**Module Criteria (taken for the PARSEL project)**

The PROFILES modules are expected to be carefully constructed so as to meet the philosophical and teaching direction for science education being advocated. This particularly relates to

1. Promoting strong student positive motivation introduction
2. Socio- scientific approach (which by definition is context-based)
3. Student-led, inquiry-based, constructivist science learning
4. Learning outcomes are competency based encompassing knowledge and skills and attitudes and especially values
5. The philosophy is based on gaining education through the context of science: this is contrary to the gaining of science through an educational course
6. Consolidating the gaining of conceptual science through transference by means of argumentation to socio-scientific issues

PROFILES modules, as a minimum, are thus expected to meet the following criteria

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| Criterion 1 Module title/layout has a socio-scientific orientation (it has familiarity to the student)  Criterion 2 Module addresses the need for relevance in the ‘eyes’ of students (it is seen as having a meaningful purpose from the students’ point of view before engagement)  Criterion 3 Module includes a range of educational appropriate learning objectives/competencies (not only conceptual science but all related to the intended curriculum) |
| Criterion 4 Module enhancing student ownership through participation (especially with respect to thinking) |
| Criterion 5 Module includes student first-hand experimentation/ modelling (IBSE intended) |
| Criterion 6 Module emphasises higher order cognitive learning by students (beyond memorisation and beyond explanation of phenomena/observations) |
| Criterion 7 Module guides teacher ownership (there is a teacher’s guide that suggests, not dictates – student worksheets, equipment, handouts are given as suggestions) |
| Criterion 8 Module includes student appreciation of the nature of science (science is not portrayed as the truth; where observation are seen as subjective rather than objective; where laws are very differ from theories, where hypotheses are more than guesses, where science is based on evidence and where science is seen as creative and influenced by society and culture) |
| Criterion 9 Module includes suggested formative student assessment strategies (relates to all learning outcomes not only those pertaining to pencil and paper approaches) |

**More Detailed Description of the Module Criteria**

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| CRITERION 1 MODULE TITLE/LAYOUT HAS A SOCIO-SCIENTIFIC ORIENTATION |
| **A Title/focus of the module has a society orientation using words/situations/graphics familiar to students as indicated by:** |
| *1. omitting, from the title, conceptual science terminology to be acquired through studying the module (which is unfamiliar and perhaps daunting to the students).* |
| *2. illustrating a real life situation as the starting point and amplifying this by a scenario and/or questions.* |
| CRITERION 2 MODULE ADDRESSES THE NEED FOR RELEVANCE FOR STUDENTS |
| **B Module is designed to be seen by teachers of science subjects as relevant for students, as indicated by:** |
| *1. conveys a perceived sense of purpose,****,*** *which is related to the overall real life direction of the module.* |
| *2. learning objectives/competencies indicated in the module are sufficiently comprehensive to meet the ‘education through science’ intentions.* |
| *3. adopting an approach, or approaches, which is/are perceived by teachers as being suitable for teaching towards the intended purpose of learning.* |
| *4. intending to* ***aid the teacher*** *in creating a classroom climate. This teacher climate is expected to include aspects, such as, enhancing student curiosity, rewarding creativity, encouraging a spirit of healthy questioning, discussion and reasoning by students.* |
| *5. the sequence of student activities are suggested in a logical manner from the perspectives, for example, of:*   * *the student and their familiarity with the topic;* * *moving from real life experiences to gaining educational (especially conceptual) competencies;* * *making decisions on real life situations.* |
| *6. introduces terms, concepts and procedures on a reasonable ‘need to know basis’ only, so as to assist students in meeting the learning objectives/competencies without overload.* |
| *7. teacher notes are included where there is a perceived need to help teachers to, for example,:*   * *realise how the science concepts relate to real life situations, and/or* * *undertake student activities in a relevant manner.* |

