THE ASSESSMENT OF SCIENTIFIC REASONING, INDUCTIVE REASONING AND SCIENTIFIC INQUIRY USING PAPER AND PENCIL IN NAMIBIA

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The goal of knowledge assessment is not only to rate or rank students, but also 'to provide feedback to students about their learning, in order to positively influence their learning motivation and help them to take control of their own learning' (Nicol & Macfarlane-Dick, 2006). Therefore, this paper presents the results of the paper and pencil assessment of scientific reasoning skills, scientific inquiry, and general thinking skills such as inductive reasoning skills, needed to be acquired by the students in the 21st century. The purposes of this study were to assess and to investigate the relationship between scientific reasoning (SR), inductive reasoning (IR) and scientific inquiry (SI) skills in Namibia using the paper and pencil method. The sample of the study was drawn from the tenth (N=130) and twelfth graders (N=452). The assessment tools for SR skills consisted of 24 items assessing different types of reasoning skills (Lawson, 1978, 2000), and the IR test consisted of 38 items (Pásztor, Molnár, Korom, B. Németh & Csapó, 2017). The SI tests had 36 items assessing seven constructs of inquiry skills (Korom et al., 2012; Pásztor et al., 2017). The Cronbach alphas were good, .90, .89 and .93 for SR, IR and SI skills, respectively. Overall mean results showed that students had high performances (SR: M=61.95, SD=26.58; IR: M=77.00, SD=17.00 and SI: M=72.65, SD=12.68). SEM was used to explore the relationship between the three skills. The model fits were acceptable (χ^2=278.13, df=101, CFI=.93, TLI=.92, RMSEA=.06, SRMR=.06). Further analysis of the test scores showed that there were no significant gender differences in performance in these three tests (SR: t=0.05, p>.05; SI: t=1.74, p>.05; and IR: t=.63, p>.05). In terms of age, no significant differences were found concerning SR (t=1.26, p>.05). However, grade 12 students performed much better than the grade 10 students in SI (t=5.19, p<.01) and in IR (t=8.72, p<.01) One-parameter Rasch analyses showed a good match between item difficulty and students' ability level. Significant correlation was found between SI and IR (r=.35, p<.01). However, no significant correlations were found between IR and SR or between SI and SR. These results revealed that the paper and pencil assessment proved to be very reliable as all the three tests yielded very high internal consistency in both age groups. Mean performance results indicated that no significant difference were found between genders in all the three tests, therefore, our results conform within the research community. The results suggest the need to reconsider the Namibian education system to improve the reasoning skills among the students. The findings indicate that paper and pencil assessment methods may provide schools and teachers with assessment instruments to assess these kind of skills regularly.