

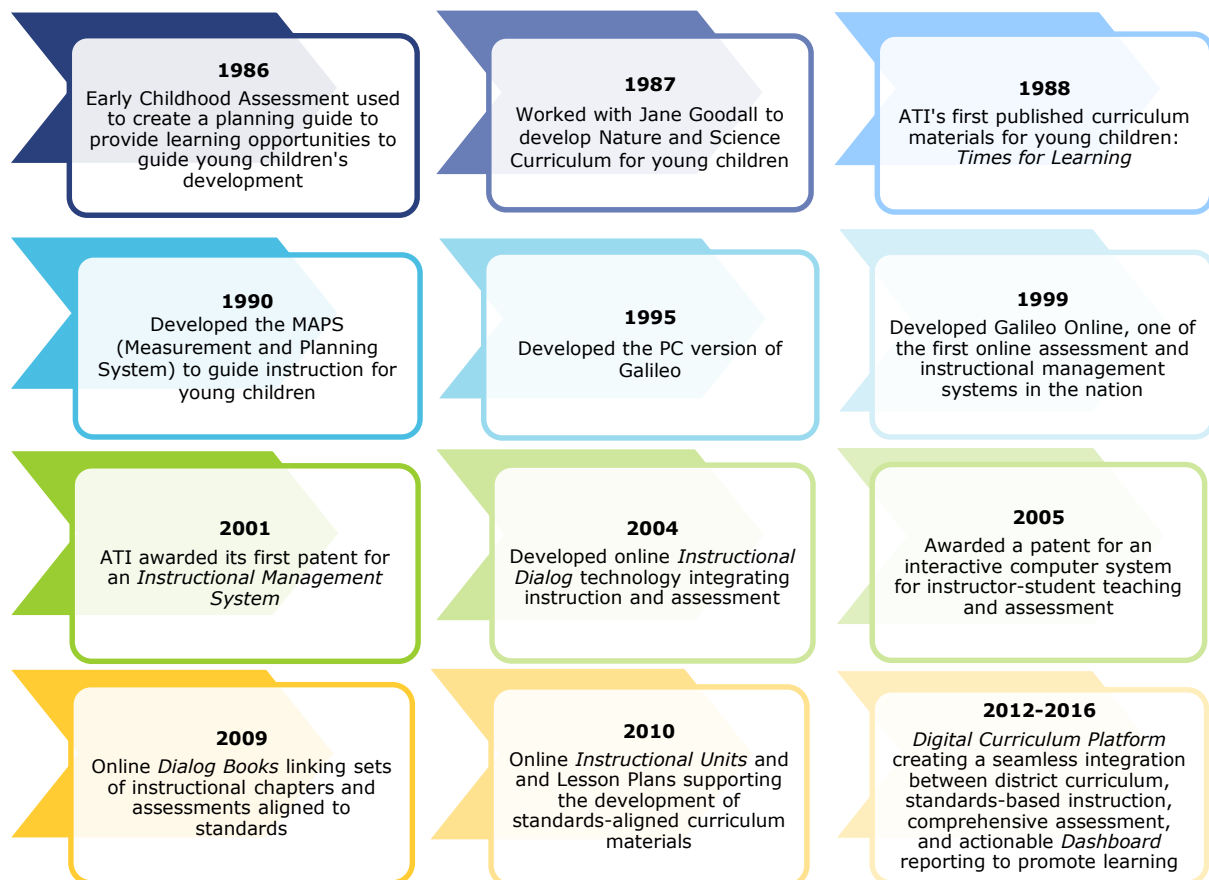
# A Brief History of Galileo® Digital Curriculum Technology

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ATI was founded in 1986 through the Technology Transfer Program at the University of Arizona. The mission of the corporation to create and disseminate technology to promote learning was informed by a large research program focused on the application of mathematical models to increase understanding of how children learn and how variations in instruction affect learning. Results of this and related research have been published in a large number of journals and books including the *Review of Educational Research*, the *Journal of Educational Psychology*, *Contemporary Educational Psychology*, the *Psychological Bulletin*, the *Journal of Educational Measurement*, *Applied Psychological Measurement*, and the *Review of Research in Education*.

