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A Pilot Study in the Use of Learning Analysis in Student Learning

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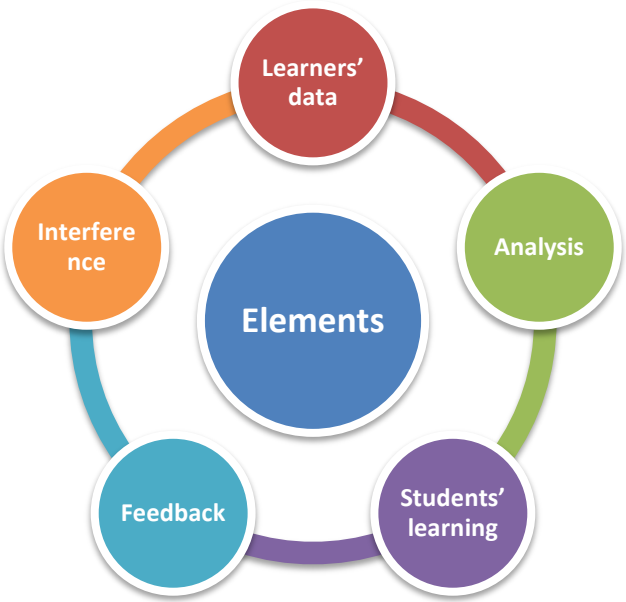
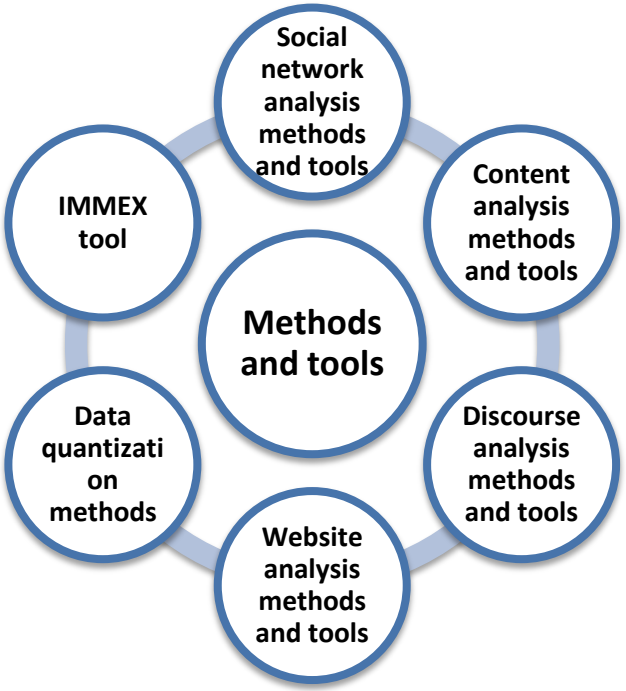
Prolog

- Massive educational data have been accumulated during the progress of educational informationization.
- Many related software and systems are established to obtain and store data, whilst the methods and tools for data analysis and response to education itself are just started to conceive.
- How to use these massive data and turn them into valuable information, even then provide effective support for education and decision-making, has now become the focus of recent researches.

Purpose: Learning Analysis Supported Teaching

- Our purpose is to try to use the recorded data of learners' behaviors, then analyze these data and make predictions about the students' learning results and then provide effective support for teaching.





Purpose: Data Preparation

- Situation: Learning analysis is widely applied in network learning. However, the analysis is mainly based on learning behavior status and results: log in and out duration and frequency, resource using status, online homework results, online test results, etc.
- Critical issue: result data analysis are indirect to learning process itself. We need to prepare data from all aspects: status, results and process.

Purpose: Model Establish

- Our study introduces an idea of how to use learning analysis into student learning process.
- We use variety data during the learning process to achieve learning analysis through the artificial intelligence feedback.
- We then provide detailed feedback and learning suggestions for learners.

