our [YouTube](#) channel
- For all things miniSASS see the [miniSASS](#) website



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Detailed **online learning content** has been developed for these tools:

- [miniSASS](#)
- [The Clarity Tube](#)
- [The Velocity plank](#)
- [miniWET-Health](#)
- [The Dragonfly Biotic Index](#)
- [The E. coli Water Test](#)

Click on each of the tools above to access **videos, readings, and quiz questions**



What's in the "box"?

What citizen science tools are available for biomonitoring of water systems?

From the WRC Toolbox:

- miniSASS
- The Clarity tube
- The Transparent Velocity Head Rod (velocity plank)
- The Riparian Health Audit (RHA)
- The Wetland Assessment Tool (miniWET-Health)
- The Spring Tool
- The Estuarine Tool
- Weather monitoring tool
- School Lesson plans
- The Climate Change Education Game (Picture-building game)

For a brief summary of these tools and what they can be used for [click here](#)

Additional complementary citizen science tools

- [iNaturalist](#)
- [Dragonfly Biotic Index \(DBI\)](#)
- [E. coli Water Test](#)

A **one-page picture-based summary** of how to use each of these tools can be found [here](#)





3) CHOOSE YOUR LMS

There are many free learner management systems available: **Google Classroom**, **Moodle**, **EdX**, and **Pluto LMS** are just some of the options you can choose from.

Most offer similar features, but we suggest you look for one that allows you to:

- Design self-assessment quizzes (quizzes that mark themselves)
- Set up forums so the participants can discuss topics with each other
- Work with and view content off-line once it has been downloaded

LMS = Learner
Management
System

Comparison of various platforms for online learning

YouTube	WhatsApp	LMS software (Pluto)
Allows for easy upload of video content.	Allows for easy sharing of video links, images, and documents. Allows for communication between participants	Facilitates the sharing of information through videos, images, and documents, and incorporates quizzes and forum discussions
Participants were familiar with this platform.	Participants were most familiar with how to use this platform.	Participants had to learn to navigate the platform.
Limited to video content only.	All types of content could be shared.	All types of content could be shared, and this platform allowed the facilitator to set up self-assessment quizzes.
Required internet access for streaming – cost of internet incurred.	Required internet access for the downloading of content – cost of internet incurred.	Required internet access to download the app and the course. Once downloaded, the app can run offline. The quizzes need to be streamed.
Dialogue is generally one-directional, there is not much facilitated discussion between participants and between the facilitator and the participant (participants can comment on the videos, reply to comments, but in-depth discussion is limited).	Participants preferred to communicate with each other, and with the facilitators using this platform (they opted for using WhatsApp as opposed to the online forums that were set up for the same purposes on the LMS system).	Participants did not make use of the forum facility to its full potential. Dialogue between participants, and with the facilitators through the platform's applications was limited.

Comparison of various platforms continued:



An integrated approach is recommended:

- Use **WhatsApp** to set up a **communication support group**. This allows participants to communicate with each other and their facilitators. Additional, supplementary, learning content can be shared easily, if needed via WhatsApp.
- Use **YouTube** to load and “store” video content. This allows for easy access to video materials by participants and other users of the internet.
- Use a **LMS**, such as Pluto, to **structure and present the course**. An LMS has the advantages that it allows the facilitator to easily track the progress of the participants, and set up assessment tasks, such as quizzes and assignments.
 - Many LMS platforms are available, eg: Google Classroom, Pluto, EdX, Moodle
 - Most have a free version (allowing a limited number of participants)
 - When looking for a LMS platform for citizen science training, it is recommended that you use one that allows you to design self-assessment tasks or quizzes; and allows you to download the content for off-line use

4) CHOOSE WHICH LEARNING SUPPORT ACTIVITIES YOU WILL USE

- The “picture building” activity
- The make your own “instructional video” task
- The “Change Project” task
- The “tying-it-together” activity



