

3. Assessment

3.1. Assessment criteria

The criteria for assessment relates to the intended learning gained by the students. The learning expected is that students will:

- understand the problem and hence be able to draw a reconstruction diagram of the situation;
- successfully complete calculations based on the laws of motion;
- successfully complete calculations based on an understanding of the coefficient of friction and its impact on the change in kinetic energy and work done against friction;
- be able to cooperate as a member of a group in a discussion on the outcomes of the calculations to apportion blame;
- be able to decide, with justification, whether the van driver was to blame for the accident and to refute alternative arguments.

It is suggested the teacher and the student are not interested in an overall mark that does not indicate strengths and weakness in the learning by the student. Rather the teacher and student is interested in whether the different components of learning to be expected is, or is not, being achieved, to the level deemed appropriate by the teacher. This requires separate assessments, based on each of the different learning outcomes intended. A suggested approach is x = learning not achieved to the level expected by the teacher, \surd = learning reached the level expected; $\surd\surd$ = learning above that expected.

It is suggested that such assessment can be undertaken in a formative manner by (a) marking of written work and (b) observation/asking questions of the students during their group work. It is further suggested that such assessment can be undertaken on a lesson by lesson basis (combining the assessment approaches), or by separate teacher strategy over the whole module.

Part A. Suggested Formative Assessment by Lesson

Lesson 1 (Associated with stage 1):

Dimension	Criteria for evaluation Student:	Mark/grade given(x,√,√√)
Draws diagram to represent the accident situation.	Provides graphical representation as required.	
	Presents the graphical representations of a suitable size and in suitable detail.	
	Provides full and appropriate labelling for diagrams, figures, tables.	
Records data provided.	Records data appropriately on the reconstruction diagram.	
Calculates from data provided; making conclusions.	Calculates time taken for boy to reach the point of the accident, based on assumptions made.	
	Draws appropriate conclusions based on the calculations undertaken.	

Lesson 2 (Associated with stage 2):

Dimension	Criteria for evaluation Student:	Mark/grade given(x,√,√√)
Additional information needed.	Suggests additional information that is required to determine whether the van driver is to blame for the accident.	
Meaning of friction.	Can explain the tyre marks on the road in terms of friction.	
Derive: $v = (2\mu gs)^{1/2}$	Understands the link between change in kinetic energy and work done against friction. Based on this is able to derive the expression: $v = (2\mu gs)^{1/2}$	

Lesson 3 (Associated with stage 2):

Dimension	Criteria for evaluation Student:	Mark/grade given(x,√,√√)
Answer questions.	Explain why the coefficient of friction is F/N.	
	Suggest how the coefficient of friction can be determine experimentally.	
Undertake experimenta.	Carries out experiments as a member of a group to determine the coefficient of fraction and point out experimental error.	
Undertake calculations.	Calculates, individually, how long it took the van to stop by making use of the skid marks.	
Interpret from data provided and making additional calculations.	Assuming a given reaction time for the van driver, determine the position of the van when the lights went red and the boy started to cross the road.	

Lesson 4 (Associated with stage 3):

Dimension	Criteria for evaluation Student:	Mark/grade given(x,√,√√)
Scientific or socio-scientific reasoning.	Justifies a decision on whether the van driver is to blame for the accident.	
	Guides the discussion to arrive at a consensus opinion across all students by determining the assumptions being made.	

Part B. Suggested Assessment if based on Teacher Strategy

Assessment Tool based on Teacher Marking of Written Material:

Dimension	Criteria for evaluation Student:	Mark/grade given(x,√,√√)
Draws diagram to represent the accident situation.	Provides graphical representation as required.	
	Presents the graphical representations of a suitable size and in suitable detail.	
	Provides full and appropriate labelling for diagrams, figures, tables.	
Record data provided.	Records data appropriately on the reconstruction diagram.	
Interpret or calculate from data provided; making conclusions.	Interprets data provided by undertaking calculations accurately using the laws of motion (reinforcement of earlier learning).	
	Applies data provided to undertake calculations accurately using the relationship between change of kinetic energy and work done against friction.	
	Draws relevant conclusions based on the calculations undertaken.	

Assessment Tool based on the Teacher's Observation:

Dimension	Criteria for evaluation Student:	Mark/grade given(x,√,√√)
Functioning in the group during the discussion.	Cooperates with others in the group and fully participates in the work of the group.	
	Illustrates leadership skills – guiding the group by thinking creatively and helping those needing assistance; summarising outcomes.	

Dimension	Criteria for evaluation Student:	Mark/grade given(x,√,√/√)
	Shows tolerance with, and gives encouragement to, the group members.	
	Reaches a justified decision on whether to apportion blame to the van driver making reasonable assumptions.	