How to measure the effectiveness of learning-processes in informatics that rely on the use of programming environments?

In every 'programming'-, 'software development'- or 'algorithmic problem solving'-class a programming environment will be used. The teacher chooses language, tool support in order to meet curriculum needs and in hope to improve learning effectiveness. But how can one be sure to be made the best choice?

A question like this arouses in all areas a computer is used to support learning and so it is subject in many studies. A typical research design: between a pre- and a post-test two groups interact with two different tools. But results of different studies are often contradictory, which is due to the type of research approach using such a design. Clark concluded already in 1983 that "media do not influence learning under any conditions" (quoted from Kozma). Kozma answered in 1994, "if there is no relationship between media and learning it may be because we have not yet made one" (Kozma, p.7).

The consequence is to study the use of the learning tools. The general research question shifts from searching the best media to search effective learning environments in which teaching methods, media / tool usage and learning activities are related in an effective way. Since some years this direction is marketed as so called 'blended learning'-approach.

This means to supplement pe-post design through instruments which measure the interaction of the learners with the tools in order to describe learning processes. This kind of studies aim to find out and describe 'learning patterns': effective user-tool interactions that result in meaningful learning processes. In the paper two related instruments will be described: Logfile-analyses and the categorisation-based examination of screen-videos. An example will be given, the instruments will be discussed, and hints for interpreting the results with an theory-based-approach will be given.