# The Achievement of Students' Mathematical Power by Using APOS Theory

BY

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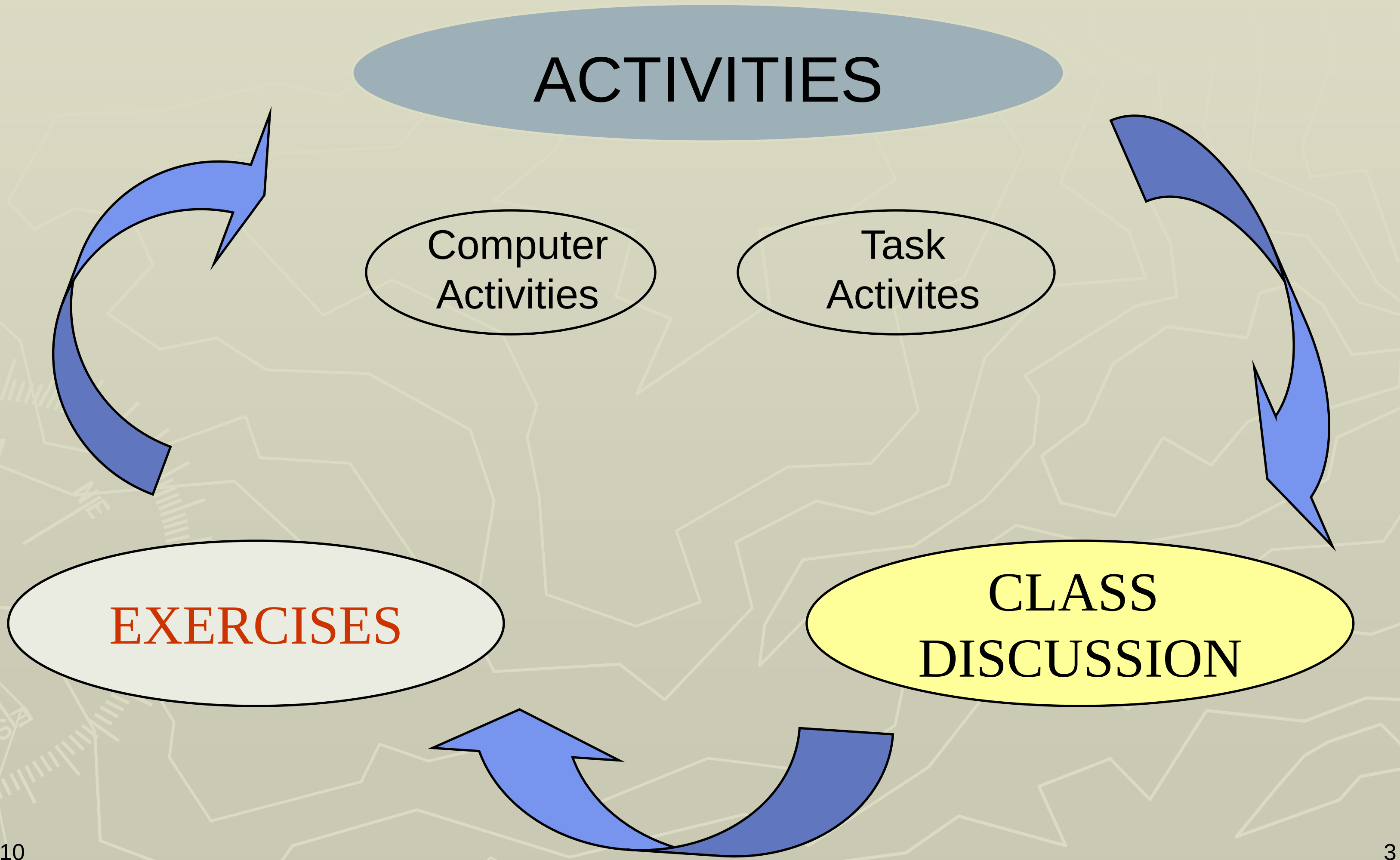
# Background and Problems

- Base on pre-survey  in implementation of APOS theory, there are some problems in computer activities at laboratory, such as the students have some obstacles to construct computer program (ISETL), so they can not conclude the concept from program which they constructed.
- How to overcome the problems ? (M-APOS)
- Does the new model (M-APOS) can achieve the result better than APOS model ?
- Is there any interaction between learning model and math prior ability?

