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The Efficacy of Cross-Discipline Representations for ill-defined IAS Concepts

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This study examines ways of increasing learner's expertise of ill-defined concepts through the use of varying types of representations.

Research Questions:

Are representations of ill-defined concepts within the same discipline as effective as cross-discipline representations in increasing expertise in learners?

To what degree do additional representations of ill-defined concepts increase the conceptual understanding of learners?

Methods:

3 Days of Treatments
3 Groups

Model Eliciting Activities

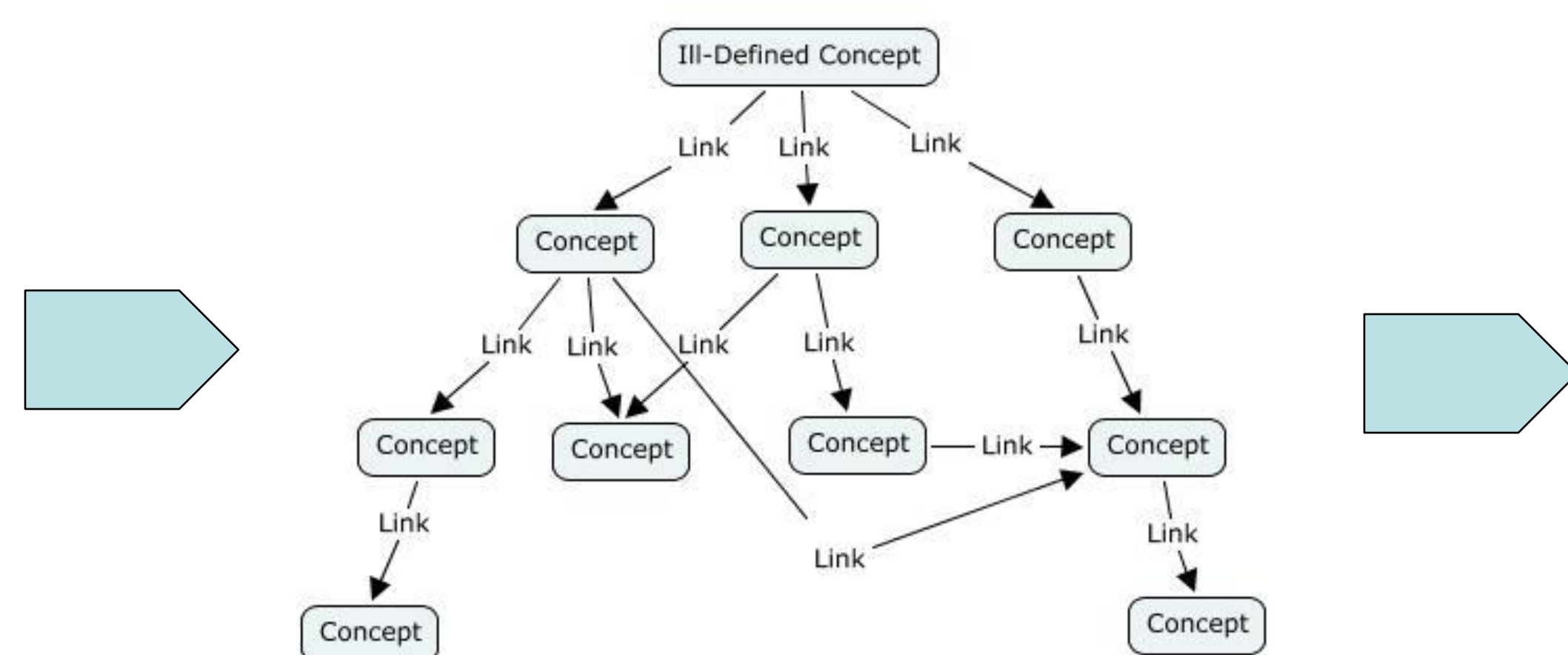
To help with the instructional design of MEA's, six principles were developed during a series of 10-week research studies. They include:

1. The Personal Meaningfulness Principle
2. The Model Construction Principle
3. The Self-Evaluation Principle
4. The Model Externalization Principle
5. The Simple Prototype Principle
6. The Model Generalization Principle

Students were divided into 3 groups. Two groups were given activities called MEA's (Model Eliciting Activities) and the third group was given a handout on "Threat Analysis" to read and discuss.