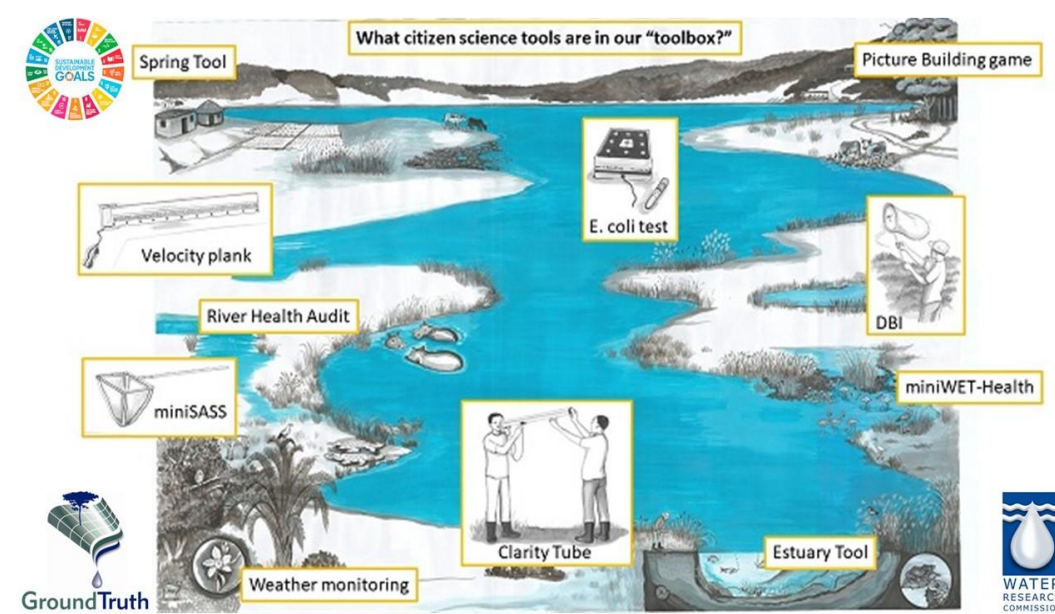
These could be run as either **in-person activities** or online
Descriptions can be found in the “Best Practice” guide



Activities that support learning

These activities can be used in conjunction with the online learning materials:

- The **Picture-building activity** – participants add their own photos of an environmental concern from near their home or place of work to a landscape, picture-building poster. As they add their picture, they explain what their concern is, and how it links with other environmental concerns in the region.
- **Making an instructional video** – participants choose one of the citizen science tools that they have been introduced to make an instructional video for. The videos are made in groups, which are viewed and critiqued by others.
- The **change project task** – Each participant documents their learning journey; and shares how they have used what they have learnt to approach the environmental concern that they started with. They are required to share which citizen science tools they applied and what they discovered in the process.
- The **“tying-it-together” activity** – working in groups, the participants reflect and summarise what they learnt about: the citizen science tools, aquatic ecosystems, indigenous knowledge, and through the change project. They then link these concepts together with string and report back to the other groups.

