Mar 6th, 11:15 AM - 11:35 AM

Finding the connection between Game-Design and Problem-Solving: Game-Design and Learning Programs

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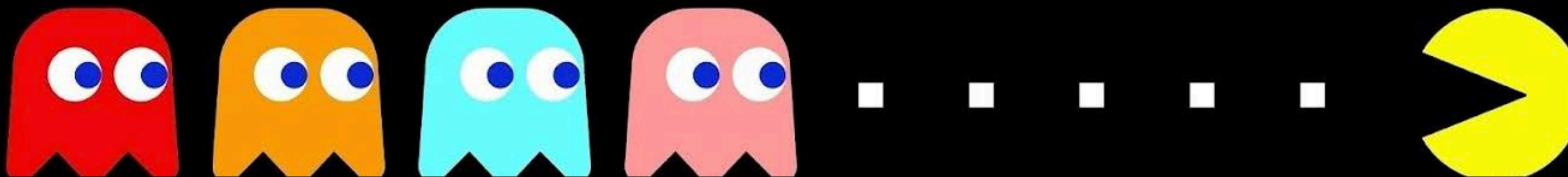

Connecting Game-Design and Problem-Solving: Game-Design and Learning Programs

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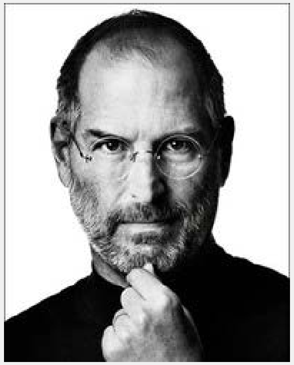
on design...



"...Life can be much broader once you discover one simple fact: Everything around you that you call life was made up by people that were no smarter than you and **you can change it, you can influence it, you can build your own things that other people can use.**

Once you learn that, you'll never be the same again."

Steve Jobs, 1995

Design

Design is…

- Synthesis of variables in multiple unique ways
- A quintessential ill-structured problem
- problem-solving, problem-finding, inquiry
- Involves creating new objects, processes, or ideas
- personally meaningful
- engaging
- important for STEM careers

Hard to teach in formal schooling contexts

Design and problem solving skills

syste

lesign

(digital)