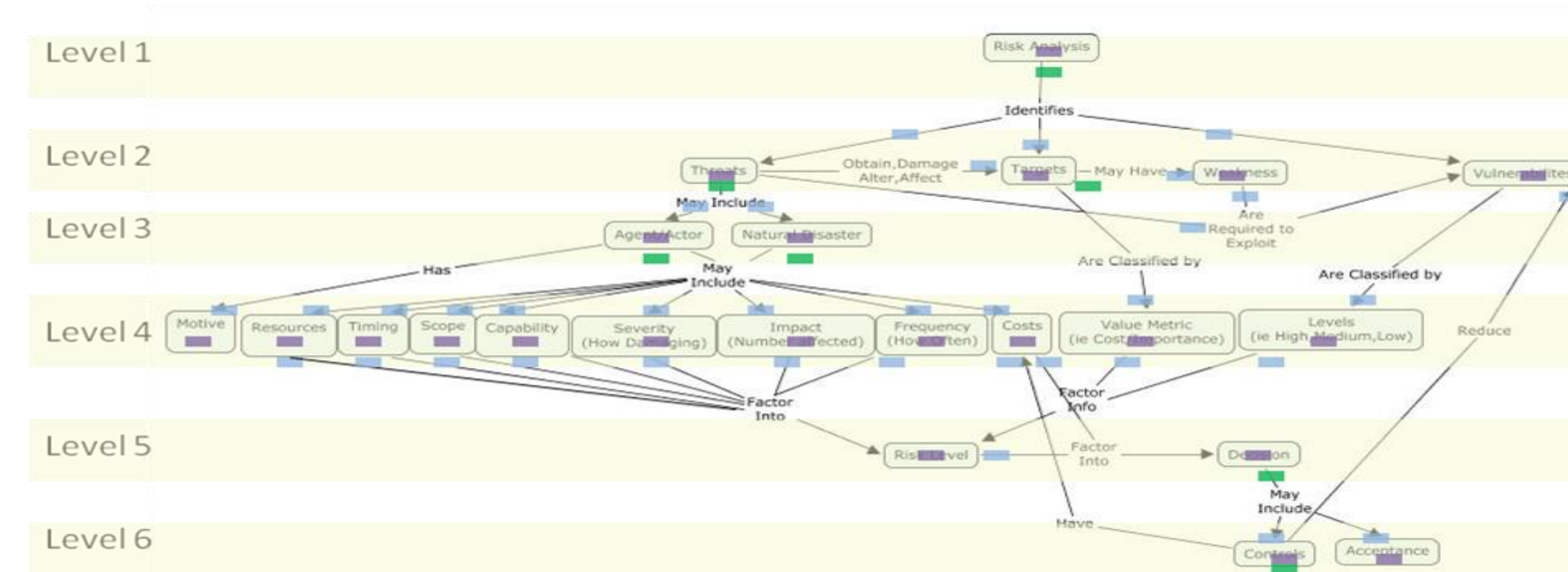
Group 1 was given "Inner-discipline" (within one discipline) activities. Group 2 was given "Cross-discipline" (across discipline) activities. Group 3 was given Hand-outs on "Threat Analysis" to read and discuss.