## Through the Years to 2016 and the Galileo Digital Curriculum Platform



Initial work at ATI employed log-linear models and structural equation models to assess the effects of subordinate skills on the development of superordinate skills. Latent-class models were used to validate hierarchical learning structures revealing the order in which skills are acquired. Latent-class models were also used to assess the effects of variations in the order of teaching on the order of learning. As this work progressed, it became apparent that Item Response Theory (IRT) could play an important role in assessing learning and improving instruction. In order to improve instruction, it

is essential to know the extent which instruction has resulted in academic progress or growth. IRT provides mathematical procedures that can place multiple assessments on a common scale that adjusts for differences in the difficulty of the tests. This makes it possible to measure growth. IRT also can be used to recommend next instructional steps based on probability estimates of readiness to learn for large numbers of skills. For example, IRT techniques can easily determine next instructional steps for skills to be taught in an entire instructional unit.

When the benefits of IRT became apparent, ATI developed technology to take advantage of those benefits to promote learning. More specifically, ATI developed a printed planning guide that linked student Developmental Level (DL) scores to estimates of student readiness to learn specific skills. Three readiness levels were utilized: Ready now, ready soon, and ready later. Those levels were used by teachers to determine the learning opportunities most suitable for the developmental level of the child. ATI continues to use IRT to measure growth and to recommend next instructional steps. The early printed planning guide has been replaced by a variety of online reports providing actionable information to guide differentiated instruction and evaluate curriculum. The IRT models used by ATI have also changed. IRT models available today are much more powerful than those available at the end of the twentieth century. For example, ATI now estimates parameters for thousands of items simultaneously creating IRT scales capable of representing entire curriculums. ATI also uses IRT in the construction and delivery of Multi-Stage Computerized Adaptive Tests. These types of computerized adaptive tests did not exist in the 1990s.

ATI began work on curriculum development shortly after the corporation was founded. In 1987 we were fortunate to be able to work with Dr. Jane Goodall on a project involving curriculum development related to nature and science. This led to the publication in 1988 of ATI's first curriculum materials, *Times for Learning*, with a forward written by Dr. Goodall. In 1990, ATI developed a *Measurement and Planning System* (MAPS) that was designed to promote learning and development as children made the transition from preschool programs into the elementary school. In connection with this work, ATI staff wrote an article published in 1991 in the *American Education Research Journal* showing that the use of assessment to guide instructional planning for children in kindergarten not only increased learning, but also reduced the likelihood of retention in grade and referral to and placement in a special education program.

Our first patent for an instructional management system integrating curriculum with assessment was filed in 1998 and granted in 2001. Shortly after this initial work, we began an initiative to implement teacher facilitated online instruction and assessment involving multimedia assessment and instructional content. As a result of this work, a second patent involving multimedia instruction offered online using ATI's *Storyteller* technology was granted in 2005. During that year, ATI also developed the PC version of what would later become Galileo® Online, one of the first online assessment and instructional management systems in the nation. Following the initial work with multimedia content, ATI introduced the concept of an online *Instructional Dialog*. Dialogs enabled teachers to create their own online lessons and assignments. In addition, Dialogs provided prebuilt multimedia instructional resources. Shortly after the introduction of Dialogs, ATI introduced *Dialog Books*. The *Dialog Book* offered a structure within which to organize instructional content. Each chapter in a book began with chapter objectives based on standards in use by the district. Assessments linked to each chapter provided evidence on what was learned from the book. *Instructional Units* and lesson plans were also added to the system. The concept of a digital curriculum platform emerged from the early lesson plans and *Instructional Units* available in Galileo. The platform also had common features with *Dialog Books*. Like the books, the Galileo *Digital*

*Curriculum Platform* provided a structure within which to organize instruction. The platform had the additional advantage of providing users with the capability to easily enter and use district curriculums online. The availability of online curriculums supported real-time curriculum delivery of instructional content. The fact that the curriculum was online and linked directly to assessment information opened the way for the creation of dynamic curriculums that could be continuously improved based on consideration of assessment evidence.

As technology availability and capability have increased, many new features have been added to the platform. This is to be expected. The platform is designed to change. In our view, that is a requirement of 21<sup>st</sup> century education and educational technology.

