Title	The use of multi comparison groups in quasi-experimental designs
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Abstract:

The use of control groups in experimental designs allows the researcher to determine whether a treatment has had an effect or whether one treatment is more effective than another. This is particularly the case for medical and psychological research. However, the use of 'intact classes' in educational research, resulting in the cases of quasi-experimental design, control groups pose a number of threats to the internal validity of such designs. This paper discusses the issues of such designs and the related threats, and proposes a design which incorporates instead suitable use of multiple 'comparison groups' in such designs from the perspective of a study on the mathematical learning and achievement of lower secondary students using metacognitive strategies. It will also be shown how such a use of multiple 'comparison groups' allows for a more cautious and reliable basis for acceptance and rejection of hypotheses, thus providing a way of examining common threats to the internal validity of such studies.

The Use of Multiple Comparison Groups In Quasi-experimental Designs

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ABSTRACT

The use of control groups in experimental designs allows the researcher to determine whether a treatment has had an effect or whether one treatment is more effective than another. This is particularly the case for medical and psychological research. However, the use of 'intact classes' in educational research, resulting in the cases of quasi-experimental design, control groups pose a number of threats to the internal validity of such designs. This paper discusses the issues of such designs and the related threats, and proposes a design which incorporates instead suitable use of multiple 'comparison groups' in such designs from the perspective of a study on the mathematical learning and achievement of lower secondary students using metacognitive strategies. It will also be shown how such a use of multiple 'comparison groups' allows for a more cautious and reliable basis for acceptance and rejection of hypotheses, thus providing a way of examining common threats to the internal validity of such studies.

Experimental Research

Enables researchers to go beyond description and prediction, beyond the identification of relationships, to at least partial determination of what causes them.

Essential Characteristics

- At least two (but often more) conditions or methods are compared to assess the effect(s) of particular conditions (treatments) (independent variable)
- The independent variable is directly manipulated by the researcher.

Comparison of Groups

Involves two groups of subjects:

- The Experimental Group receives a treatment of some sort
- The Control Group receives no treatment (or the Comparison Group receives a different treatment)

Intervention Programmes

Enables researchers to assess the effectiveness of various teaching methods, curriculum models, classroom arrangements, and other efforts at influencing the characteristics of individuals or groups, and involves comparison of the experimental individuals or groups with control individuals or groups.

Experimental Research?

The Study

Enhancing Mathematical Learning and Achievement

Of

Secondary One Normal (Academic) Students

Using Metacognitive Strategies

Treatment – explicit use of metacognitive instructional strategies

Some Problems

- The use of intact classes due to timetable and logistic constraints (quasi-experimental)
- Integration with school programme
- The number of classes available for involvement in study

Pilot Study

School A	Experimental Class	Part of school's remediation programme
School B	Control Class	The only N(A) Class, special programme instituted

Some Issues - Threats to Internal Validity

- **Incompatibility in using school examination results as a measure of achievement**
- **Differences in school programmes resulting in differences in the duration of treatment being administered**
- **Subject characteristics threat – the different school culture and ethos**
- **Attitude of subjects – a case of the opposite to the Hawthorne effect**
- **History threat caused by the different mathematics teachers teaching the 2 different classes from the 2 different schools**
- **Mortality threat – the issue of attendance for the programme is being handled differently in different schools**