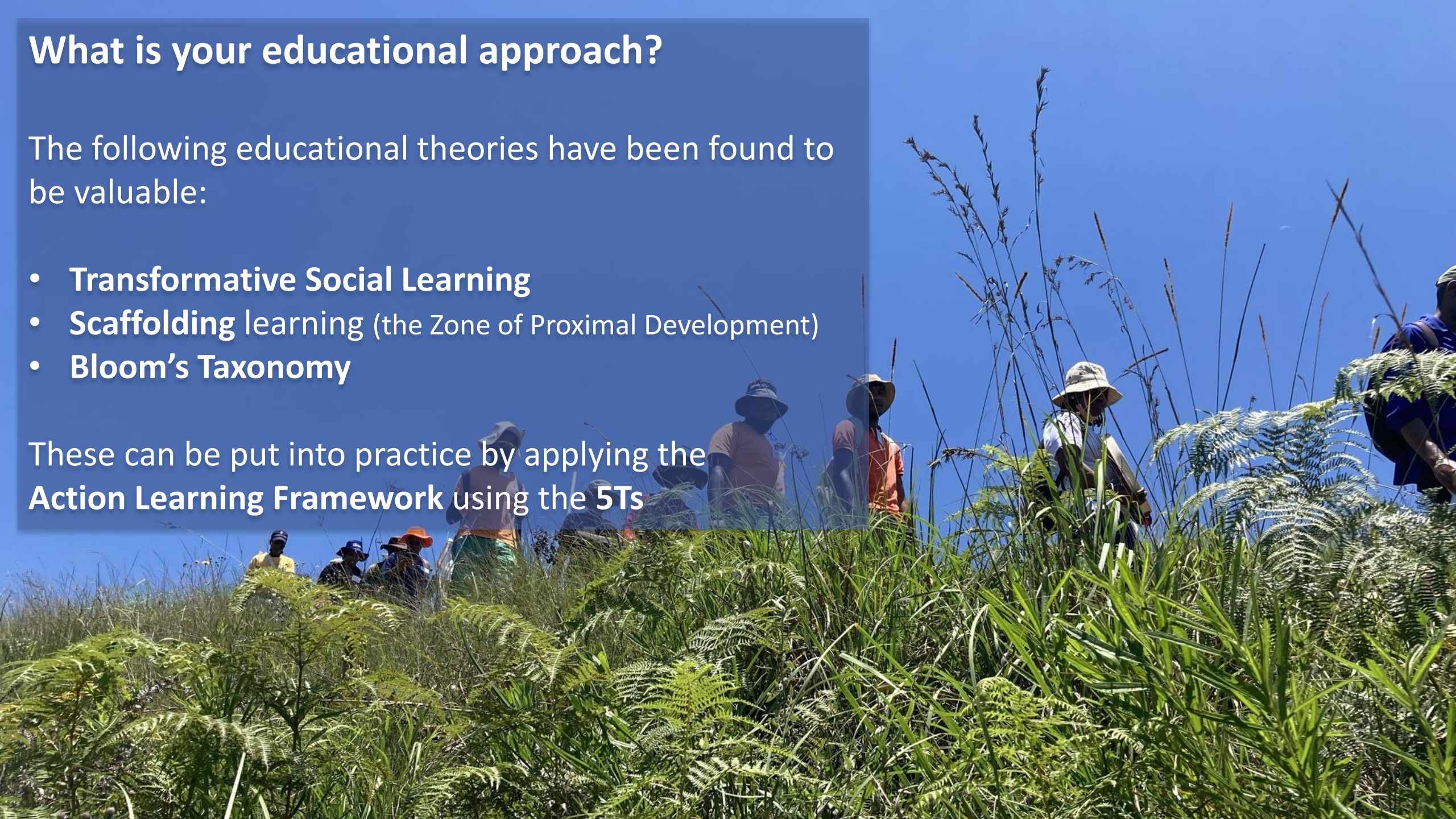


What is your educational approach?

The following educational theories have been found to be valuable:

- **Transformative Social Learning**
- **Scaffolding** learning (the Zone of Proximal Development)
- **Bloom's Taxonomy**

These can be put into practice by applying the **Action Learning Framework** using the **5Ts**



How does learning occur?

- **Learning** is a **social process** underpinned by **cultural** and **historical** contexts.
- **Learning** is a **transformative process**, rather than the simple gaining of knowledge.
- **Social learning** occurs within a **Community Of Practice (CoP)**: which refers to a **group of people** who share a **common interest** on a **particular subject** and **interact** on a **regular basis** to deepen their understanding on the topic.
- During this interaction, members of the community of practice create their **own set of practices** through **constant interaction** enabling the **sharing of knowledge** on a **shared topic** or **problem**.
- CoPs are characterized by 3 main elements: **(1) domain**, **(2) the culture** and **(3) the practice**.