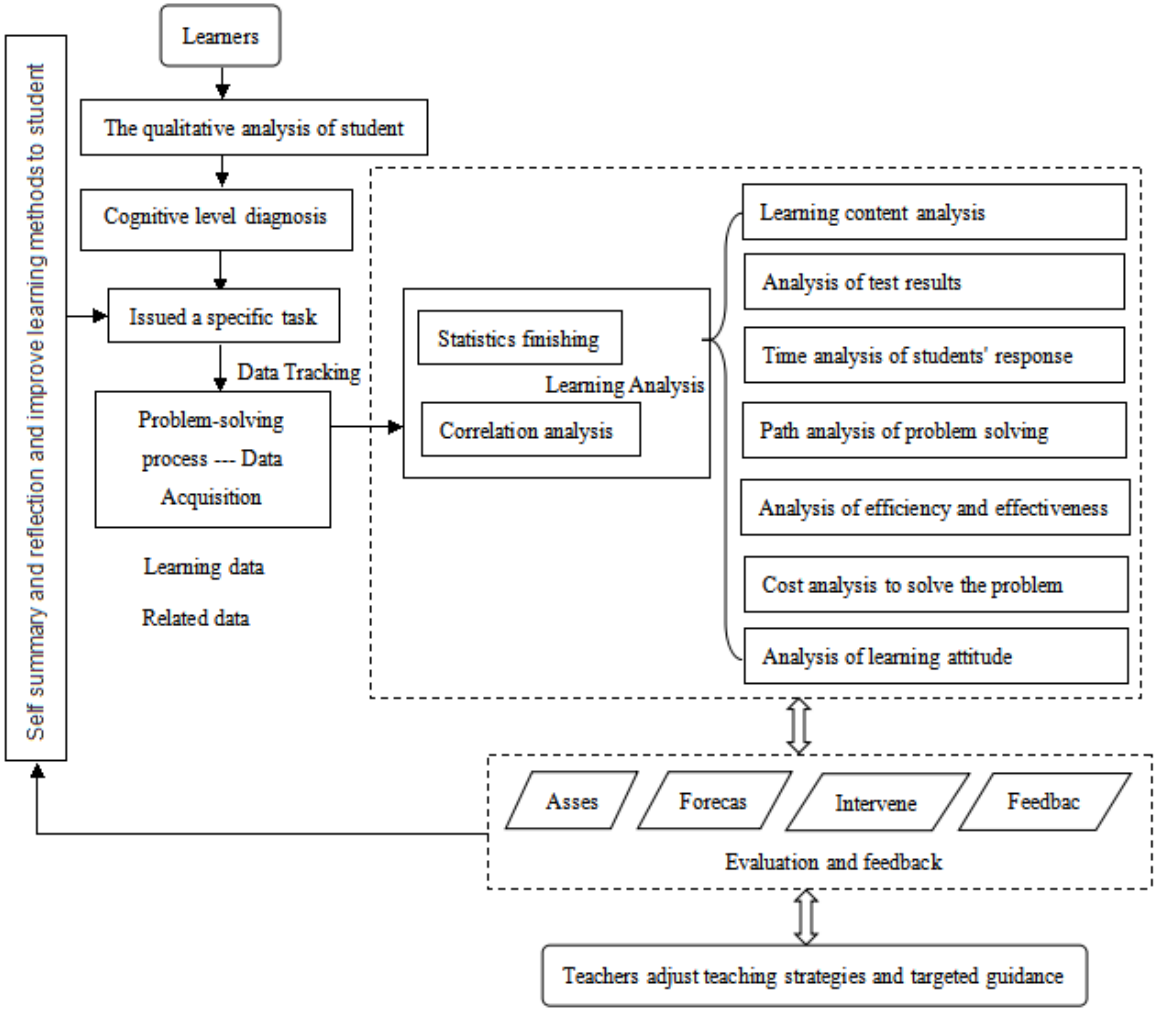
Model Design Principles

- Process data plays an important role:
  - In order to obtain data to reveal learning itself, we designed specialized problem formation to sample data of problem solving process.
- Result and process combination:
  - Learning result and process are both equally important to learning analysis.
  - Monitor both result and process can provide well directed intervention target and reduce labor of teachers whilst increate learning effectiveness and efficiency.

