

## **Professor Swan Lecture Summary**

Research suggests that there are three main frameworks that teachers tend to teach within; Transmission, Discovery and Collaborative.

**Transmission** is the “traditional” type of teaching, whereby teachers explain and “tell” content to students. Its focus is on outcomes and skill based objectives. This type of teaching has been proven as an ineffective method of allowing students to develop and retain deeper understandings of concepts.

**Collaborative;** Strong trends in research suggest that this is the most effective way to improve student learning in mathematics. Some key principles of teaching within this framework include;

- emphasis on collaborative learning and discussions,
- higher order questioning.
- encouraging students to clearly articulate knowledge and understandings.
- ensure students are building on prior knowledge,
- emphasising reasoning skills and justifications for answers.
- exposing and discussing misconceptions,
- encouraging evaluation of ideas.
- classifying and categorising information.
- using multiple representations.
- creating connections between concepts.

**Discovery** refers to allowing students to explore and develop their own understandings more independently. Although it has a socio-constructivist basis that is related to the collaborative framework, it is nonetheless seen as largely ineffective due to the expectations that are placed on students to facilitate their own learning. Teachers operating within this framework tend to set open ended tasks, but provide limited support and questioning. This does not enable students to sufficiently address misconceptions, make clear connections and develop deeper understandings.

It is interesting to note that teaching within the discovery framework is actually *less* effective than teaching within the transmission framework. However, the majority of teachers tend to move from transmission to discovery, before they can effectively teach within the collaborative framework. Essentially, this means that teaching may become less effective, before it improves.

So this is why maths lessons can seem like absolute debacles when trialling new methods of teaching!!

**Key Principles:**  
**Collaborative as opposed to Transmission.**

| <b>More Effective (collaborative)</b>                                 | <b>Less Effective (transmission)</b>                |
|---|---|
| Students are challenged before teacher provides help.                 | Teacher helps before challenging students.          |
| Students and teachers discuss ways of working.                        | Students are told what to do.                       |
| Teacher elicits interpretations and methods.                          | Teacher elicits facts and answers.                  |
| Teacher gives students extended time to answer questions. (wait time) | Teacher gives answer if they are not forthcoming.   |
| Teacher listens before intervening in student learning processes.     | Teacher intervenes before listening.                |
| Teacher does not let students off the hook if they cannot explain.    | Teacher explains for the student.                   |
| Teacher leaves some discussions unresolved.                           | Teacher feels the need to resolve every discussion. |

This last principle is particularly interesting, particularly in terms of the traditional structure of lessons, whereby the end part is often used to “go through answers” and see if students have met the lesson objectives. This has implications for planning and assessment as it means a shift in emphasis from answer-oriented objectives and methods of assessment, to more process oriented expectations. Assessment may therefore need to be based more heavily on assessing whether students can reason, explain and discuss their understandings.

Most significantly, maths teaching should be seen as an ongoing and fluid process, whereby objectives are not segregated, but rather, built upon and revisited constantly.

All of this research strongly links to the fundamental principles of the e5 instructional model, as well as new assessment strategies such as *Scaffolding Numeracy in the Middle Years* (SNMY).