Academic Program Assessment and Accreditation: KFUPM Experience

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Abstract

Institutions of higher education have to demonstrate that the academic programs they offer are of high quality and do positively impact student's learning and provide the capabilities and skills required by the workplace. Realizing this fact and for its Quest for Excellence, King Fahd University of Petroleum & Minerals (KFUPM) have opted for external review as well as continuous internal assessment of its academic programs. Currently all engineering and industrial management programs of the university have been reviewed by international accrediting organizations namely the Accreditation Board for Engineering & Technology (ABET) and the Association to Advance Collegiate Schools of Business (AACSB) and have gained substantial equivalency or full accreditation.

In order to maintain its international recognition and for continues improvement of its academic programs, it is now the policy of KFUPM that all of its academic programs must undergo self-assessment activities every five years. Following a comprehensive program self-assessment guidelines, seven programs have completed their self-assessment activities and are now working on the implementation of the assessment findings for improvement. All remaining programs of the university have started their self-assessment activities this academic year and are in the process of finalizing their reports. These activities are coordinated by a dedicated Program Assessment Center as part of the Deanship of Academic Development in order to insure its success and continuity.

This paper will summarize KFUPM experience in program assessment and accreditation and will highlight the benefits gained and the lessons learned from such experiences.

Introduction

The challenges facing higher education today are greater than ever before. Higher education institutions have major responsibilities to ensure that the next generations have the best possible education that will enable them to meet the requirements of a very dynamic job market. Hence, the pressure on higher education programs to ensure that the quality of educational provision is adequate is very demanding.

The continuous assessment of various academic programs is the key for the quality assurance at the university. The aim of assessment is to understand how educational programs are working and to determine whether they are contributing to student

growth and development. It focuses on programs rather than on individual students. It provides information on whether the curriculum as a whole provides students with the knowledge, skills and values that graduates should possess in accordance with its mission and set goals and learning objectives.

Accrediting agencies such the Accreditation Board for Engineering and Technology (ABET), the Association to Advance Collegiate Schools of Business (ACCSB) and the National Architectural Accrediting Board (NAAB) require programs or colleges seeking accreditation to have self-assessment. Industry push and competitive job markets have also contributed to the need for continuous program quality improvement that focus on students learning and preparation for professional practice after graduation.

What is Assessment?
Assessment is a systematic ongoing, iterative process of monitoring (recording and analyzing) student learning outcomes and processes in order to determine what we are doing well and what we must improve. Assessment has been defined by Angelo (1995) as *"an ongoing process aimed at understanding and improving student learning. It involves making our expectations explicit and public; setting appropriate criteria an standards for learning quality; systematically gathering, analyzing, and interpreting evidence to determine how well performance matches those expectations and standards; and using the resulting information to document, explain, and improve performance."*

Other definitions for assessment exist by Palomba and Banta (1999), ABET (2003) and others which all agree on emphasizing the focus of assessment on the quality of student learning.

The aim of assessment is to understand how educational programs are working and to determine whether they are contributing to student growth and development. It focuses on programs rather than on individual students. It provides information on whether the curriculum as a whole provides students with the *knowledge*, *skills* and *values* that graduates should possess in accordance with its mission and set goals and learning objectives. Assessment is a means of discovering what, how, when, and which students learn and develop the expected learning outcomes both inside and outside of the classroom (Maki, 2002).

What is Accreditation?
Accreditation is defied by ISO (ISO/IEC guide 2:96) as "A procedure by which an authoritative body gives formal recognition that a body (organization) or a person is competent to carry out specific tasks". Assessment is a pre-requisite for accreditation of academic programs by most accrediting organizations.

Accreditation is used to assure quality in educational institutions and programs. Accreditation is a voluntary, non-governmental process of peer review. It requires an educational institution or program to meet certain, defined standards or criteria. There are two types of accreditation: institutional and specialized. Institutional accreditors, such as those referred to as "regional" accreditors, examine the college or university as a whole educational institution. Specialized accreditors evaluate specific educational programs. Professional accreditors, such as those for medicine, law,

architecture and engineering, fall into this category. Consequently, there is a range of methods which are used to assess the quality of education and which are designed to ensure that teaching uses modem technologies, that teaching staff are adequately trained, that the content of a program is appropriate and up to date, and that the assessment process used is fair, challenging and designed to measure the ability of the candidates in meeting the job market demand.