Model Design Principles

- Analysis pluralism
  - Human intelligence is organic, systematic, diverse. Then analysis and evaluation should be plural too.
  - Plural but focused: application of learning is to solve problems. Hence we will focus on the analysis of problem solving process.
- Data centralized
  - In order to keep objective, the model should be data centralized.

Model Diagram



Model Explanation

- Phase 1: A qualitative analysis of students
  - In order to carry out teaching and learning supported by learning analysis more efficient, we should analyze the initial capabilities of learners. And then, we adopt the way of grouping teaching for the student who have the same initial status, in order to success in the next teaching phase.
- Phase 2: The diagnosis of cognitive starting
  - Before taking any task, we need to identify students' cognitive characteristics through qualitative analysis. Then we can conduct necessary teaching such as reviewing the related knowledge to warm up students.

Model Explanation

- Phase 3: Practice of Specific Tasks
  - According to the assessment of previous phases, we use our specialized problem to assign targeted tasks to students.
- Data Acquisition
  - Problems carried out by the system IMMEX-C, we can acquire problem-solving-process data silently during students exercise.

Model Explanation

- Evaluation and Feedback
  - In this phase, we use results and process data to make reconfiguration of the solving process. And according to this powerful reconfiguration, we can make accurate analysis and evaluation of the problem solving process, so that the feedback to students could be neat and effective too.
- Audience:
  - Teachers: making adjustment and progress of teaching strategy according to these analysis.
  - Students: making summary and introspection of problem solving strategy, and cognition of related knowledge.

Case Study

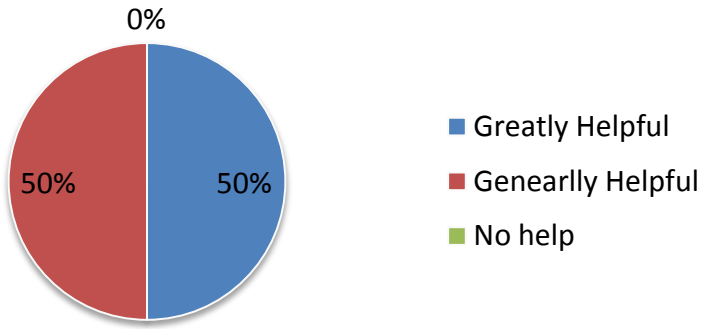
- Period: 2014.9 ~ 2015.1, 2 hours per week.
- Audience: 9th grade, 10 random students.
- Teaching Subjects: parallel with school teaching.
- Following Demo:
  - Subject: Transformation of Geometric Forms.
  - Student: Mr. Wen.

Case Study: overall statistics

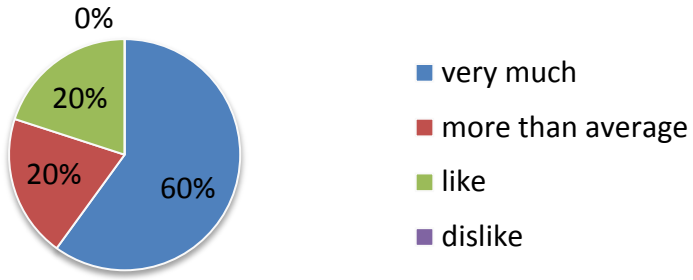
- After Phase 1 and Phase 2, we now have the overall statistics of our sample students first base evaluation.
- After Phase 3 and intervene according to the data analysis, we did some comparing statistics.
- And we have:

