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SCIENCE LABORATORY DYNAMICS AND ACQUISITION OF SCIENCE P ROCESS SKILLS AMONG FORM FOUR SCIENCE FEMALE STUDENTS

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By

SAROJINI DEVI A/P ALGARETNAM

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Especially for my late father, Mr. K.Alagaretnam,

who encouraged me to excel.

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Chairman: Professor Dr. Kamariah Hj. Abu Bakar

Faculty: Educational Studies

Laboratory activities have been regarded as an integral and essential aspect of learning experience in school science teaching. So to achieve the goals of the science curriculum, there was a need to enhance the diagnostic study of the science laboratory environment. Thus, the general purpose of this study was to investigate the nature of the laboratory dynamics and determine the dominant types of variables existing in a science laboratory. The study also sought to investigate the relationships between variables such as lesson structures, class setting, student interactions and student behaviours in a science laboratory. Besides that, the researcher attempted to examine the relationship between the above variables and student acquisition of science process skills. Hence, a conceptual framework based on an adapted causal model

proposed by Pizzini and Sherpardson (1992) was used in the study.

A correlational design was employed to describe in quantitative terms the relationship between the major variables such as lesson structures, class setting, student interactions, self-on-task (no interactions but on-task) and student behaviours in a science laboratory and achievement of science process skills. A sample of 81 students was selected randomly from three girls schools based on Test of Basic Science Process Skills (Test BSPS). The reliability coefficient of Test BSPS was .80. A power analysis indicated the power achieved by using the selected sample size was within the acceptable range of .75 to .80. Data on the variables was collected through direct observation of the subjects using an observational schedule, used by Pizzini and Shepardson (1992). Once the observations were over, all the observed students in the classes were given a test to assess the acquisition of integrated science process skills (Test ISPS). This test was mainly adapted from TIPS (Dillashaw and Okey, 1980). The reliability coefficient of the final test was .78.

The descriptive analysis of the data showed that among the lesson structures found in a science laboratory, the data collecting lesson structure was the most dominant followed by research

designing, data analysing, evaluating and finally problem finding. Small class setting was also more dominant than a large class setting in a science laboratory. Among the student interactions, it was found self-on-task was more dominant, indicating students very often worked on their own without any interaction. Among the student behaviours, the attending behaviour was most dominant, next being the following behaviour, giving behaviour, responding behaviour and finally soliciting behaviour.

In the inferential analysis, Pearson Correlation analysis was carried out to investigate the relationships between the variables. A number of statistically significant relationships were found between the variables. However, no significant relationships were found between any of the variables in the laboratory and acquisition of integrated science process skills. To derive a possible causal model, path analysis was used. Based on the correlation coefficients and path coefficients, the proposed causal model was revised.

The limitations and the implications of this study were discussed in detail. Suggestions and recommendations for future study were also made.

Abstrak tesis yang dikemukakan kepada
Senat Universiti Putra Malaysia sebagai memenuhi keperluan
untuk ijazah Doktor Falsafah

DINAMIKS MAKMAL SAINS DAN PEROLEHAN KEMAHIRAN PROSES SAINS DI KALANGAN PELAJAR PEREMPUAN TINGKATAN EMPAT

Oleh

SAROJINI DEVI A/P ALGARETNAM

Jun 2003

Pengerusi: Profesor Dr. Kamariah Hj. Abu Bakar

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Aktiviti makmal dianggap sebagai satu aspek yang perlu dan penting untuk pengalaman belajar dalam pengajaran sains sekolah. Jadi, untuk mencapai matlamat kurikulum sains, adalah perlu mengadakan satu kajian diagnostik suasana makmal sains. Oleh itu, tujuan umum kajian ini ialah menyiasat keadaan dinamiks makmal dan menentukan jenis–jenis pembolehubah dominan yang wujud dalam satu makmal sains. Kajian ini juga telah cuba mengkaji hubungan di antara pembolehubah-pembolehubah seperti struktur pengajaran, susunan kelas, interaksi pelajar dan kelakuan pelajar dalam sesuatu makmal sains. Selain itu, penyelidik telah cuba meneliti hubungan di antara pembolehubah-pembolehubah di

atas dan perolehan kemahiran proses sains pelajar. Justera itu, suatu rangka konseptual berdasarkan satu model yang telah diadaptasikan dar

Shepardson (1992) telah digunakan dalam kajian ini.

Reka bentuk korelasi telah digunakan untuk menerangkan secara kuantitatif hubungan antara pembolehubah-pembolehubah utama seperti struktur pengajaran, susunan kelas, interaksi pelajar, kerja-sendiri (tiada interaksi), tingkah laku pelajar dalam satu makmal sains dan penguasaan kemahiran proses sains. Satu sampel sebanyak 81 pelajar telah dipilih secara rawak dari tiga buah sekolah perempuan berdasarkan Ujian Basic Science Process Skills (Ujian BSPS). Nilai koefisien kebolehpercayaan ujian ini ialah .80. Satu analisis kuasa memperlihatkan nilai kuasa bagi saiz sampel yang dipilih di antara julat yang boleh diterima, iaitu .75 ke .80. Data pembolehubah-pembolehubah dikumpulkan melalui pencerapan subjek-subjek dengan menggunakan satu instrumen pencerapan yang telah dipakai oleh Pizzini dan Shepardson (1992). Apabila pencerapan selesai, semua pelajar dalam kelas telah menduduki satu ujian untuk mentaksir perolehan kemahiran proses sains sepadu. Ujian ini iaitu Ujian ISPS sebahagian besar telah diadaptasikan daripada TIPS (Dillashaw and Okey, 1980). Nilai koefisien kebolehpercayaan ujian ini ialah .78.

Analisis keperihalan data memperlihatkan di kalangan struktur pengajaran yang terdapat dalam makmal sains, pengumpulan data ialah yang paling dominan di antara semua struktur pengajaran, diikuti dengan mereka bentuk eksperimen, menganalisis data, penilaian and akhir sekali, mendapatkan penyelesaian masalah. Susunan kelas kecil juga lebih dominan daripada susunan kelas besar dalam makmal sains. Antara interaksi pelajar pula, didapati kerja-sendiri adalah paling dominan, menunjukkan pelajar selalu menjalankan tugas bersendirian tanpa sebarang interaksi. Bagi tingkah laku pelajar pula, yang paling dominan adalah memerhati, diikuti dengan tingkah laku mengikut, tingkah laku memberi, tingkah laku merespons, dan akhir sekali tingkah laku meminta.

Dalam analisis pentakbiran, analisis Kolerasi Pearson telah digunakan untuk mengkaji hubungan di antara pembolehubah-pembolehubah. Didapati beberapa hubungan yang signifikan dari segi statistik antara pembolehubah wujud. Walau bagaimana, tiada hubungan yang signifikan terdapat di antara pembolehubah-pembolehubah dalam makmal sains and perolehan kemahiran proses sains sepadu. Untuk memperoleh satu model yang mungkin wujud, analisis path telah digunakan. Berdasarkan koefisien kolerasi dan koefisien path, model yang dicadangkan diubahsuai.

Limitasi dan implikasi kajian telah dibincang secara terperinci. Syor dan cadangan untuk kajian masa hadapan turut diberikan.

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Finally, I remain solely responsible for any errors and shortcomings contained in this study.

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