

A Framework of Teachers' Concern about School Based Assessment of Science Practical Work (PEKA)

Satu Kerangka tentang Keprihatinan Guru terhadap Pentaksiran Kerja Amali (PEKA) Sains

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Abstract

Science Practical Work Assessment (*Pentaksiran Kerja Amali Sains* - PEKA) had been incorporated into three upper secondary school level science subjects, namely Chemistry, Physics and Biology; to replace the external examination of practical work - Science Practical Examination in Form Five. This change obviously has placed the school science teachers with more challenging role and new responsibilities, that is, the dual roles of educator and assessor. While this implementation is in line with the principle of reliable, valid and holistic assessment, any efforts to improve a more effective implementation should be based on detail investigation and comprehensive analysis on the effects of current practice of PEKA program in schools, especially the teachers' concerns in implementing the PEKA program. Thus, this paper aims to discuss the teachers' key concern about the implementation of PEKA program based on Cheung and Yip's five stages of concern about school based assessment which was originally developed by Hall.

Keywords Science Practical Work Assessment, stages of concern, school based assessment, Science Practical Examination, upper secondary school

Abstrak

Pentaksiran Kerja Amali (PEKA) Sains telah digunapakai bagi tiga mata pelajaran sains pada peringkat sekolah menengah atas, iaitu Kimia, Fizik dan Biologi; untuk menggantikan peperiksaan umum kerja amali—Peperiksaan Sains Praktikal di Tingkatan Lima. Perubahan ini jelas telah meletakkan guru-guru sains sekolah dengan peranan yang lebih mencabar dan tanggungjawab yang baharu iaitu peranan sebagai pendidik dan penilai. Walaupun pelaksanaan ini selaras dengan prinsip pentaksiran yang berkebolehpercayaan, sah dan holistik, namun sebarang usaha untuk memperbaiki pelaksanaan yang lebih berkesan harus berdasarkan penyiasatan terperinci dan analisis komprehensif mengenai kesan amalan program PEKA di sekolah-sekolah, terutama kebimbangan guru-guru dalam melaksanakan program PEKA. Oleh itu, kertas ini bertujuan untuk membincangkan kebimbangan utama guru mengenai pelaksanaan program PEKA berdasarkan lima peringkat kebimbangan yang diutarakan oleh Cheung dan Yip dalam kajian mereka tentang pentaksiran berasaskan sekolah, yang pada asalnya dibangunkan oleh Hall.

Kata kunci Pentaksiran Kerja Amali Sains, peringkat kebimbangan, pentaksiran berasaskan sekolah, Peperiksaan Sains Praktikal, sekolah menengah atas

Introduction

The different forms of examinations and assessment are widely documented as determinants of educational practice. Over the past few years, new approaches of assessment have emerged in a number of countries to replace the traditional external examination (especially standardized paper and pencil test) or to meet the special needs of new education system. A current change in the assessment structure for secondary schools in Malaysia marks a shift from a sole focus on national examinations to the use of both national examinations and school based assessments. A form of school-based assessment (SBA), the Science Practical Work Assessment (*Pentaksiran Kerja Amali Sains*, PEKA), had been incorporated into three upper secondary school level science subjects, namely Chemistry, Physics and Biology; to replace the external examination of practical work - Science Practical Examination in Form Five. The change obviously has placed the school science teachers with more challenging role and new responsibilities, that is, the dual roles of educator and assessor, in an effort to providing a more holistic, reliable and valid assessment on students' performance (Giddings, Hoftein & Lunetta, 1991; Auty, 1997). Besides, the implementation of SBA also provides school teachers with a formative view of the students' performance and allows the teachers to address more accurately and specifically the needs of their students. Even with such advantages, PEKA Project, like many other educational assessment and innovations, poses a number of problems to teachers. They will unavoidably face a lot of concerns. These include the workload problem, lack of support and sources, the reliability and validity of assessment result and impact on students' learning (Yip & Cheung, 2005). Thus, this paper aims to identify a framework about the key concerns that may be faced by teachers when implementing PEKA.

The Framework of SPM PEKA

The SPM PEKA was introduced by the Malaysia Examination Syndicate (LPM - *Lembaga Peperiksaan Malaysia*) in 1989 to replace the traditional external practical work examination, accounting for 10% of the total subject mark. The main objective in implementing PEKA is to enable the students to inculcate the scientific attitude and noble values. Therefore, the assessment is designed which is comparable with knowledge, skills, scientific attitudes and noble values to be developed in teaching and learning as highlighted in the Science Curriculum Specification. Besides, PEKA focuses more on continuous and formative assessment; throughout the assessment periods, the students are encouraged to acquire knowledge and experience to enable them the opportunity to improve their work and score.

