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An instrument to determine the technological literacy levels of upper secondary school students

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Abstract
In this article, an instrument for assessing upper secondary school students' levels of technological literacy is presented. The items making up the instrument emerged from a previous study that employed a phenomenographic research approach to explore students' conceptions of technology in terms of their understanding of the *nature of technology* and their *interaction with technological artefacts*. The instrument was validated through administration to 1,245 students on completion of their 12 years of formal schooling. A factor analysis was conducted on the data and Cronbach alpha reliability co-efficients determined. The results show that a five-dimension factor structure (namely, *artefact*, *process*, *direction/instruction*, *tinkering*, and *engagement*) strongly supported the dimensions as developed during the original phenomenographic study. The Cronbach alpha reliability co-efficient of each dimension was satisfactory. Based on these findings, the instrument has been shown to be valid and reliable and can be used with confidence.

Introduction
The inclusion of Technology as a defined subject area in schooling (Tamir 1991; Waetjen 1993; Gagel 1995, 1997; Lewis 1999) emerged strongly in the 1990s (cf. Compton and Harwood 2003; Williams 2005, Jones et al. 2013). South Africa was a country to follow suite during this time (Ankiewicz 1995; Pudi 2007; van Rensburg et al. 1996) and throughout multiple revisions of the national curriculum (Department of Education 1997, 2002, 2011; Stevens 2005; Potgieter 2012), the primary aim has explicitly been to produce technologically literate students. However, defining *technological literacy* has proven to be "unexpectedly complex and difficult" (Gagel 1997, p. 1). It has been argued that being literate in technology means that you have proficiency and knowledge, beyond the focus on artefacts and techniques of technology, but with more focus on the knowledge and inventiveness that is technology (Gagel 1997). For students, a simplistic view of technology has the potential to reduce the concept of technology to raw materials—"stuff that we can transform into artefacts" (Dakers 2006, p. 2). For a more sophisticated way of conceptualising about technology, students' thinking should encompass an awareness of the knowledge and processes that are involved in the creation of artefacts, as well as the implications thereof (ITEA 2000).

Prosser, M., & Trigwell, K. (2006). Confirmatory factor analysis of the approaches to teaching inventory. *British Journal of Educational Psychology, 76*, 405–419.

Pudi, T. I. (2007). *Understanding technology education from a South African perspective*. Pretoria: Van Schaik.

Raat, J. H., & de Vries, M. J. (1985). What do 13-year old pupils think about technology? *The conception of and the attitude towards technology of 13-year old girls and boys*. Paper presented at the science and technology education and future human needs conference of the International Council of Scientific Unions, Bangalore.

Rose, L. C., Gallup, A. M., Dugger, W. E, Jr, & Starkweather, K. N. (2004). The second installment of the ITEA/Gallup poll and what it reveals as to how Americans think about technology. *Technology Teacher, 64*(1), 1.

Rose, L. C., & Jr Dugger, W. E. (2002). ITEA/Gallup poll reveals what Americans think about technology. A report of the survey conducted by the Gallup Organization for the International Technology Education Association. *Technology Teacher, 61*(6 insert), 1–8.

Saskatchewan Education. (2001). *1999 Provincial learning assessment in technological literacy*, (p. 69).

Stevens, A. (2005). Technology teacher education in South Africa. PATT-15: Technology education and research: Twenty years in retrospect (2005) (cited 03 July 2013). www.iteaconnect.org/Conference/ PATT/PATT15/Stevens.pdf.

Tabachnick, B. G., & Fiddell, L. S. (2007). *Using multivariate statistics*. Needum Heights, MA: Pearson/ Allyn and Bacon.

Tamir, P. (1991). Factors associated with the acquisition of functional knowledge and understanding of science. *Research in Science and Technological Education, 9*(1), 17–37.

Trigwell, K. (2000). Phenomenography: Variation and discernment. In C. Rust (Ed.), *Improving student learning, Proceedings of the 1999 7th International Symposium, Oxford Centre for Staff and Learning Development* (pp. 75–85). Oxford: Oxford.

Trigwell, K. (2002). Approaches to teaching design subjects: A quantitative analysis. *Art, Design Communication in Higher Education, 1*, 69–80.

Van Rensburg, S. J., Myburgh, C. P. H., & Ankiewicz, P. (1996). *Curriculum development for technology in South Africa: Gender issues*. Paper presented at the GASAT 8 conference, Ahmedabad, India, 5–10 January.

Volk, K., Yip, W. M., & Lo, T. K. (2003). Hong Kong pupils' attitude toward technology: The impact of design and technology programs. *Journal of Technology Education, 15*(1), 48–63.

Waetjen, W. B. (1993). Technology education. *Journal of Technology Education, 4*(2), 5–10.

Williams, P. J. (2005). Technology education in Australia. *Proceedings of the pupils' attitude toward science conference 15*, the Netherlands, April 2005.