Transformative Social Learning

Social learning takes place when we learn together, from one another. Social learning involves some of the following concepts (amongst others):

- We learn more in diverse groups – the more we differ from each other the more we learn
- We learn best when we create a space of trust, empathy, and acceptance
- The group needs to work together to co-create solutions, and come to consensus about new knowledge
- Creating new knowledge together, allows a group to take ownership for their actions and work towards solutions to their shared environmental concerns.

This approach can involve transdisciplinary learning, transformative learning, and transgressive learning

For more detail on what these are [click here](#)

What is social learning (SL)?

Social learning is a process that occurs within a social context with people of diverse backgrounds, viewpoints and values, with the aim of addressing a commonly shared concern.

SL occurs when we **learn together** and **from each other**.

SL occurs within **heterogenous groups**: i.e., within a group of people with diverse backgrounds, values and perspectives.

Social cohesion: Positive social relations that reinforce a sense of unity and trust within a group enables social learning to occur.

Creating new knowledge together, allows a group to take ownership for their actions & co-create solutions to their shared environmental concerns.

Through **constant engagement**, collective meaning and understanding is reached.

Factors enabling social learning

For learning to be regarded as social learning, it must exhibit the following traits:

- Learning must **portray a change in one's behavior**
- the change in behaviour of the individual, this includes learned ideas and behaviours, **diffuses into the wider society** in which the individual belongs.
- **Learning must occur within a group of people.**





Scaffolding learning (the Zone of Proximal Development)

This concept arises from Vygotsky's theory on the Zone of Proximal Development (ZPD) and builds on the idea that what the learner can do with assistance today, they will be able to do independently in the future. The concept centers around gently moving a learner from their "comfort zone" into an area of new knowledge by adding to what they know already.

To use this concept within the context of learning about citizen science, a facilitator will start from a "**place of knowing**". This means gaining a good understanding of the **prior knowledge** of the participants, and of the context in which they have built their understanding of the world around them. A facilitator will then assist the participant to **make links** between their prior knowledge and new knowledge, helping them to accommodate new ideas, and introducing them to new skills.

Initially, the facilitator may be deeply involved in the process of building new knowledge with the participant, but as the participant develops self-confidence and the skills needed, the facilitator begins to take less of an active role and allows the participant more independence.

[Click here for more detail about scaffolding learning](#)

The online course needs to be consciously planned.

Learning needs to be gently scaffolded, **starting from a ‘place of knowing’**. For example: using the picture-building activity and incorporating pictures that the participants have taken of environmental concerns from where they live, works well as a starting point (or means of ‘tuning-in’).

Greater value from this activity can be derived **when the participants revisit these environmental concerns** throughout the learning process; and add to how they understand them using the knowledge they have built together.

For careful scaffolding of learning to take place, a facilitator needs to have a **good understanding of the knowledge that the participants bring into the learning space**. This can be gauged through purposeful activities like the Enviro picture-building activity which is image-based and facilitates discussion. A facilitator can then get an understanding of how to build on the prior knowledge of the participants.