Case Study: overall statistics

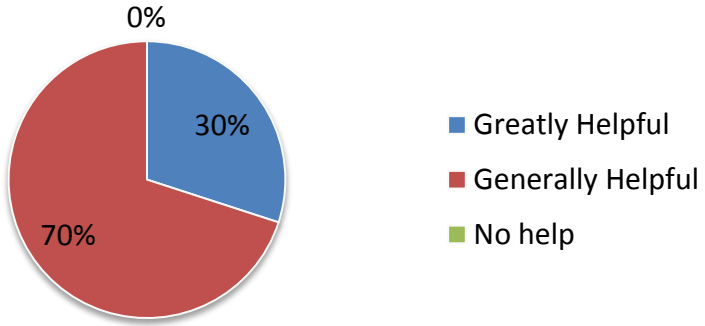
Is the teaching method helpful



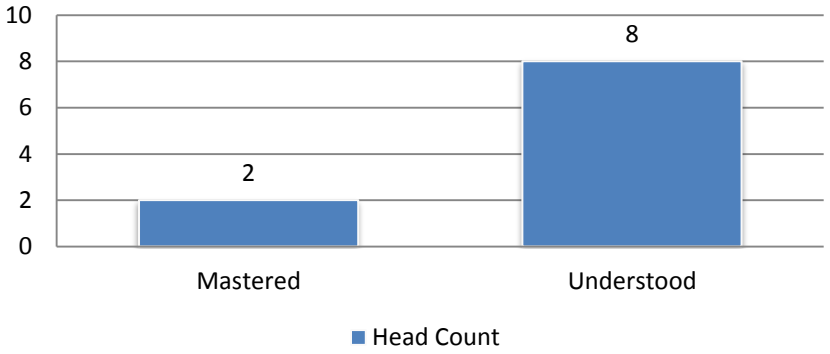
Did students like this way of learning



Is teachers' feedback helpful



Degree of Knowledge Mastery



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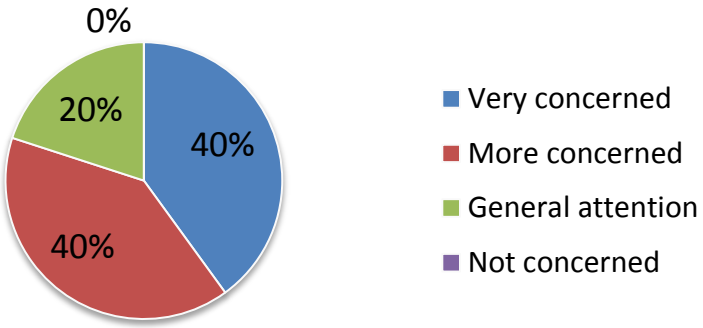
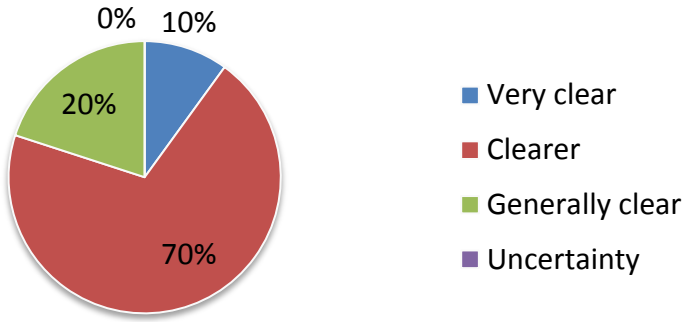
Case Study: overall statistics