3 Days of Measurements
Student Concept Maps



After each treatment students created concept maps of their understanding of "Threat Analysis"

Scoring of Students Concept Maps
Expert Concept Map

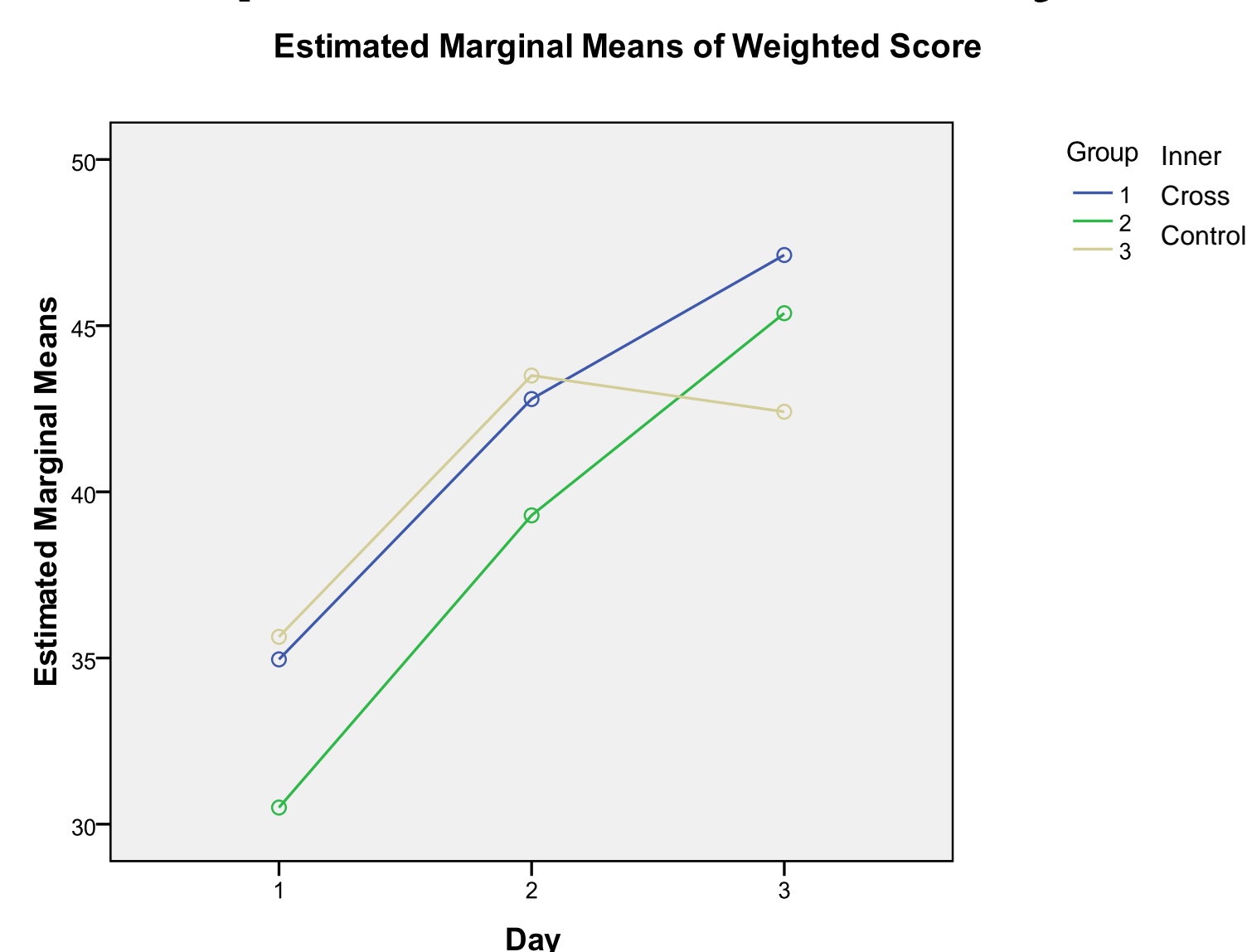


Item	Point Value	Number	Total Points
Concept	One Point	22	22
Conceptual Link	One Point	35	35
Branching	Three Points	7	21
Level of hierarchy	Five Points	6	30
Totals			108

Student concept maps were scored against an "expert" concept map using a rubric.