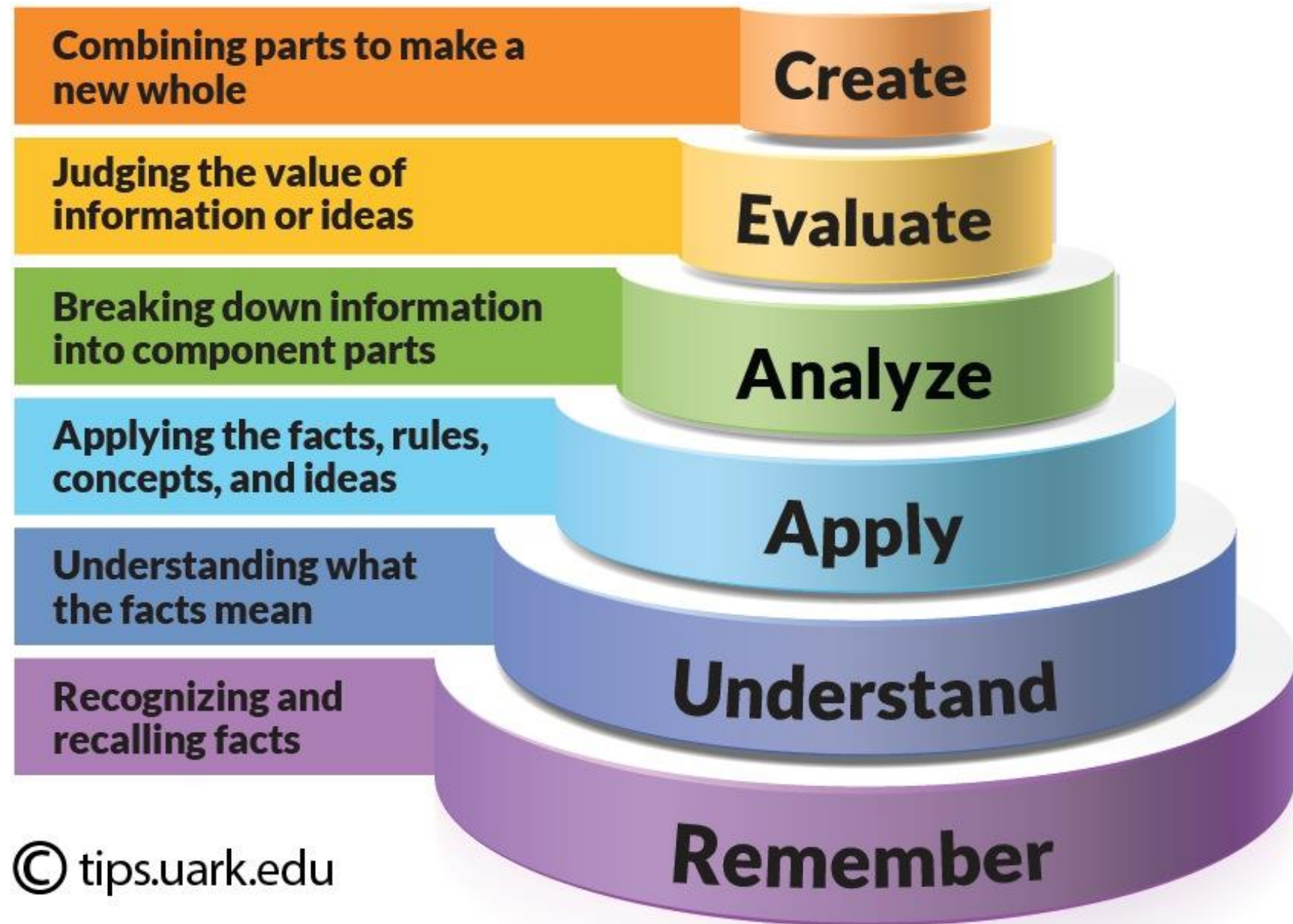


Bloom's Taxonomy

The revised framework depicted in the diagram outlines the cognitive skills involved in learning. Bloom and his colleagues arranged these skills **from simple to more complex**, and **from concrete to more abstract** applications.

In a practical sense, a facilitator would make sure that the initial tasks that a participant needs to do involve the skills required at the lower levels of Bloom's hierarchy.

As the participant builds a deeper understanding, they are required to demonstrate the skills that are nearer the top of the diagram.



The 5Ts of Action Learning model put these theories into practice. The 5 Ts: **Tune-in**, **Talk**, **Touch**, **Think**, and **Take Action** can be used in any order during the process of engagement with a shared environmental concern, promoting **deliberation, experientially learning, real-life encounters, reflection and critical accommodation of new ideas, and taking action** for the common good.

