

APPENDIX F

THE PERIOD OF THE PENDULUM LEVELS OF CONCEPTUALIZATION and RELATED KNOWLEDGE

LEVELS OF CONCEPTUALIZATION

- [1] Representation of the phenomenon which does not include length of string as a relevant factor
- [2] Representation of the phenomenon which incorporates but does not isolate the effect of the length of string
- [3] Discovery of positive covariation between length of string and period (i.e. as length of string increases -- period increases)
- [4] Discovery that length of string is the only factor that covaries with the period
- [5] Representation of linear relationship between length of string and period
- [6] Discovery of non-linearity of relationship between length of string and period
- [7] Unsuccessful attempt to formulate a mathematical representation of a non-linear relationship between string length and period
- [8] Successful mathematical representation of a non-linear relationship between string length and period [e.g. period proportional to square root of length, T (time) = approximately $2 \cdot$ the square root of the length]

APPENDIX F

RELATED KNOWLEDGE

`K1' - Knowledge Related to Period of the Pendulum

#1-Measurement of Time:

[0] DOES NOT FORMALLY¹ MEASURE TIME

[1] USES AN INSTRUMENT TO MEASURE TIME

[2] USES MEASUREMENT INSTRUMENT CORRECTLY AND EXPRESSES THE UNITS OF MEASUREMENT CORRECTLY

¹FORMALLY = using a measurement instrument

`K1' - Knowledge Related to Period of the Pendulum

#2-Measurement of Distance:

[0] EYES DISTANCES

[1] USES A MEASUREMENT INSTRUMENT

[2] USES MEASUREMENT INSTRUMENT CORRECTLY AND EXPRESSES THE UNITS OF MEASUREMENT CORRECTLY

APPENDIX F

`K1' - Knowledge Related to Period of the Pendulum

#3-Ratio - Theoretical Knowledge

[0] DOES NOT MENTION "RATIO(S)"

[1] USES THE TERM "RATIO"

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#4-Ratio - Practical Knowledge

[0] DOES NOT FORMULATE RATIOS

[1] FORMULATES RATIOS

`K1' - Knowledge Related to Period of the Pendulum

#5- Proportions - Theoretical Knowledge

[0] DOES NOT MENTION PROPORTIONS

[1] USES THE TERM "PROPORTIONS"

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#6-Proportions - Practical Knowledge

[0] DOES NOT FORMULATE PROPORTIONS

[1] FORMULATES PROPORTIONS