Results:

Graphical Summary



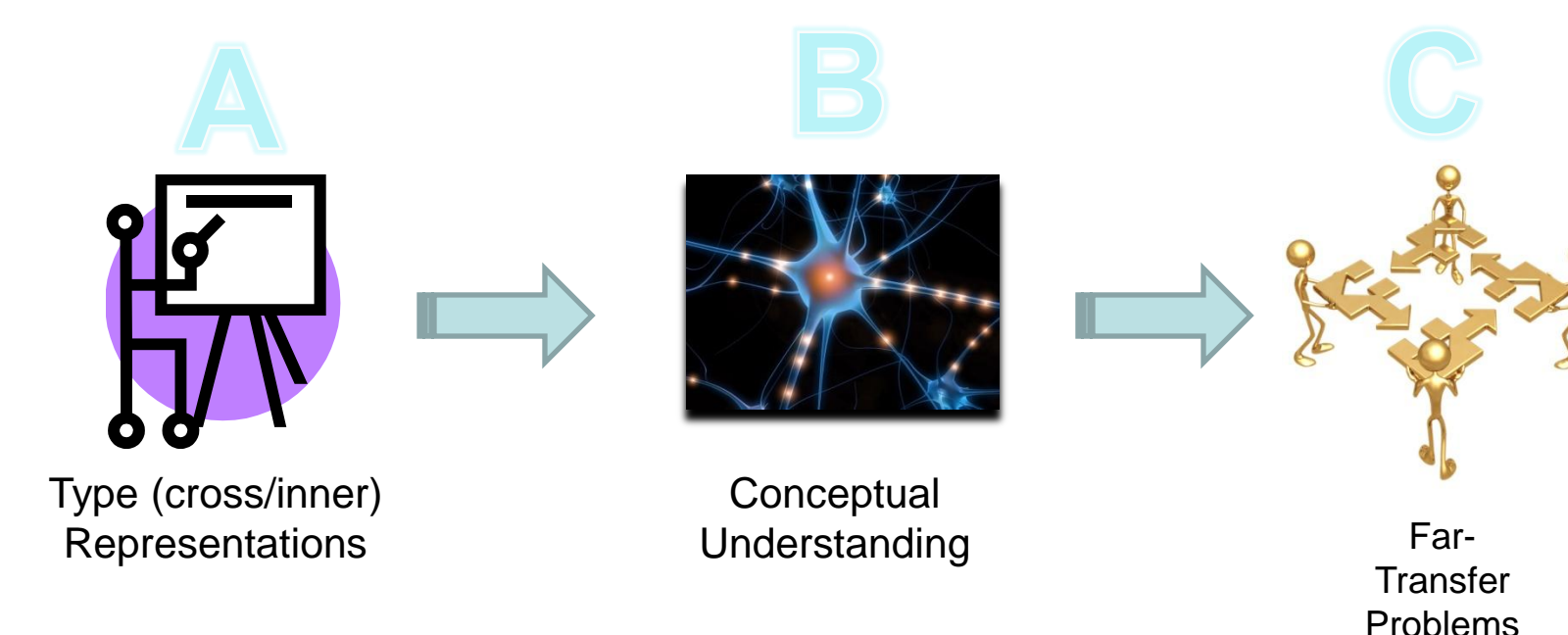
p - values

Weighted Score	Day 1-2	Day 2-3	Day 1-3
Inner	.05*	.61	.00*
Cross	.06	.19	.00*
Control	.05*	.99	.13

Both the "inner" and the "cross" groups show a positive increase with each additional representation while the control group decreases after the first two.

Future Research

Future research may include looking at how cross-discipline representations of ill-defined concepts affect the ability for students to apply this conceptual understanding to new "far-transfer" problems. A → C



IAS students will need to learn how to grapple with uncertainty in their professional lives, hence encountering uncertainty in the classroom is an important aspect of their education and understanding how to teach ill-defined areas is an important aspect of the curriculum.