STUDENTS' UNDERSTANDING OF UNCERTAINTY IN PHYSICAL MEASUREMENTS

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ABSTRACT

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A test to assess student understanding of measurement and uncertainty has been developed and administered to 90 students of the Faculty of Applied Sciences. The aim is to identify the level of students' understanding of uncertainty in physical measurements. A ten-item-test answered within thirty minutes focuses on three objectives of the study: 1) To identify students' understanding behind multiple measurements and data dispersion, 2) To identify students' ability to carry out numerical calculation of uncertainty for a given set of data and 3) To identify students' understanding of uncertainty propagation and the use of uncertainty for comparison of measurement results. The test was administered by the researcher to degree level students (Bachelor of Science) from three different courses in the faculty: Physics (AS203), Bio-Composite Technology (AS232) and Industrial Physics (AS231).

CHAPTER 1

INTRODUCTION

1.1 Background and problem statement

In an ideal world, measurements are always perfect where it tells us about a property of something. Measurements might tell us how heavy an object is, or how hot, or how long it is. Rulers, stopwatches, weighing scales, and thermometers are all measuring instruments that we used. However, we live in the real world, and here measurements are never perfect and have limitations. The imperfection inherent in all measurement is called an uncertainty.

The word "uncertainty" means doubt, and thus, in simpler meaning, "uncertainty of measurement" means doubt about the validity of the result of a measurement. All measurements are subject to uncertainty and a measured value is only complete if it is accompanied by a statement of the associated uncertainty (Bell, 1999; Birch, 2003).