International Experiences in Program Quality Assurance
The United States, Canada, England, Ireland, Australia, New Zealand, and Hong Kong have signed a mutual recognition agreement designated the Washington Accord, which recognizes the engineering education evaluation processes. To assure the equivalence of engineering credentials, the European Federation of Engineering Societies (FEANI) certifies professional engineers in Europe. In, U.K. university programs are also subject to accreditation by the Engineering Council and assessed by the Quality Assurance Agency (QAA). Universities with engineering education programs in a number of countries have requested that the U.S. Accreditation Board for Engineering and Technology (ABET) assist in the evaluation of their engineering education programs using ABET evaluation criteria. As a result, there has been significant interest in the accreditation process used by ABET for engineering education programs in the United States. The following is a brief on the methods which are used in the United Kingdom and USA to assess the quality of education:

United Kingdom
Engineering programs in U.K. universities are subject to evaluation by two bodies namely: the Engineering Council (SARTOR, 1997) and the Quality Assurance Agency (QAA 1998-2000).

a.   Engineering Council
The Engineering Council, set up by Royal Charter, is the governing body for the standard of competence of engineering professionals. The major professional institutions have responsibility for ensuring that the standards of education in engineering in universities are satisfactory, and will accredit courses, which satisfy their exacting standards. Students graduating from these courses have qualifications which exempt them from the Engineering Council's qualifying examinations and can proceed to undertake their professional industrial training. The Engineering Council requires programs to be accredited every five years. A Panel of senior practicing engineers and engineering academics, which inspect the department and prepare a written report to the Professional Institution, carries this out in a two-day visit. The Visiting Moderation Panel may recommend that a program should be accredited for a further five-year period, or give provisional accreditation for one year pending a revisit, or may de-accredit a course. A report is sent to the Head of Department outlining the decision, together with the strengths and weaknesses of the program.

b.   The Quality Assurance Agency (QAA)
The Quality Assurance Agency (QAA) for Higher Education (http://www.qaa.ac.uk) is another body in U.K. that assesses higher education programs. QAA is an independent body funded by subscriptions from universities and colleges of higher education, and through contracts with the main higher education funding bodies. QAA reviews standards and quality, and provides reference points that help to define clear and explicit standards. It conducts a rigorous three-day inspection by a trained

Peer Review team, drawn from other universities and industry. Institutions are reviewed through an institutional audit. In addition, for a transitional period ending in 2005, institutions may also be reviewed through a developmental engagement or an academic review at subject level. The audit team expresses 'broad confidence', 'limited confidence', or 'no confidence', in the soundness of the institution's present and likely future management of the quality of its programs and the academic standards of its awards as well as the accuracy, integrity, completeness and frankness of the information that the institution publishes about the quality of its programs and the academic standards of its awards.

United States of America
Engineering and business programs in U.S.A. are subject to evaluation by two bodies namely: The Accreditation Board for Engineering and Technology (ABET) and the Association to Advance Collegiate Schools of Business (AACSB) International.

a.   The Accreditation Board for Engineering and Technology (ABET)
The Accreditation Board for Engineering and Technology (ABET) in the U.S.A. is a professional accrediting organization that accredits engineering programs, not institutions. The evaluation of a program by ABET includes assessment of both qualitative as well as quantitative factors in the process leading to an accreditation decision. The evaluation process is initiated when an institution requests that ABET conduct an evaluation of the engineering programs at the institution. The evaluation and accreditation process used is based on a combination of a self-study or self-evaluation by the institution and the individual engineering education programs, and a visit to the institution by a team of professionals in the discipline (http://www.abet.org).

Self-Study Report - An institution's educational programs will be initially evaluated on the basis of data submitted by the institution to ABET in the form of a Self-Study Report.
On-site Visit - The Self-Study Report is supplemented by an on-site visit by a carefully selected team representing ABET and it's Participating Bodies.
Report - Based on the review of the self study documentation, the observations made during the on-site visit, and discussions with the various program teams responsible for program processes, outcomes and continuous improvement actions, the program evaluators prepare a report of their evaluation. The program evaluator report summarizes the evaluation and observation of factual information, discusses the findings, and recommendations. The report addresses the accreditation criteria, documenting strengths, deficiencies, and any suggestions for improvement. The report also includes findings regarding the evaluation and assessment processes in the program, and the use of these process results to improve the effectiveness of the program.
Accreditation Actions - Accreditation is granted for a specific period of time for each program, depending upon the recommendations of the visiting team.