In this program, teachers are asked to assess their own students continually throughout Form Four and Form Five. According to the manual for managing and conducting PEKA (2006), students are assessed by their own teachers in five practical skills, namely: i) constructing/planning experiment; ii) conducting experiment; iii) collecting and recording data/ observation; iv) interpreting data and making conclusion; and v) scientific attitudes and noble values.

Based on the guideline provided, the assessment is to be carried out from Form four until Form Five. Throughout the assessment period the students are encouraged to acquire

knowledge and scientific skills to enable them the opportunity to improve their work and the score obtained. Thus, SPM PEKA is carried out as part of teaching and learning process. Teachers can assess either one construct/skill or several constructs/skills to a small group of pupils or the whole class. The organization of SPM PEKA includes, 1) planning, such as, the students to be assessed, - the time/duration to conduct the assessment, the frequency of the assessment, the personnel involved, the type of instrument, the scoring, the grading and the reporting; 2) administration – all information regarding the assessment are collected and assessed by teachers responsible in the teaching and learning process of the subject. The teachers are required to manage the evidence produced by the students; 3) scoring – scores are awarded based on the scoring scheme; 4) reporting – the scores of the students are summarized according to the principles and the grading procedures to obtain the students' level of mastery; 5) moderation – a mechanism exercised to ensure the students are assessed on the similar construct and given the relevant scores. Moderation is an essential procedure to standardize and monitor school based assessments to maintain the validity and reliability of the scores given by the teacher (Ministry of Education, 2006).

Issues of Implementation of PEKA in Malaysia

Several researches had been done regarding the implementation of PEKA project. For instance, Yeow (2002) investigated the perception and attitude of students and teachers in 10 secondary schools in the Seremban District towards the School Based Practical Science Assessment (PEKA) carried out in secondary school, and identified the problems faced by teachers in implementing the PEKA from the teachers' view. The results of this study revealed that the majority of the students and teachers showed positive perceptions towards certain aspects of the PEKA program, especially scientific skills and knowledge development. Generally, teachers showed a slightly negative attitude towards PEKA. Results found that majority of the teachers (73.2%) agreed that the implementation of PEKA increased their work load considerably and only a small proportion of the teachers (14.6%) agreed that PEKA program has been successfully implemented. The study also identified some main problems faced by teachers in implementing the PEKA program, namely: 1) insufficient time; 2) teaching work load is too heavy; 3) students like to copy from each other; 4) large class size; 5) having to assess each student at least three times; 6) a large number of element to be assessed; and 7) students' negative attitude.

Allias (2001) investigated the implementation of the PEKA program in several secondary schools in the Lower Perak District. The result revealed that the PEKA program course which the teacher have attended were insufficient to help them to understand all procedures in the implementation of the PEKA program. However, majority of the teacher felt that they were capable of carrying out the PEKA in their classroom according to the procedure suggested. In his study, he also managed to identify some constraints that hinder the effectiveness of implementing the PEKA program in classroom, such as: 1) insufficient time; 2) the difficulties involved in determining the score; 3) large class size; 4) large number of elements to be assessed; 5) unfair scoring; 6) unavailability of students' reference material; 7) passive students; 8) lack of co-operation from students; 9) lack of apparatus and materials; and 10) the implementation of the PEKA program in school was rarely monitored.

In Ahmad and Jailani (2002) study, they noticed that majority of the teachers (66 Science teachers from three districts of Johor State) agreed that they need to spend more time, make additional references and make additional preparations to implement the PEKA program. Besides, they also confronted some problems, for examples: 1) administration work load is too many; 2) teaching work load is too heavy; 3) assessment work load is too heavy; 4) the instruction of implementing PEKA program is not clear; 5) the effects to implement PEKA program are never been appreciated.

According to Cheung and Yip (2004), one of the reasons why many teachers found that the in-service workshops provided by authority to be unrelated are that they are not in the direction of their peak stages of concern. For example, Broyles and Tillman (1985) found that the content topics (introduction, skills, organization and theory) were correlated to changes in teachers' concerns following training. Thus, one of the responsibilities of the authority is to help the teachers resolve their concerns especially regarding the evaluation, information and management.

While this implementation is in line with the principle of reliable, valid and holistic assessment, any efforts to improve the implementation of PEKA should be based on detail investigation and comprehensive analysis on the effects of current practice of PEKA in schools, especially the teachers' concerns in implementing the PEKA.