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| CRITERION 3 MODULE INCLUDES LEARNING OBJECTIVES/COMPETENCIES |
| **C Material is geared to promoting learning for responsible citizenry (STL/Education through Science) as indicated by stating specific learning objectives/competencies for:** |
| *1 a spectrum of intended student educational gains (****above and beyond*** *acquisition of science concepts).* |
| *2. personal educational developmental skills (for example, attitudes and/or personal aptitude gains in aspects such as safe working, tolerance towards views of others).* |
| *3. social skills, for example, cooperative, collaborative and/or leadership learning skills.* |
| *4. nature of science and/or involve developing a sequence of process skills related to problem solving.* |
| *5 socio-scientificdecision making in a real life situation, including argumentation skills and reaching a consensus decision.* |
| CRITERION 4 MODULE ENHANCING STUDENT OWNERSHIP THROUGH PARTICIPATION |
| **D Student ownership through participation is anticipated to be high as indicated by:** |
| 1. *including questions and/or tasks for students which, for example,*  * *directly relate to the learning objectives/competencies to be achieved;* * *provide guidance to the student and teacher on student progress.* |
| 1. *providing guidance to explicitly address students thinking relevant to the learning objectives/competencies.* |
| *3. being perceived that students will appreciate the module as including relevant and sufficient learning experiences.* |
| *4. allowing adequate opportunities for students to, for example :*   * *put forward ideas related to their learning;* * *cooperate as a member of a team;* * *communicate their learning in interesting ways.* |
| *5. not being in conflict with a teacher’s classroom climate in which the teacher is encouraging, for example:*   * *high expectations from* ***all*** *students.* * *enabling* ***all*** *students to experience success;* * *providing all students with a feeling of being involved in relevant and meaningful learning.* |

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| CRITERION 5 MODULE INCLUDES STUDENT FIRST-HAND EXPERIMENTATION/ MODELLING |
| **E Experimentation/modelling is included so as to ensure gains in cognitive and process skill are high as indicated by:** |
| * 1. *inclusion of inquiry learning, constructivist approaches and/or experimental problem solving (including process skills).* |
| 1. *paying adequate attention to availability of materials or potential alternatives, including student made equipment.* |
| CRITERION 6 MODULE EMPHASISES HIGHER ORDER COGNITIVE LEARNING BY STUDENTS |
| **F Intended scientific learning by student emphasises higher order cognitive learning as indicated by:** |
| *1. providing an appropriate balance of firsthand and other experiences (stemming from the real life phenomena being addressed), which are explicitly linked to higher order conceptual science learning competencies.* |
| *2. includes higher order (analytical/evaluative) learning within the problem solving and/or decision making learning.* |
| CRITERION 7 MODULE GUIDES TEACHER OWNERSHIP |
| **G Potential for teacher ownership of the teaching based on the module is high as indicated by:** |
| *1. the teaching guide suggested is sufficiently detailed to guide teachers to modify the approach, as per their situation, without heavy time demands.* |
| *2. the assessment strategies suggested are sufficiently detailed to guide teachers towards formative and, if appropriate, summative assessment, but allowing adequate teacher opportunities to make modifications.* |
| *3. teacher notes are included, where there is a perceived need, which help teachers, for example, in realising the science concepts related to real life situations and in being confident in making modifications.* |

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| CRITERION 8 STUDENT APPRECIATION OF THE NATURE OF SCIENCE INCLUDED |
| **H Nature of Science is stressed as tentative, empirical, culturally embedded, theories seen as independent of laws, as indicated by:** |
| *1. suggesting ways for students to recognise/overcome the limitations of science when gathering empirical evidence, putting forward explanations, problem solving and/or concluding/ decision making.* |
| *2. avoiding dogmatism, or a culturally independent ‘right answers’ and/or ‘right method’ approaches.* |
| CRITERION 9 MODULE INCLUDES SUGGESTED FORMATIVE STUDENT ASSESSMENT STRATEGIES WHICH RELATE TO THE INTENDED LEARNING |
| 1. **Suggested formative assessment approaches are given in the module, which relate to the student learning outcomes/competencies and involve the teacher in observation, oral questioning, and/or marking of written work, as indicated by**: |
| *1. including effective formative assessment suggestions (questions and/or tasks) which enable the teacher to specifically ascertain student progress towards acquisition of each of the intended learning outcomes.* |
| *2. student assessment having a direct relationship with the learning objectives/competencies put forward.* |
| *3. including adequate ways for students to check and reflect on their own progress in trying to acquire the learning objectives/competencies.* |
| *4. where included, summative assessment suggestions are deemed relevant for the learning situation.* |