- Evaluation of Learning Attitude

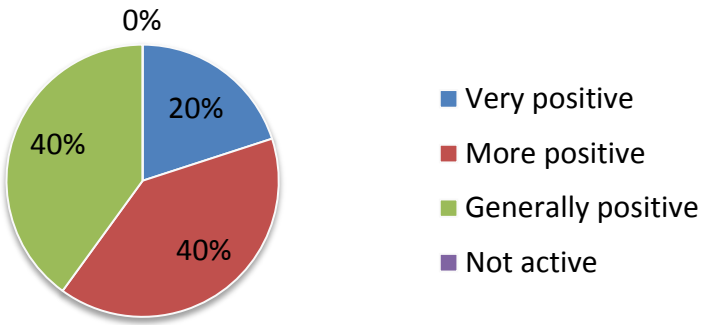
Attention of Learning process



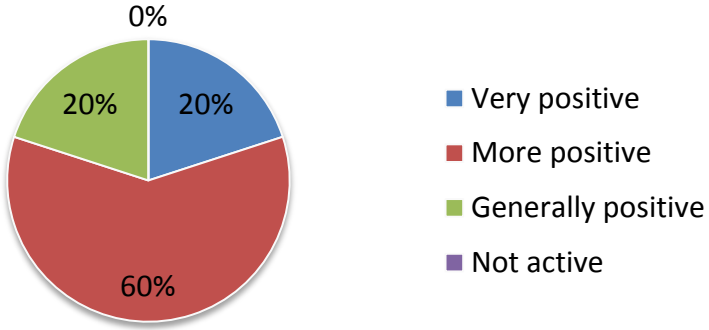
Goal of future study



Discussion Participation

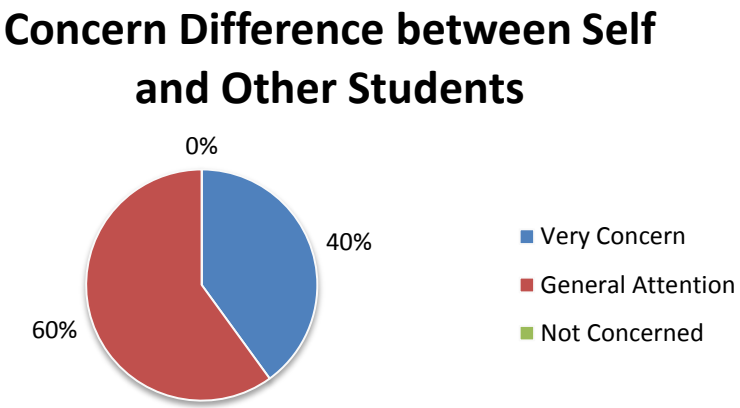


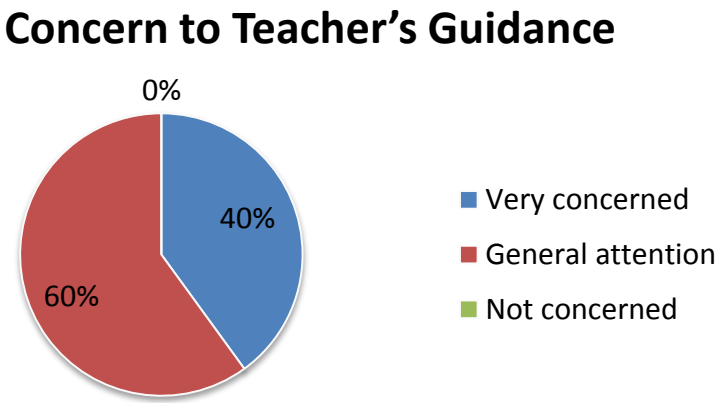
Attitude of Finishing Homework



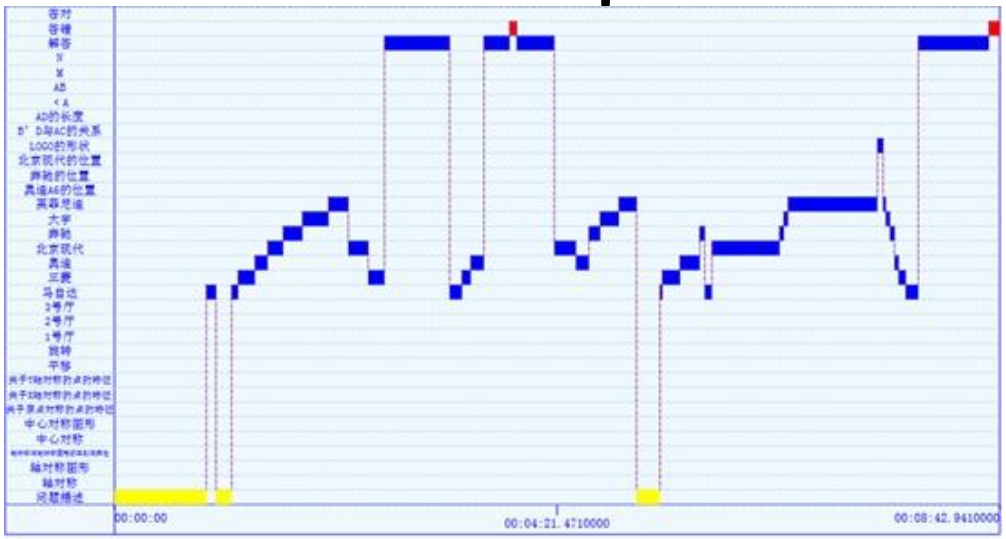
Case Study: overall statistics

- Evaluation of Learning Attitude



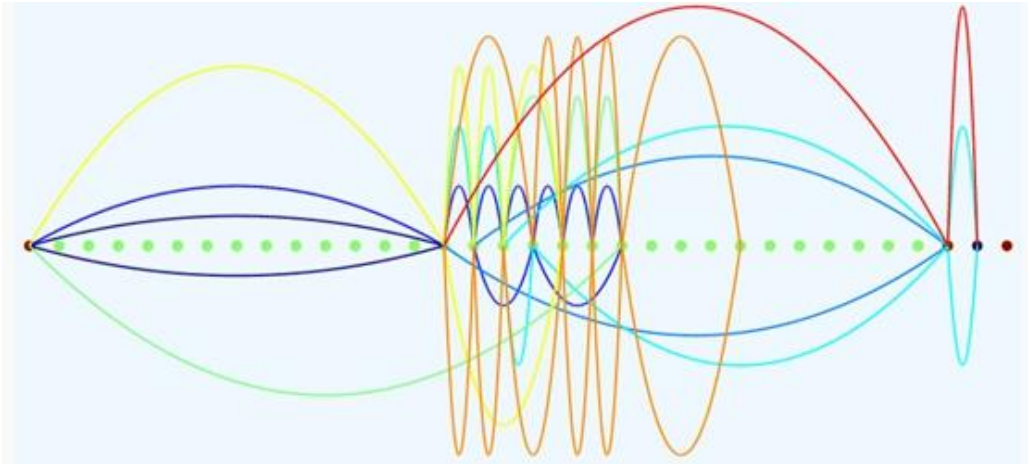