The Accreditation Board for Engineering and Technology (ABET) periodic accreditation review is the most widely recognized form of undergraduate engineering program assessment. ABET does not accredit engineering programs outside the United States, but rather grant substantial equivalency for those programs that satisfy accreditation criteria.

b. The Association to Advance Collegiate Schools of Business (AACSB) International

The Association to Advance Collegiate Schools of Business (AACSB) International (http://www.aacsb.edu) was founded in 1916 and began its accreditation function with the adoption of the first standards in 1919. In 2003, members approved a revised set of standards that are relevant and applicable to all business programs globally and which support and encourage excellence in management education worldwide. As a specialized agency, AACSB International grants accreditation for undergraduate and graduate business administration and accounting programs. AACSB International accreditation represents the highest standard of achievement for business schools, worldwide. Accreditation is valid for six years, with a maintenance visit in year five. When Board concurs, accreditation is extended for six more years, with the next maintenance visit in year five. The accreditation process unfolds in a series of integrated steps:

Step 1: Membership
Step 2: Pre-Accreditation
Step 3: Initial Accreditation
Step 4: Maintenance of Accreditation

More details of these steps are provided in the AACSB website http://www.aacsb.edu.

New Philosophy in Assessment and Accreditation

The new trends in assessment and accreditation of academic programs focus on the quality of student learning. It focuses on what students can or be able to do in preparation for professional career rather than what the programs provides them with. This qualitative approach views the program inputs and processes as tools that show the potential and capabilities of the program but can not guarantee the quality of its outcomes unless proven through measurements. Comparison of the new educational approach to that of the traditional one is summarized in Table1. The traditional approach is characterized by being prescriptive and teaching focused. However, the new approach is characterized by being outcome-based and learning focused for the purpose of providing continuous feedback for improvement. The new shift in assessment and accreditation is from (Gaff, et. al. 1997: p 597):
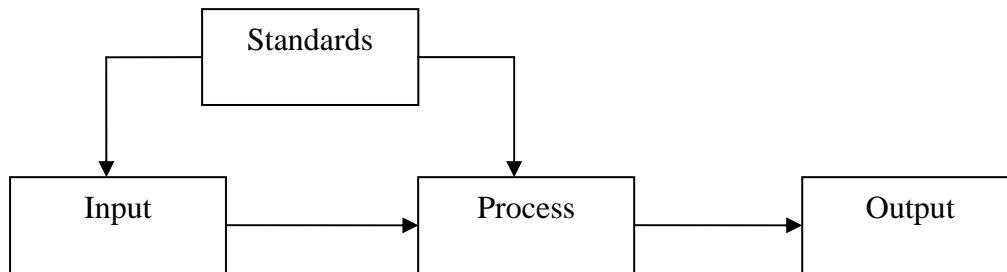
- Quantitative to qualitative approaches
- Summative to formative assessment
- Emphasis on inputs to outcomes

Traditional and new educational approaches are represented in Figures 1 and 2, respectively.
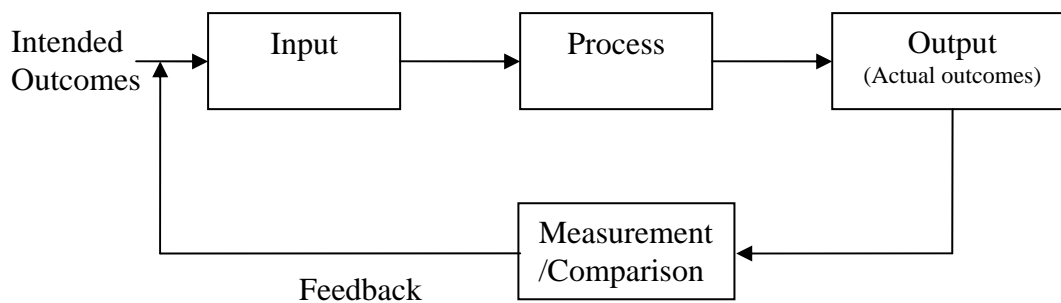
Table 1. Traditional vs. new educational approaches