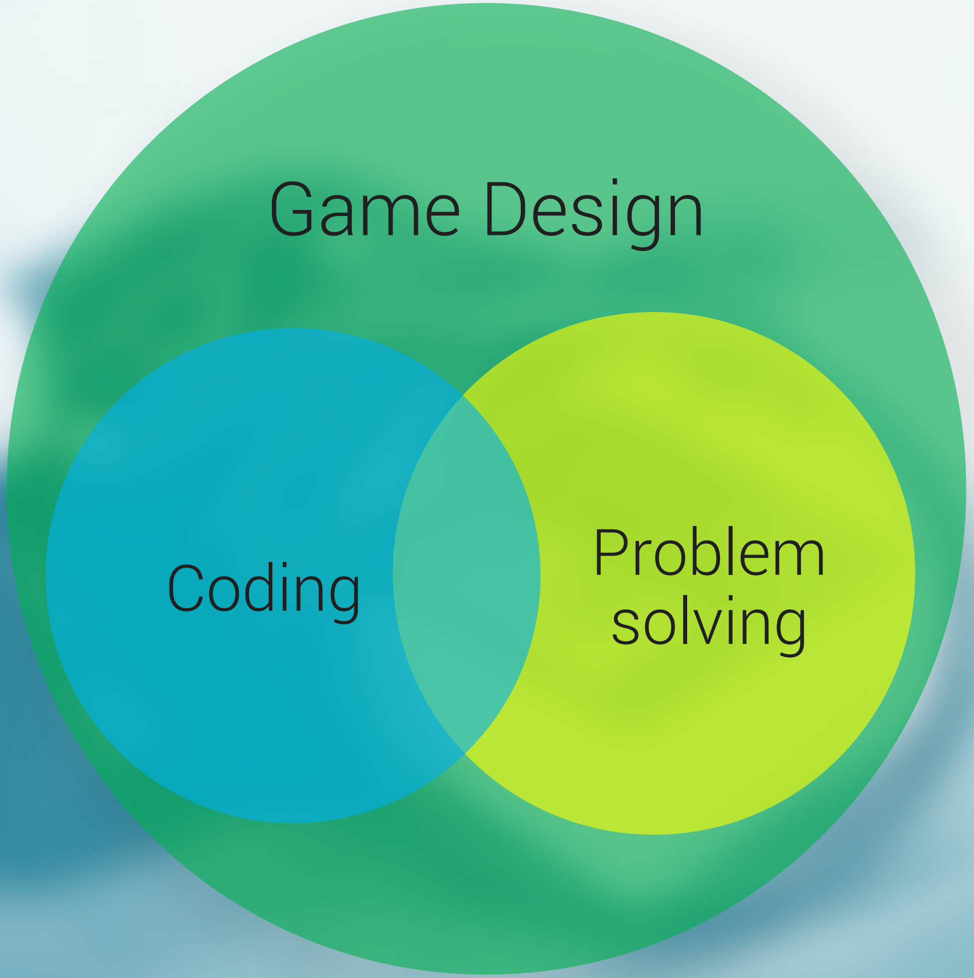
Game-Design

engaging

visual representations for complex systems

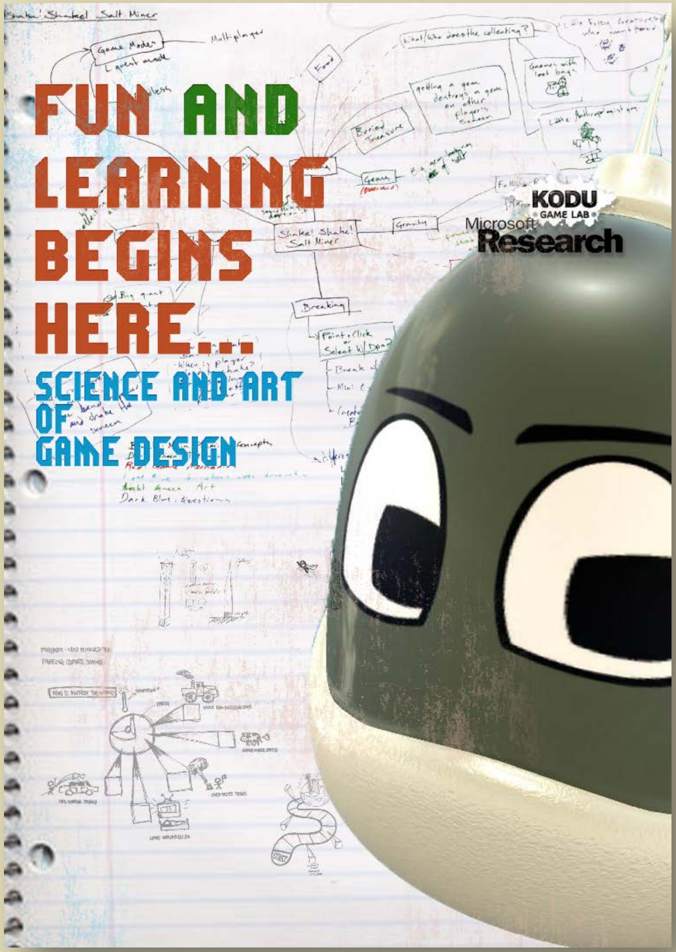
requires computer programming and problem solving