Steps taken to minimise threats to internal validity -

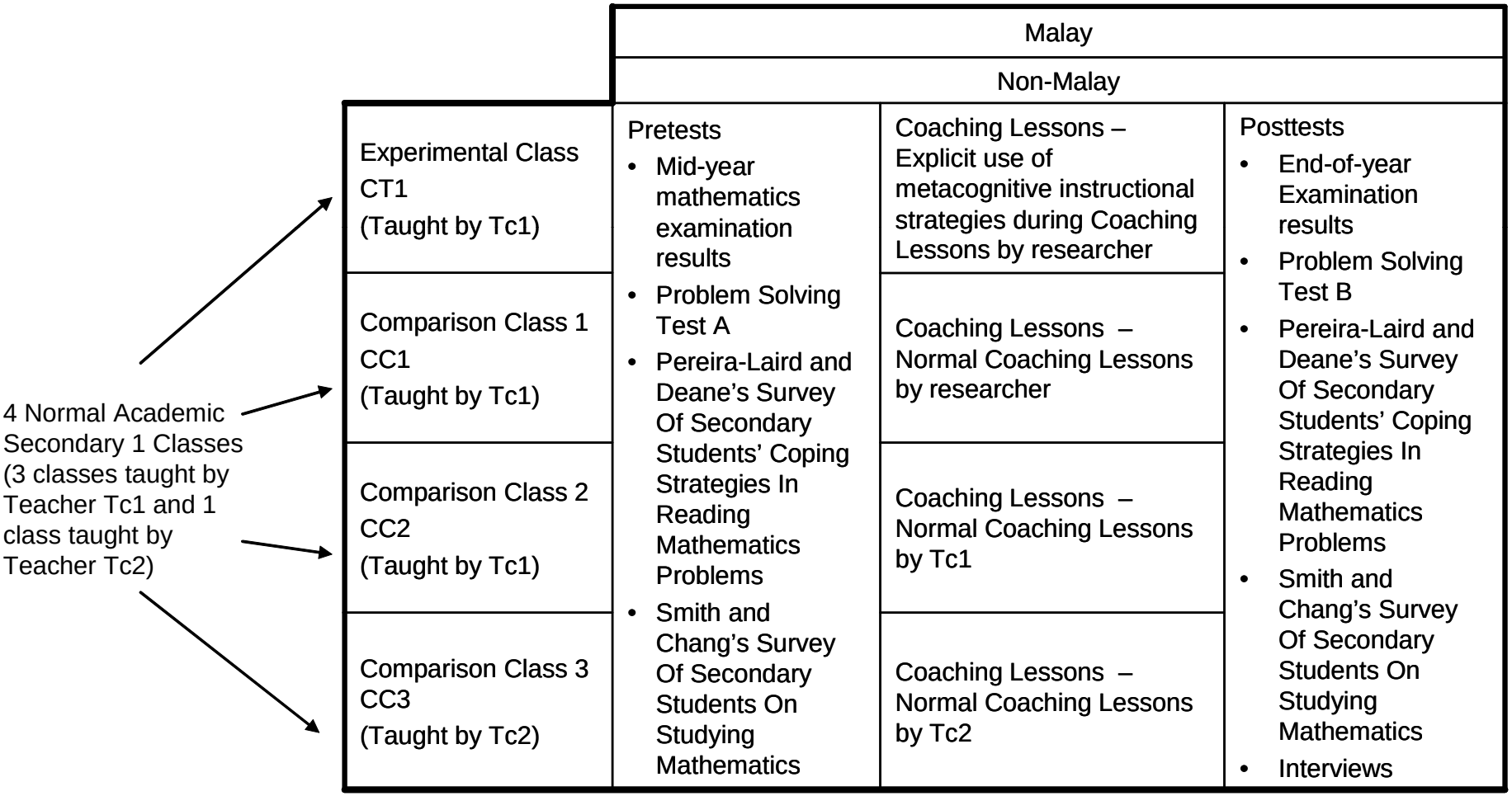
1. **Classes from the same schools were employed for the study.**
- **Faciliate comparison of examination results as one of the measures for achievement**
- **Minimise the differences in duration of the intervention**
- **Reduce subject characteristics threats**
- **Reduce mortality threat**

2. **Instead of a control group, comparison groups were employed**

3. **To minimise history threats, two of the three comparison groups are taught by the same teacher as that for the experimental group**

4. **To minimise the teacher factor, one of comparison group is taught and handled by a third teacher**

Actual Intervention Programme



Adaptation Of The 4×2 Factorial Pretest-Posttest Design

Implication for Research Design

The use of multiple comparison groups in the design of the study allows for a more cautious and reliable basis for acceptance and rejection of hypotheses, and provides a way of examining common threats to the internal validity of such a research design.

Example 1:

Hypotheses H1.1, H1.2, H2.1, H3.1, and H5.2 were partially accepted instead of accepted in totality – difference is only between that of the experimental class CT1 and one of the three comparison classes; four occurred between CT1 and CC3.

If CC3 were to be the only comparison class chosen, it may prompt one to quickly jump to the conclusion that the MIS Curriculum is the sole contributing factor to the difference.

However, no significance difference between CT1 and the other two comparison classes. Need for a more plausible explanation – possible threats to internal validity of the study?

Example 2:

When Hypothesis H6.1 was rejected, the presence of multiple comparison classes still allows one to take note of the possible significant difference between the comparison classes. So, instead of an outright rejection of the hypothesis, one might be led to consider other factors that might finally contribute to a better understanding of the non-significant difference between the experimental class and the comparison classes.

Open Discussion