Traditional emphasis	New emphasis
What we give students?	What they can/are able to do?
Inputs	Outcomes
Faculty teaching	Student learning
Curriculum	Education
Educational activities as an end	Educational activities as means to an end

More quantitative (how much)	More qualitative (how well)
Prescriptive based	Outcome-based

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                    ┌──────────────┐
                    │  Standards   │
                    └──────────────┘
            ┌──────────┘        └──────────┐
            ▼                              ▼
┌──────────────┐      ┌──────────────┐      ┌──────────────┐
│    Input     │─────▶│   Process    │─────▶│    Output    │
└──────────────┘      └──────────────┘      └──────────────┘
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Figure 1. Traditional Educational Process

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Intended      ┌──────────┐   ┌──────────┐   ┌──────────────┐
Outcomes ────▶│  Input   │──▶│ Process  │──▶│    Output    │
         ▲    └──────────┘   └──────────┘   │(Actual outcomes)│
         │                                   └──────────────┘
         │                   ┌──────────────┐      │
         └───────────────────│ Measurement  │◀─────┘
             Feedback        │ /Comparison  │
                             └──────────────┘
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Figure 2. Outcome-Based Educational Process

The Program Assessment Center at KFUPM
The Program Assessment Center at KFUPM was established in January 2003 as part of the Deanship of Academic Development. The Center strives to achieve its mission of promoting university-wide culture of assessment towards developing quality education that copes with new technological changes and meets industry needs while retaining out Islamic values. It provides the necessary services and support for the various academic programs at the university required to facilitate and coordinate their efforts to meet their objectives and institutional goals with the aim of achieving the following objectives:
1. Improve and maintain the highest academic standards at KFUPM;
2. Enhance students' learning outcomes;
3. Provide feedback for quality assurance of academic programs;
4. Follow-up on implementation of recommended actions for improvement from self-assessment findings;
5. Prepare the academic programs for national/international accreditation.

The Center utilizes a number of means and activities supported by the concerned units and departments at the University in order to achieve its objectives. The Center develops and updates guidelines and procedures for assessment activities and coordinate assessment and accreditation efforts university-wide. It also provides feedback to concerned department on assessment findings and coordinates their implementation. The Center also offers support, consultation and training for KFUPM faculty on assessment and accreditation issues. It keeps KFUPM faculty, academic and research departments updated on assessment and accreditation related issues through the invitation of reputable international speakers to conduct workshops and deliver seminars on the subjects. The Center also keeps links with national and International assessment and accreditation organizations and invites International professionals to participate in the self-assessment teams of the various programs of the University.

Program Self-Assessment Criteria and Standards at KFUPM
The program self-assessment guidelines at KFUPM consist of a set of criteria to be met by the program. The criteria are: program objectives and outcomes, curriculum design and organization, laboratories and computing facilities, student support and guidance, faculty members, process control, institutional facilities and institutional support. [PAC, 2004]

The criterion on program objectives and outcomes requires departments and colleges to have mission statements that are consistent with the institution mission statement, measurable objectives and outcomes that will achieve the stated mission statements and a strategic plan to deploy the needed resources to deliver the outcomes. Also a continuous assessment program must be in place to evaluate whether the objectives are being met. This requires departments to conduct an on-going survey of graduating students, alumni, industry and professional societies to obtain continuous feedback.

The criterion on curriculum design and organization addresses the course requirements. It requires that the program must satisfy basic math and science, major, communication, analysis, design and other requirements. These requirements are specified in terms of credit hours or as a percentage of credit hours required for the degree.

The criterion on laboratory and computing facilities focuses on the adequacy of laboratories and computing facilities, while the criterion on student support and advising addresses the guidance the students are receiving throughout their program of study, including advising and regular course offering.

The criterion on faculty requires faculty members to be current and active in their discipline and have the necessary technical depth and breadth to support the program. Also there must be enough faculty members to provide continuity and stability to cover the curriculum adequately and effectively, and to allow for scholarly activities.

The criterion on process control requires that the processes by which major activities are delivered must be planned, controlled, evaluated and continuously improved.