Image credit to Empire Building Network

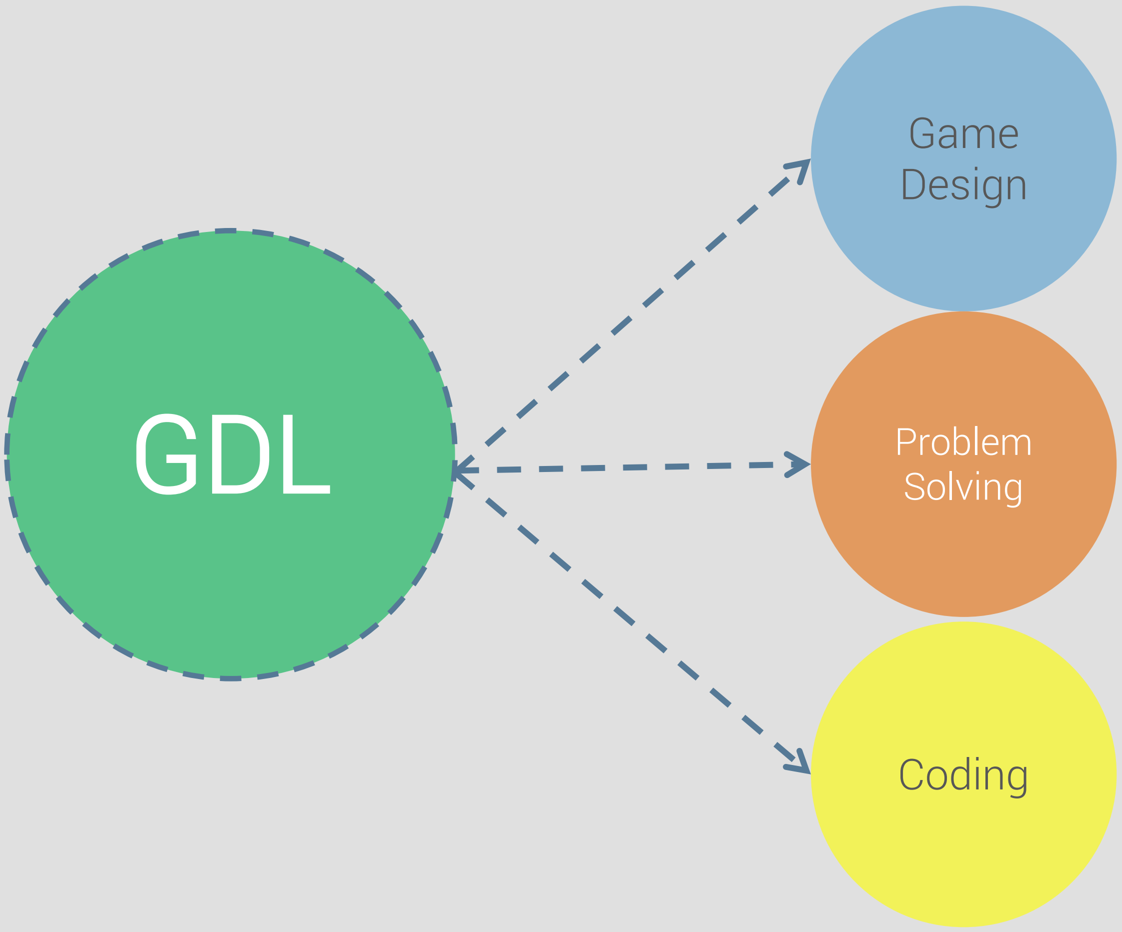

Game Design
Coding
Problem solving

Game-Design and Learning (GDL) courses

after or summer school

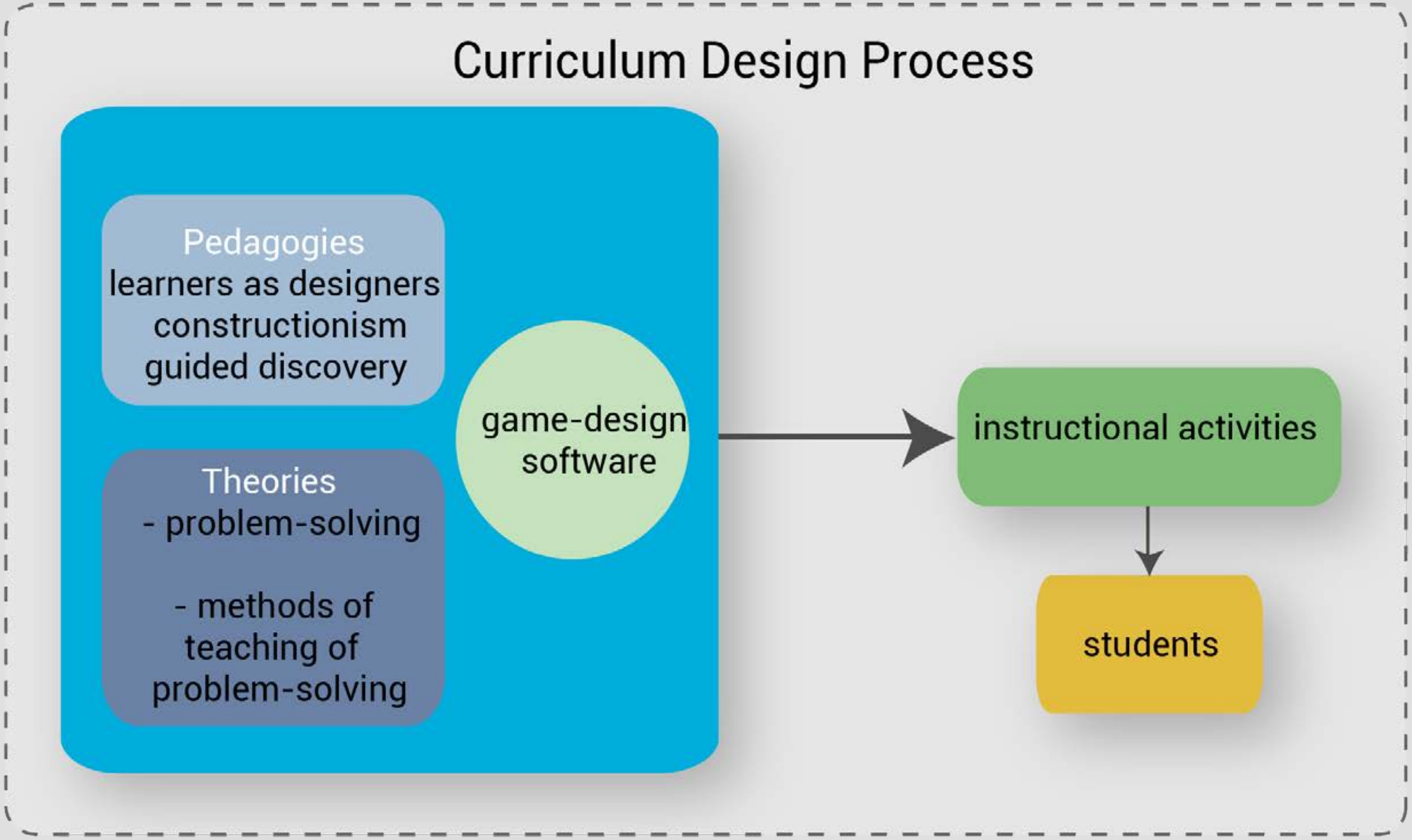


GDL goals