Case Study: visualized personal process data



Strategy Path Map of variation 1 of ‘Transformation of Geometric Forms’ Problem Set.

Thinking Loop Graph in variation 1 of ‘Transformation of Geometric Forms’



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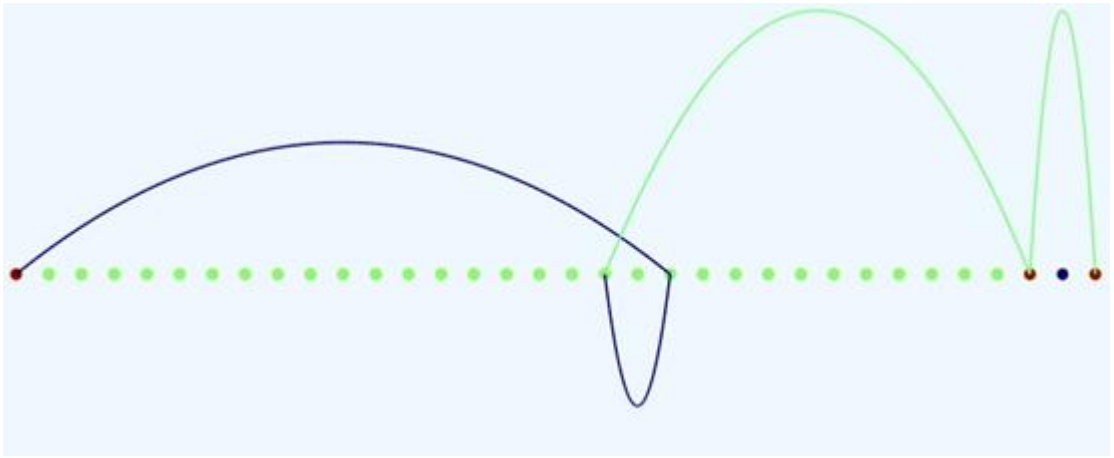
Case Study: visualized personal process data

Strategy Path Map in variation 2 of ‘Transformation of Geometric Forms’ Problem Set

Thinking Loop Graph in variation 2 of ‘Transformation of Geometric Forms’