The last two criteria require the adequacy of institutional facilities, such as libraries, computing facilities, classrooms and offices to support the objectives of the program. Also the criteria require that the institution's support and the financial resources for the program must be sufficient to provide an environment in which the program can achieve its objectives and retain its strength.

The fulfillment of each criterion is judged by meeting the standards specified in the self-assessment document. A summary of criteria and corresponding standards for the program self-assessment at KFUPM is presented in Table 2.

Table 2. Summary of KFUPM program self-assessment criteria and standards.

Criteria	Standards
C1. Program Mission, Objectives and Outcomes	S1.1 Measurable objectives S1.2 Program Outcomes S1.3 Previous actions for improvement S1.4 Overall assessment using quantifiable measures
C2. Curriculum Design and Organization	S2.1 Courses vs. objectives S2.2 Problem analysis and design requirements S2.3 Mathematical and basic sciences requirements S2.4 Major Requirements S2.5 General Education requirements S2.6 Information technology requirements S2.7 Communication skills (oral and written) requirements
C3. Laboratories and Computing Facilities	S3.1 Lab manuals/documentation/instructions S3.2 Lab support personnel S3.3 Computing facilities
C4. Student Support and Advising	S4.1 Frequency of course offering S4.2 Student advising and counseling
C5. Faculty	S5.1 Number of full time faculty S5.2 Faculty currency and development S5.3 Faculty recruitment and retention
C6. Process Control	S6.1 Admission process S6.2 Registration process S6.3 Effective teaching & learning assurance process S6.4 Program requirements completion assurance process S6.5 Curriculum and textbooks update and approval process
C7. Institutional Facilities	S7.1 New trends in learning (e.g. e-learning) S7.2 Library collections and staff S7.3 Class-rooms and offices adequacy
C8. Instructional Support	S8.1 Financial and technical support for faculty S8.2 Number and quality of graduate students S8.3 Financial support for library, labs and computing facilities

Program Self-Assessment Procedure at KFUPM

It is the policy of KFUPM that all its academic programs undergo self-assessment every five years. The Program Assessment Center (PAC) at the Deanship of Academic Development (DAD) initiates the process about one semester before its start. The academic department forms a program representative team (PT) who will be responsible for the preparation of the self-assessment report (SAR). The PT normally consists of a team leader and several faculty members from the department concerned. The PT is given about one academic year for report preparation including the collection and analysis of relevant data and information according to the self-assessment guidelines as discussed in the previous section. The report is submitted to PAC for review and final approval. Meanwhile PAC would have formed an assessment team (AT) for each program involved in the process consisting from three members one is external to the university, one is external to the department but from within KFUPM in addition to the PT leader as a facilitator for the AT. The approved SAR is then sent to the AT members for their own review at least two months prior to their visit to the department.

A one week visit to the university is then scheduled where the AT, hosted by PAC, visits the department and meets with the chairman, faculty, students, and staff as needed. The AT also visits classes and laboratories and reviews sample students work and exams and any other relevant information. The AT also visits and meets with the officials of other supporting units of the university such as the library, admission and registration, information technology and others for an overall assessment of the provided supporting facilities.

This process is concluded by an exit meeting attended by the Rector of the university and other officials as well as the faculty of the departments' concerned where the AT report is presented. A complete document of the AT findings and recommended actions for improvement is then submitted to PAC for presentation to the concerned people and forward to the department concerned for preparation of an implementation plan of the AT findings and recommendations. Follow-up on the implementation of the plan is taken care of by PAC in coordination with the department chairman and PT leader.

Program Self-Assessment Status at KFUPM

Since the establishment of the Program Assessment Center at KFUPM in 2003, seven academic programs have completed their self-assessment activities and developed an implementation plan of actions for improvement. Work is in progress by those programs on the implementation of the plan. In addition, eleven programs are working on the preparation of their self-assessment reports in anticipation of finalizing them by the end of this academic year (2004/2005). The AT visit for those eleven programs is planned for November 2005.

The Program Assessment Center is supporting the assessment efforts of those departments in various ways. The Center provides support in the development of the assessment surveys, the training of faculty on the subject, consultation and the planning and coordination of the overall assessment activities. It is also responsible for the follow-up on implementation of the assessment findings and actions for improvement. The ultimate goal is to insure quality in all university academic programs.