# ACE CYCLE


ACTIVITIES
Computer Activities
Task Activites
CLASS DISCUSSION
EXERCISES

# Design Experiment

$X_1$ O

$X_2$ O

O

Note :

$X_1$ = Implementation of APOS learning model

$X_2$ = Implementaton of M-APOS learning model

O = Mathematical power test

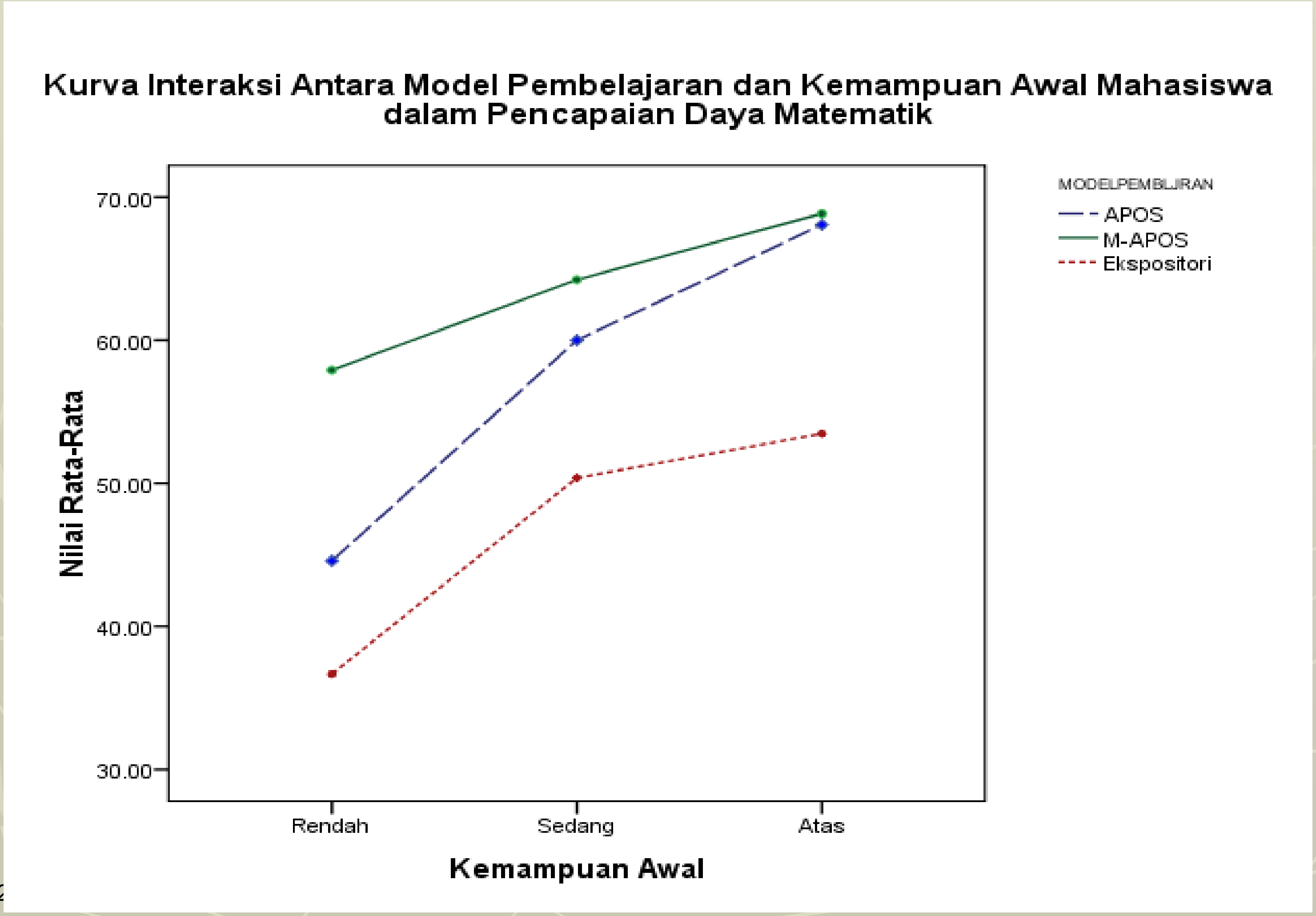
# Subject of Study

Subyect of this study was 114 students of three abstract algebra classes selected randomly from six classes. Then, each class of was determined randomly for APOS, M-APOS and for expository class. Furthermore, all students were clasified into low, medium, and high group of prior mathematics ability that estimated by their score on prerequisite of abstract algebra

