Example 12: An investigation into the growth of red kite population in Wales

Assessment

Criterion	A	B	C	D	E	F	G	Total
Achievement level awarded	1	2	1	2	0	2	1	9
Maximum possible achievement level	3	3	5	3	1	3	2	20

Comments

Criterion A: Introduction

A1—There is a clear task but there is no plan.

Criterion B: Information/measurement

B2—The data are fit for purpose, but require little, if any, organization. The discrepancy between the sources for 1993 was overlooked. There was no stated rationale for the choice of years.

Criterion C: Mathematical processes

C1—It is debatable whether any mathematical processes have been used at all, but benefit was given to the student. It cannot be verified from the graphs whether such processes are correct, as they have no scale. The domain of the graph is discrete. On checking the mathematics (which is one of the teacher's responsibilities), both the first and second exponential models are incorrect.

Criterion D: Interpretation of results

D2—Assuming an exponential model, the conclusion was consistent with this. Thus, the 6% population growth is a consistent conclusion. As with criterion C, this level was barely attained.

Criterion E: Validity

E0—The only mention of validity concerns sample size, which is not sufficient for the award of E1.

Criterion F: Structure and communication

F2—The project is not coherent, but there is some structure and it can be followed with relative ease.

Criterion G: Notation and terminology

G1—Calculator notation has been used. "Line of regression" is inappropriate. Use of the same symbol x for a

variable and for multiplication is confusing.

General comments

This project has lots of potential, and some suggestions for its improvement are given below.

1. Two sources of data are used. There are potential problems with validity that could have been discussed in more detail than on page 3. It may well be that the first data set is used to determine the model, with the second data set being reserved for validation, or both data sets are used, with more up-to-date data being sought to validate.

2. An initial graph either on a spreadsheet or by hand, to put the problem in the context of a growth model, would have aided communication. A student-drawn graph would illustrate a mathematical technique that the student has mastered other than by using software.

3. A linear model could be attempted first—and then rejected, by correlation methods—for completeness and to provide a rationale for leading the project into more challenging areas.

4. Once the model (exponential) had been decided upon, sophisticated understanding of the situation would be demonstrated by using the theory of a geometric sequence to determine whether a “constant” growth rate is applicable. This could be undertaken either by using the first growth rate as a first guess or a mean growth rate calculated either by hand or on a spreadsheet.

5. An alternative approach would be to undertake a doubling time process that would lend weight to an exponential model.

6. Only then would the regression feature on the GDC be used to determine the best fit, with clearly drawn graphs used (rather than GDC screenshots) to illustrate the fit.

7. The move to a second exponential model shows good appreciation of the curve fitting. It could have been formalized perhaps by using percentage errors to isolate 1982 as the starting point of a refined model.

8. It may well be that an alternative “polynomial” regression model gives a better fit, and a discussion of the reasons behind why such a model was chosen could have been undertaken.

9. More recent data may exist to determine whether the exponential model still holds. In any case, a discussion on the validity of continued exponential growth would be useful.

Student work (PDF)

(../../../../xmltwo.ibo.org/publications/DP/Group5/d_5_matsd_tsm_1205_1/pdf/Example12.pdf)