- **Tune in:** The “tuning-in” element of the model, is a critical part of establishing the prior knowledge of the participants and allows for the discussion of the matter of concern
- **Talk:** focuses on the participants discussing and sharing their knowledge and investigating what further research they need to do to engage with the “nexus of matters of concern” This contributes to the collaborative learning process, useful in citizen science activities.
- **Take Action:** element is about going into the field and taking actionable steps to implement what you have learnt).
- **Touch:** refers to field-based encounters which are pivotal in the learning process of an individual.
- **Think:** allows citizens to be involved in the learning process, in an engaged and alert manner, which allows them to ask questions and deepen their understanding

Putting the theory into practice





How can the 5 Ts' of Action Learning: 'Talk', 'Touch', 'Take Action', and 'Think' be incorporated into online learning?

Retaining the '5 Ts' within an online learning setting requires some creative thought, however, when a 'change project' is included as one of the activities, the participants are introduced to the elements of Action Learning.

A change project requires that the participants reflect on their learning process, take-action within their community, and share their learning journey with others.

The 'change project' activity has proved to be a successful way to incorporate Action Learning, and to consolidate the knowledge that the participants have gained.

5) SET UP A COMMUNICATION NETWORK



Set up a group on WhatsApp or another social communication app that is widely used to allow easy discussion with the facilitators and between the participants.

Share your stories on the **Citizen Science for Rivers** Facebook and Instagram pages by tagging the page or adding the hashtags **#CitizenScienceForRivers #CSFR**



A change project can be summarised and shared easily on social media



Guiding principles

These were the principles that guided how we used the online learning materials and how we facilitated the in-person training:

- **Relationships** between the facilitators and participants, and between the participants themselves need to be organically formed and continually nurtured.
- **Learning needs to be contextually relevant** to the participant and must link to their needs and lived experience.
- **Commonly shared environmental concerns** should be investigated using the Action Learning approach and linked back to indigenous or historic practices as related to the concern. The related indigenous practices can be used to inform how to address the environmental concern.
- **Citizen science** could then be introduced as a monitoring and evaluation **tool** to assess the changes in the state of the environment.
- Learning about the citizen science tools should **involve real-life experiences**; hands-on use of the tools; diverse field-based encounters; and repeated practice.
- Learning should be **gently scaffolded**, building on the prior knowledge of the participant, questioning, and probing assumptions and understanding, and giving the participants time to engage amongst themselves in discourse about their learning.
- Participants need to **feel that they are making a significant difference** in their community.
- The remote citizen science **learning platform needs to be accessible**, user-friendly and include the charge to use the internet.

The following aspects of the remote learning system proved to **successfully facilitate social learning** processes:

- **The introduction of facilitators via the online learning platform.** This gave a face to each facilitator, and allowed the participant to identify with their facilitators, and facilitated the building of trust between the participant and the facilitator. This enriched the learning experience.
- **The provision of in-person contact sessions** where the participants were able to meet each other, form bonds and friendships, and interact with their facilitators. In-person training sessions provided a conducive environment for social learning to occur within the group, and thus enhanced the learning experience of the participants. Evidence showed that even though the bulk of the learning took place in an online setting, the participants valued the time when they were brought together to do activities with their group and facilitators. This human connection is still an important component of learning and should still be incorporated into a remote learning process. The value of online learning is that the time allocated for these in-person contact sessions can be reduced substantially when compared to traditional learning. This can save costs, travel, and the expenditure of Carbon.
- **The setting of group-work tasks.** Providing opportunities for and encouraging group-work opened space for social learning. These tasks fell outside of in-person sessions and encouraged the participants to connect and communicate with each other (either on WhatsApp or in-person) to complete assignments. The challenge of having to complete a task within a group facilitates deliberation, drives active participation, and the need to reach consensus to produce a submission for an assignment. These are important components of the social learning process.
- **Using a WhatsApp group for communication within each group.** This type of communication media provided opportunity for easy discussion within a remote setting. The WhatsApp group also served as an alternative platform to share learning material and for participants to support each other's learning journey. In lieu of face-to-face interactions, the familiarity of the participants with the use of WhatsApp meant that it was their preferred mode of communication. The other mediums communication (the online forums, email, and built-in message system) was not well used.



Have fun
and
welcome to the community of practice!