# The Result

| Prior Math Ability | Component of math power | Learning model | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | APOS | | M-APOS | | Expository | | All | |
| | | Mean | Sd | Mean | Sd | Mean | Sd | Mean | Sd |
| High | Problem solving | 13,08 | 5,96 | 12,09 | 6,05 | 10,38 | 6,28 | 12,05 | 6,25 |
| | Communication | 14,23 | 5,72 | 13,08 | 5,96 | 12,31 | 5,25 | 13,21 | 5,56 |
| | Reasoning | 11,92 | 6,93 | 11,54 | 6,58 | 8,46 | 5,55 | 10,64 | 6,40 |
| | Connection | 13,46 | 5,16 | 17,31 | 2,59 | 13,08 | 4,08 | 14,61 | 4,64 |
| | Representation | 15,38 | 5,19 | 14,23 | 5,72 | 9,23 | 5,72 | 12,95 | 6,04 |
| | Sub Total | 68,08 | 18,09 | 68,85 | 15,57 | 53,46 | 11,97 | 63,46 | 16,63 |
| Medium | Problem solving | 7,69 | 5,25 | 11,15 | 5,06 | 8,97 | 5,15 | 8,97 | 5,15 |
| | Communication | 13,08 | 4,80 | 11,92 | 5,96 | 11,53 | 5,54 | 12,18 | 5,36 |
| | Reasoning | 11,15 | 6,18 | 11,15 | 6,18 | 9,62 | 6,28 | 10,64 | 6,09 |
| | Connection | 12,69 | 5,63 | 15,00 | 5,77 | 10,00 | 5,77 | 12,56 | 6,06 |
| | Representation | 15,38 | 5,19 | 15,00 | 5,00 | 11,15 | 6,18 | 13,85 | 5,67 |
| | Sub Total | 60,00 | 16,20 | 64,23 | 15,66 | 50,38 | 14,78 | 58,20 | 16,24 |
| Rendah | Problem solving | 6,67 | 5,36 | 7,50 | 5,84 | 4,58 | 5,42 | 6,25 | 6,25 |
| | Communication | 10,42 | 5,82 | 11,67 | 4,92 | `10,00 | 6,40 | 10,69 | 5,63 |
| | Reasoning | 7,08 | 6.20 | 12,08 | 6,56 | 7,08 | 4,98 | 8,75 | 6,59 |
| | Connection | 10,42 | 5,82 | 11,25 | 6,78 | 7,08 | 4,98 | 9,58 | 6,02 |
| | Representation | 10,00 | 6,40 | 15,42 | 3,96 | 7,93 | 5,41 | 11,11 | 6,11 |
| | Sub Total | 44,58 | 18,76 | 57,92 | 16,58 | 36,67 | 18,38 | 46,39 | 19,55 |
| Mean Total | | 57,89 | 19,78 | 63,82 | 16,13 | 47,11 | 16,47 | 56,27 | 18,72 |

# Interaction Graph Between Learning Model and Math Prior Ability for Mathematical Power



# Conclusion

- M-APOS learning model was better than APOS and expository learning models.
- The students' mathematical power of M-APOS learning model was classified as good, and of APOS and expository learning models were classified as fairly good and medium successively.
- Students' prior mathematics ability was a good predictor to attain the students' mathematical power.
- The M-APOS gave the best role to the attainment of students' mathematical power than the role of APOS and expository learning model, and the role of students' prior mathematics ability.
- There was no interaction between learning model and students' prior mathematics ability toward the attainment of students' mathematical power
- Moreover, related to non-cognitive aspect, the study concluded that students thought by using APOS and M-APOS learning model performed a good learning attitude, and they were more active and autonomous in learning and solving all mathematical tasks.

# Thank You