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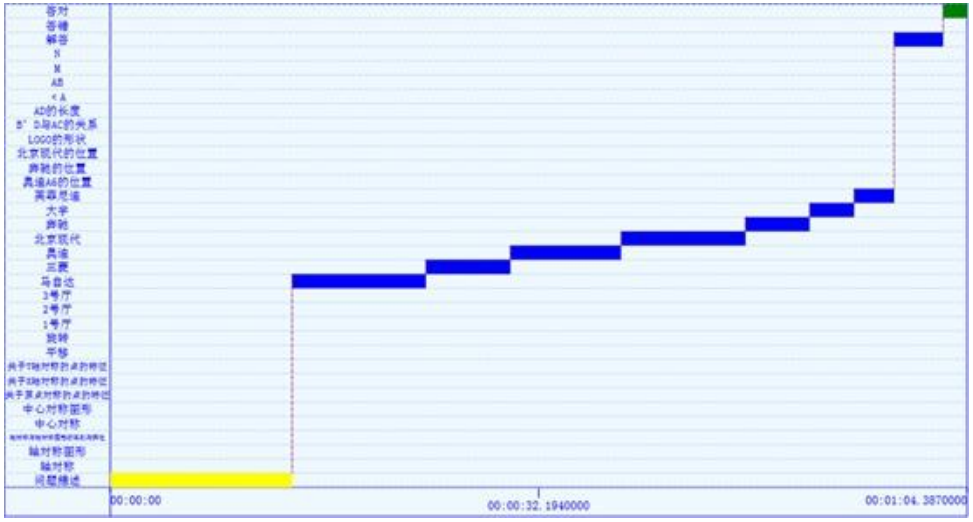
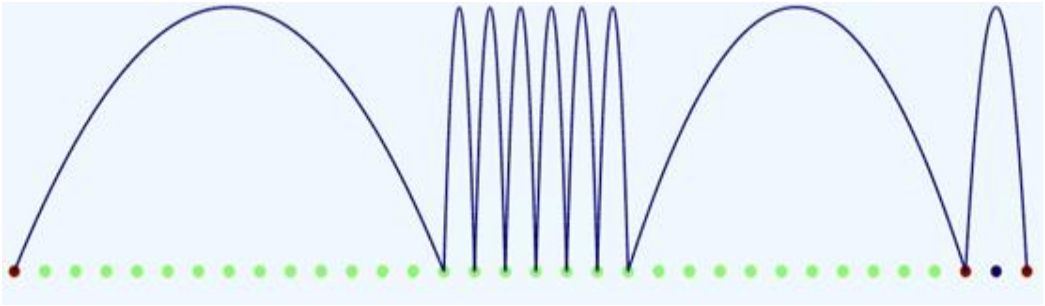
Case Study: visualized personal process data



Strategy Path Map ‘Transformation of Geometric Forms’ Problem Set after teacher’s intervene of focus on related information.

Thinking Loop Graph of ‘Transformation of Geometric Forms’ Problem Set after teacher’s intervene of focus on related information.