Categories of Teachers' Concern

According to Hall and George (1980), 'concern' can be defined as the composite representation of the feelings, preoccupation, thought and consideration given to a particular issue or task. Fuller (1969), Hall and Loucks (1978) had developed the Concerns-Based Adoption Model for describing the feelings, perceptions and attitude towards innovation. More specifically, seven stages of concerns have been identified. There are described as follows:

1. Awareness: little concern about or involvement with the innovation is indicated.
2. Informational: a general awareness of the innovation and interest in learning more detail about it is indicated. The person seems to be unworried about him or herself in relation to the innovation. She/he is interested in substantive aspects of the innovation in a selfless manner such as general characteristics, effects and requirements for use.
3. Personal: individual is uncertain about the demands of the innovation, his/her inadequacy to meet those demands, and his/her role in relation to the reward structure of the organization, decision-making and consideration of potential conflicts with existing structures or personal commitment. Financial or status implications of the program for self and colleagues may also be reflected.
4. Management: attention is focused on the processes and tasks of using the innovation and the best use of information and resources. Issues related to efficiency, organizing, managing, scheduling and time demands are utmost.
5. Consequence: attention focuses on impact of the innovation on students in his/her immediate sphere of influence. The focus is on relevance of the innovation for students, evaluation of student outcomes, including performance and competencies, and changes needed to increase student outcomes.

6. Collaboration: the focus is a coordination and cooperation with others regarding use of the innovation.
7. Refocusing: the focus is on exploration of more universal benefits from the innovation, including the possibility of major changes or replacement with a more powerful alternative. Individual has definite ideas about alternatives to the proposed or existing form of the innovation (Hall and George, 1979).

The seven stages of concern can be categorized into three groups: self-concerns (Stages 1–3); task concerns about the innovation (Stage 4); and impact concerns regarding students (Stages 5–7). The second assumption in the 7-stage model is that teacher concern is a developmental construct. Hall, George and Rutherford (1977) conceptualized an educational innovation – as a process involving developmental changes in teacher concerns. Initially, a teacher's self-concerns are expected to be the most intense. As the teacher becomes more experienced with the innovation, task concerns predominate. Finally, impact concerns become most intense. In other words, Hall assumed that every teacher's concern about an innovation progress should be from self-concern to task concern and finally to impact concern. A teacher can experience several stages of concern concurrently, but there is different degree of intensity (Cheung, Hattie & Ng, 2001). Earlier concerns must first lower in intensity before later concern increase in intensity. Hall, George and Rutherford (1977) assumed that the seven sequential stages of concern form a simplex structure (Joreskog, 1970); that is, correlations among the seven latent stages of concern variables in a correlation matrix are expected to decrease as one move away from the main diagonal.

Using a similar approach, Cheung and Yip (2004) have characterized teachers' concerns in five stages in relation to the implementation of Teacher Assessment Scheme in Advanced Level science subjects. These stages of concern about school based assessment of practical work provide one key diagnostic tool for identifying the key concerns about the implementation of PEKA program in three science subjects as follows:

1. *Evaluation*: the teacher concerns about the need, fairness and students' support of implementing PEKA in school.
2. *Information*: the teacher concerns about some general aspects of PEKA, such as teacher training, resources, designing checklist and moderation mechanism. He/she also concerns about the demands of PEKA.
3. *Management*: the teacher raises a number of questions about the tasks and processes of implementing PEKA. He/she concerns about the problems of workload in marking student reports, time constrains in planning and implementing of assessment and achievement of PEKA requirement.
4. *Consequence*: the teacher concerns about the impact of PEKA on his/her professional development and student learning. The teacher wants to know how PEKA can be used to enhance student learning. The teacher is eager to develop working relationships with other PEKA teachers and collaborate with them so as to enhance the effects of PEKA.
5. *Refocusing*: the teacher concerns about the further improvement of PEKA such as the possibility of refining or improving the operation of the existing PEKA by changing some of its features or by replacing it with more powerful alternative.

Conclusion

The model developers hypothesized that the stage of concerns change as users become increasingly familiar with and skilled in implementing school based assessment. This progression appears to be very similar with findings observed by Fuller (1969), that is early concerns deal with self and then come task related concerns; and finally concerns about the impact of the school-based assessment on others. It appeared that it was necessary for early stage concerns to be resolved, or at least reduced in intensity before later more mature concerns can emerge or increase in intensity. A teacher can experience several stages of concern concurrently, but there are differential degrees of intensity. Earlier concerns must first be lowered in intensity before later concerns increase in intensity. In other words, according to the stages of concern, every teacher can experience difference degrees of strength about PEKA, depending on factors such as the nature of the PEKA, the teacher's experience and the kind of assistance provided during the process (Hord, Rutherford, Huling-Austin and Hall, 1987). Regarding to Hall and Hord (1987), Cheung (2002) and Cheung & Yip (2004) 'teacher concern' is a developmental construct. For example, if the implementation process of PEKA has been efficiently supported, initially the novice teachers' concerns are expected to be the most intense in Stages 1 and 2. As the teacher becomes more experienced with PEKA, Stage 3 concerns predominate. Finally, Stages 4 and 5 concerns become most intense when the teacher becomes more competent, confident and expert in implementing an education innovation.

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