KFUPM Experience in Accreditation
KFUPM for its Quest for Excellence and recognizing the importance of assessing its programs opted for independent assessment since its establishment. In the early years KFUPM was associated with a Consortium (international body from USA universities) for its program assessment. Currently all of the engineering and business programs have been granted accreditation and substantial equivalency from BET and AACSB, respectively.

Engineering Programs
The engineering programs at KFUPM opted twice (1993 and 2001) for accreditation by the Accreditation Board for Engineering and Technology (ABET).

The latest program evaluator report indicated the followings:
1. The KFUPM engineering programs are of high quality.
2. The students are well qualified, highly motivated, and career-oriented.
3. Highly qualified and enthusiastic faculty.
4. All the evaluated engineering programs were judged to be substantially equivalent to accredited programs of similar titles in the United States.
5. It is recommended that the younger faculty members be offered an opportunity to work at other institutions around the world for one to two years to gain experience.
6. In order to foster interaction between industry and the various engineering disciplines, it suggested that an Industry Advisory Council be established for each discipline.
7. In order to recognize students who have accomplished a great deal and who are academically successful, it is suggested that an engineering honor society be established such as the Tau Beta Pi engineering honor society in U.S.A.
8. In order to recruit and retain top quality faculty the university must assure that it offers a total compensation package that is competitive with other institutions in the Middle East.
9. Significant progress has been made since the 1993 ABET visit in the area of faculty participation in conferences and symposia. The university is encouraged to continue and expand its efforts in these areas. These activities are essential in maintaining the technical and professional proficiency of the faculty.
10. The College of Engineering has established an advisory council at the college level. As the university prepares for the next visit under Criteria 2000, it will be important to move the advisory council activity to the program level.
11. Areas for improvement included design of components, and soft skills (communication, presentation and team work).

College of Industrial Management Programs
The undergraduate and master's degree programs in business offered by the College of Industrial Management at KFUPM are granted initial accreditation by AACSB International in September 2002. The team report included areas of strengths and opportunities for improvement.

As noted in the Team Visit Report, KFUPM College of Industrial Management is commended on its (1) 28 week cooperative education experience for all undergraduate students, which insures almost 100 percent placement of its graduates, (2) excellent progress in advancing the use of smart classrooms and technology for instructional purposes, (3) use of English as the language of instruction, which enhances the professional career opportunities for its graduates, (4) attraction of some of the best undergraduate students in the Kingdom, (5) required one year preparation program which has increased access to international faculty and students and enhances the College's ability to provide high quality programs, (6) outstanding reputation and close alliances with the business community in the Gulf region and beyond, and (7) faculty demographic diversity which strengthens the students' multicultural and global perspective.

Continued efforts are encouraged to focus on the mission and to further enhance the integration of mission-linked outcomes and processes for continuous improvement.

Conclusions and Recommendations

This paper outlined KFUPM experience in academic program assessment and accreditation. The new trends in academic accreditation require programs to have self-assessment in place. The new emphasis is on outcome-based assessment where each program has to provide an evidence of the quality of its graduates. This approach requires the involvement and participation of all stakeholders in the process. KFUPM experience in program assessment and accreditation has proven a success and provided all concerned with a very useful feedback for improvement. Faculty and students as well are becoming aware of the importance and benefits of these processes on student learning and success in their profession after graduation.

It is important for those involved in assessment and accreditation to recognize the importance of having common understanding of program mission, objectives and outcomes. The program constituents should be made clear and should be involved in the process. Assessment does not end at completing the process but rather starts after identifying program strengths and weaknesses. Implementation of actions for improvement is the most important step in assessment. The continuous collection and analysis of program assessment related data and information is an essential step for a successful and sustained quality assurance of academic programs. Accordingly, accreditation will follow as recognition by an authoritative body of the quality of the program. For a successful assessment and accreditation processes, it is important to recognize the following success factors:

- Commitment from all those involved
- Participation (involvement) of all constituents
- Listening to different voices
- Actions for improvement
- Feedback and sharing results
- Relating assessment to the world of work
- Continuity and flexibility
- Consistency of reporting format over time and keeping history of results
- Responsibility
- Providing the necessary resources.

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