# Outline of Reflective Masters Project

1. Schön’s three forms of reflective practices
* Reflection-on-action
* Reflection-in-action
* Reflection-for-action
1. Tools for evaluating reflective practices.
* IRTAR – Inventory of Reflective Teaching via Action Research
1. Obstacles to reflection / Components needed for reflection
* Fear of failure
* Outside factors as cause of problems
* Teach as you were taught
* Lack of understanding of what reflection is
* Need for open mindedness
* Confronted by counter-examples of held beliefs
1. Ways of incorporating reflection in the physics classroom
* Whiteboarding
* Reflective Journals/Writing
* Student centered learning environment
* Anticipatory sets with evaluations of prior knowledge and present knowledge
* TUG-K, FCI, MBT, ECI
* RTOP– Reformed Teacher Observational Protocol
* Student Discourse
1. Building Reflective Students
* Use of reflective journals and reflective writing
* Modeling our own reflective practices
* Asking students to critically think about their own methods (Studying, homework, group work, etc)

**Reflective Practices for the Physics Teacher**

**Abstract:**

The benefits of reflective practices have been well published since the early days of Dewey. However, few have helped to extend this knowledge into the physics classroom. The purpose of this article is to discuss how reflective practices can be adapted for the physics classroom, explore what tools are available to measure the effectiveness reflection, examine tools associated with reflective thought and to provide a quick start guide to becoming/developing reflective learners.

**Background – Insights From Schön:**

In order to properly look at reflective practices, it is important that the reader have a clear sense of the terminology used to describe the reflective process. I will be borrowing from the ideas presented by Donald A. Schön in his book entitled Educating the Reflective Practitioner. In this work, Schön describes the ideas of reflection-in-action (meaning the type of reflection that occurs on the spot), reflection-on-action (reflection that occurs after the fact that serves to evaluate the effectiveness of a given action) and reflection-for-action (done before the action has taken place in anticipation of what will occur) to help extend the understanding of what reflection is and how it is utilized by the professional.

**Incorporating Reflection in the Classroom:**

 **There are many different methods to including reflective practices in the physics classroom. The following section will provide a brief list of some of the easiest and most beneficial of those methods. This is by no means a complete list, but should serve is a good starting point for an educator looking to develop reflective thinking.**

1. **Whiteboarding**

It is no secret that effective physics instruction should be interactive and include a collaborative learning environment. One of the best ways of incorporating these practices is through the use of whiteboarding[[1]](#endnote-2). However, the use of whiteboarding also carries with it another, sometimes less celebrated, aspect of learning; namely reflection. Reflection can show itself in several ways during the course of a whiteboarding session. In order to keep things simple I will simply break these down into two categories

* Instructor: reflection-in-action
* Student: reflection-for-action, reflection-in-action, and reflection-on-action

We will first look at the instructor’s opportunity for reflection. As defined by Schön, the predominant type of reflection that the instructor can expect to be engaged in is reflection-in-action. During the course of the whiteboarding activity, the students are actively displaying their knowledge. This may, or may not, have been anticipated by the instructor in the prior design of the activity. For this very reason, the instructor may at times be involved in a certain degree of analysis right there on the spot. Students may express divergent thoughts, bring untapped prior knowledge into the open, or simply give new sight into an existing problem. The adept instructor will be able to take this information into account, and acting upon a wealth of knowledge, adjust the instruction to take advantage of these new insights. It is essential that the instructor not only have the background knowledge needed to redirect the focus of the lesson, but also the ability to abandon their previous lesson plan and re-script a new plan on the fly. The best lessons are anything but linear.

On the student side, whiteboarding provides an opportunity for a wide variety of reflective practices during the course of the activity. At the start, the student may be involved in developing a solution to a proposed problem. This may be a point where the student engages in a sort of internal reflection-for-action where the previous material is evaluated to determine which information will be used to solve the problem. However, the student may also be thinking back on previous whiteboarding sessions, about their outcome and how they relate, or don’t relate, to the current objective. In addition to the dialog happening inside the student’s own mind, the group members may also be engaged in verbalizing some of the same thoughts, thus evolving the student’s personal reflection to that of a group reflection. This is an important point because, for effective reflection to take place, it is imperative that the reflection be made public and put up for scrutiny[[2]](#endnote-3). Whether the student in aware of it or not, they are already exhibiting characteristics of reflective learning.

Stepping beyond the initial point of the activity to the presentation of results, the student has the opportunity to then begin a series of reflection-in-action events. As groups are presenting their solutions to the problem, new information or ideas presented may give rise to a re-evaluation on the student’s initial thoughts. This new information may simply prove to reinforce previously held convictions. However, it may serve to challenge those beliefs as well. At this point the student may take part in an internal evaluation of their previously held ideas in light of the new information taken in, or simply justify their previous contentions. Either way, the student has embarked on a voyage of reflection-in-action.

Finally, the conclusion of the activity can provide a point for reflection-on-action. After the problem has been evaluated and the group is satisfied with a solution, the instructor may choose to lead the students in a guided inquiry as to where their ideas were reinforced or at what point their ideas began to break down. This provides the student with an extremely robust opportunity to look back on their actions and begin to systematically apply reason to their thoughts and develop plans for future situations. Even if the group does not choose to discuss the outcome of the activity (which I would vehemently suggest not doing), the student may choose to have this discussion internally. Unfortunately though, this robs the student of a truly meaningful reflective practice since it is lacking the essential component of publicity. Either way, it is important that students be led to understand the path they took in reaching their conclusion, not only how they got there, but how can it be extrapolated to alternate situations.

Whiteboarding can be a powerful tool in your physics classroom. It provides the teacher with immediate feedback on student prior knowledge, the level of student understanding or simply the effectiveness of an activity. However, if properly linked with effective reflective practices, the learning can become greatly magnified. It is important though, that the student is made aware of the unspoken dialogs they may be engaged in so that they can learn to be reflective thinkers.

1. **Reflective Journals/Writing**
1. MacIsaac, Dan. “Whiteboarding.” From < http://physicsed.buffalostate.edu/AZTEC/BP\_WB/index.html> [↑](#endnote-ref-2)
2. [↑](#endnote-ref-3)