SYS = system analysis and design, DM = decision-making, TS = Troubleshooting

Design of GDL Curriculum



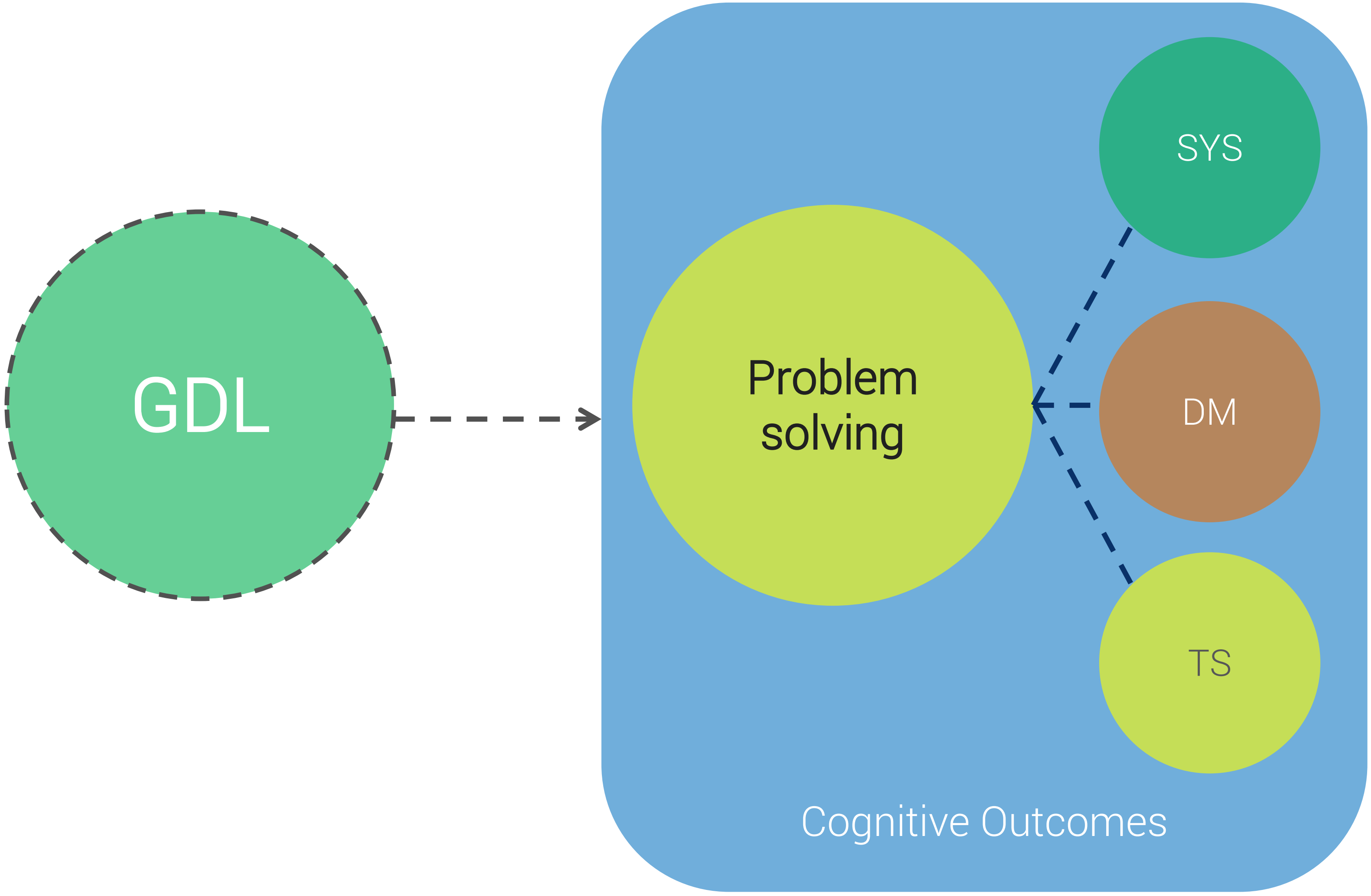
Akcaoglu, M. (2014). Teaching problem solving through making games: Design and implementation of an innovative and technology-rich intervention. In M. Searson & M. Ochoa (Eds.), *Proceedings of Society for Information Technology & Teacher Education International Conference 2014* (pp. 597-604). Chesapeake, VA: AACE.