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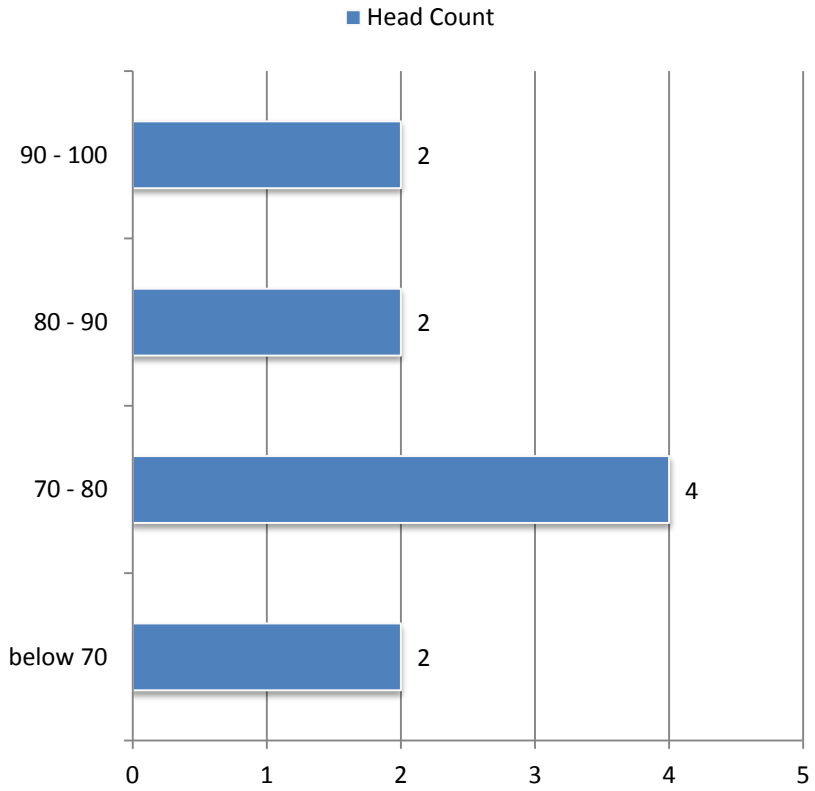
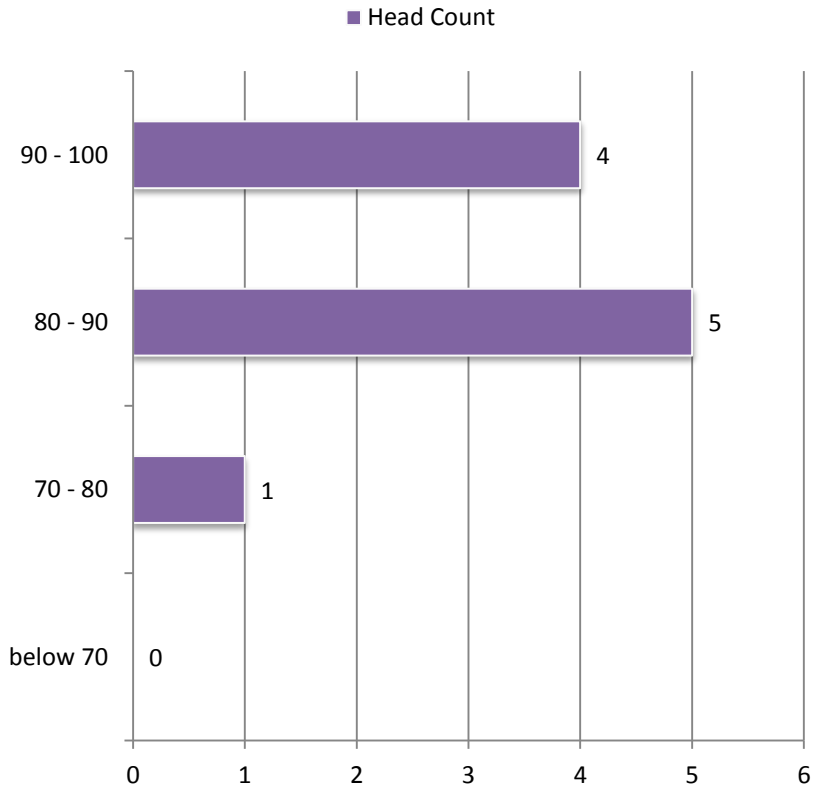
Case Study: Case Outcome

- **Final Exam of LAST semester in school**



- **Final Exam of THIS semester in school**



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Conclusion

- Our model of learning analysis using various aspects data of status, results and process, which can provide teaching activity more accurate analysis on individuals.
  - The more accurate the evaluation is, the more efficient the target teaching will be.
  - The more complete the assessment is, the more effective the student learning intervene can be.

Conclusion

- Our pilot case study also encouraged our research to go on and to make optimization.
  - Although students got great progress in their final exams in school, it took us such a lot of resource and man power on problem specialization, data analysis, intervene and monitoring.

Conclusion

- Learning analysis supported teaching is the future mode.
  - Without effective and efficient analysis, individualized learning and teaching is always the untouchable ultimate goal.
  - Information technology and big data mining can provide such manner to make good learning analysis.

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Thanks!

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