Game Design and Learning

Summer 2011	Istanbul, Turkey
Summer 2012	Istanbul, Turkey
Fall 2012	Lansing, MI
Fall 2012	Istanbul, Turkey
Spring 2014	Morgantown, WV
Spring 2015	Statesboro, GA
Spring 2015	Savannah, GA

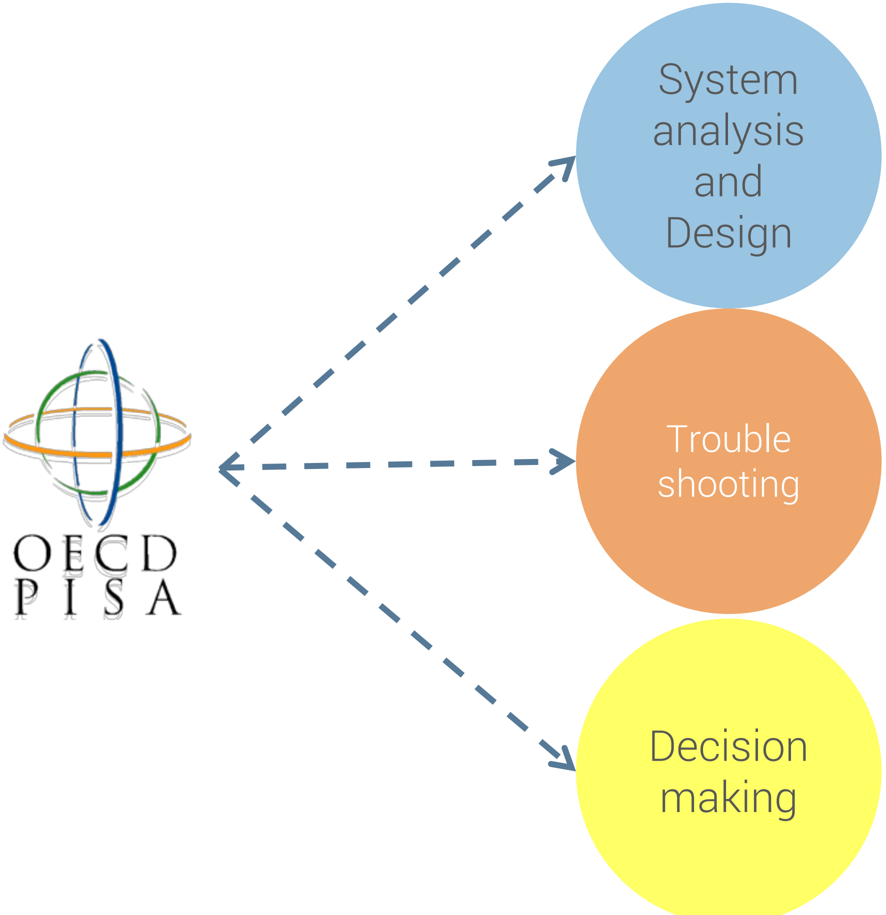
over 200 students, and growing

Research



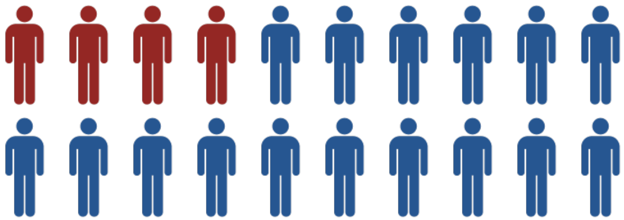
SYS = system analysis and design, DM = decision-making, TS = Troubleshooting

Instruments



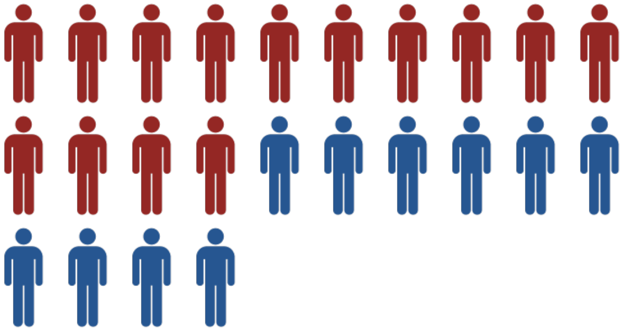
Study design

GDL



Female = 4
Male = 16

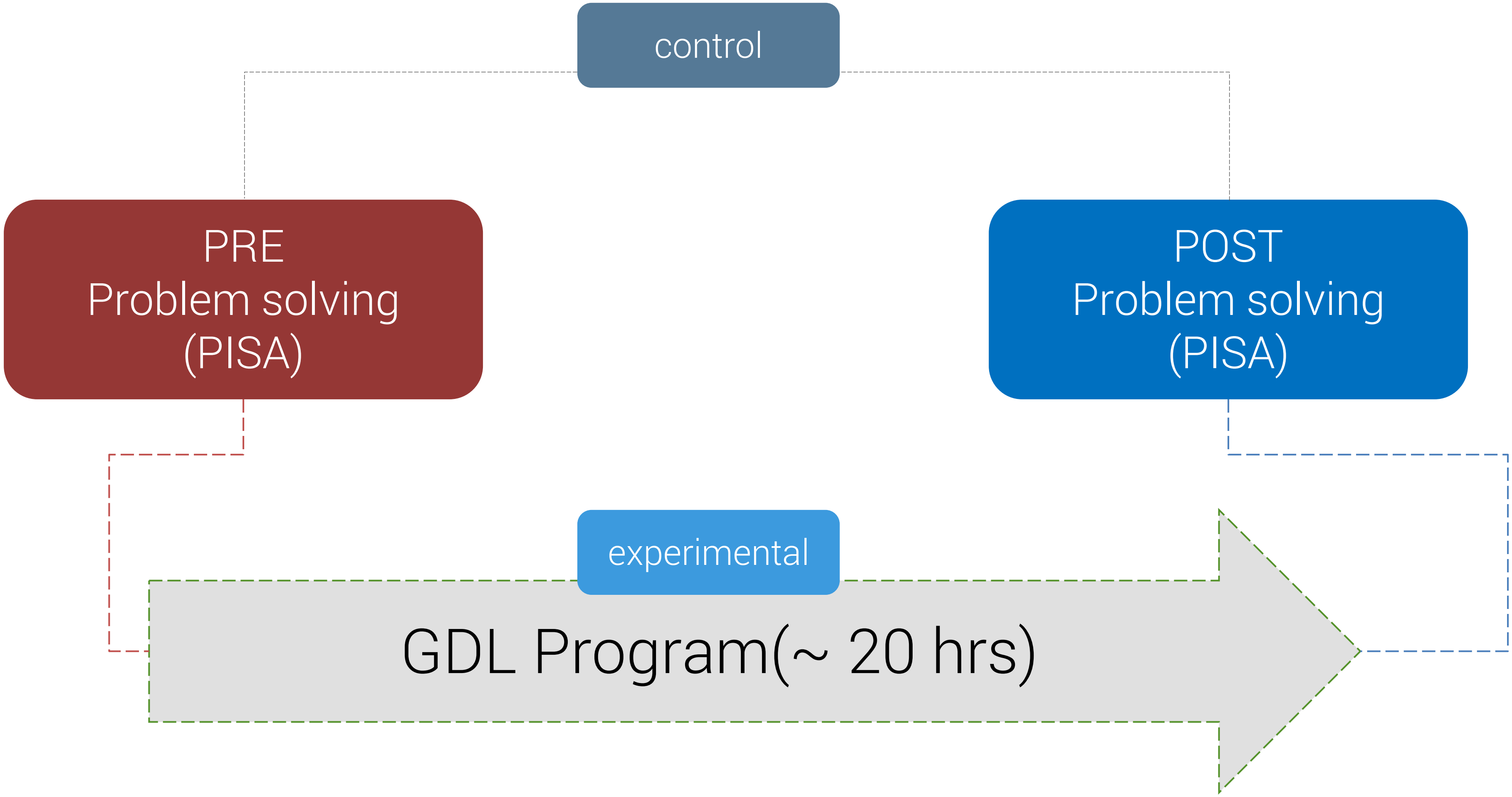
Control



Female = 12
Male = 12

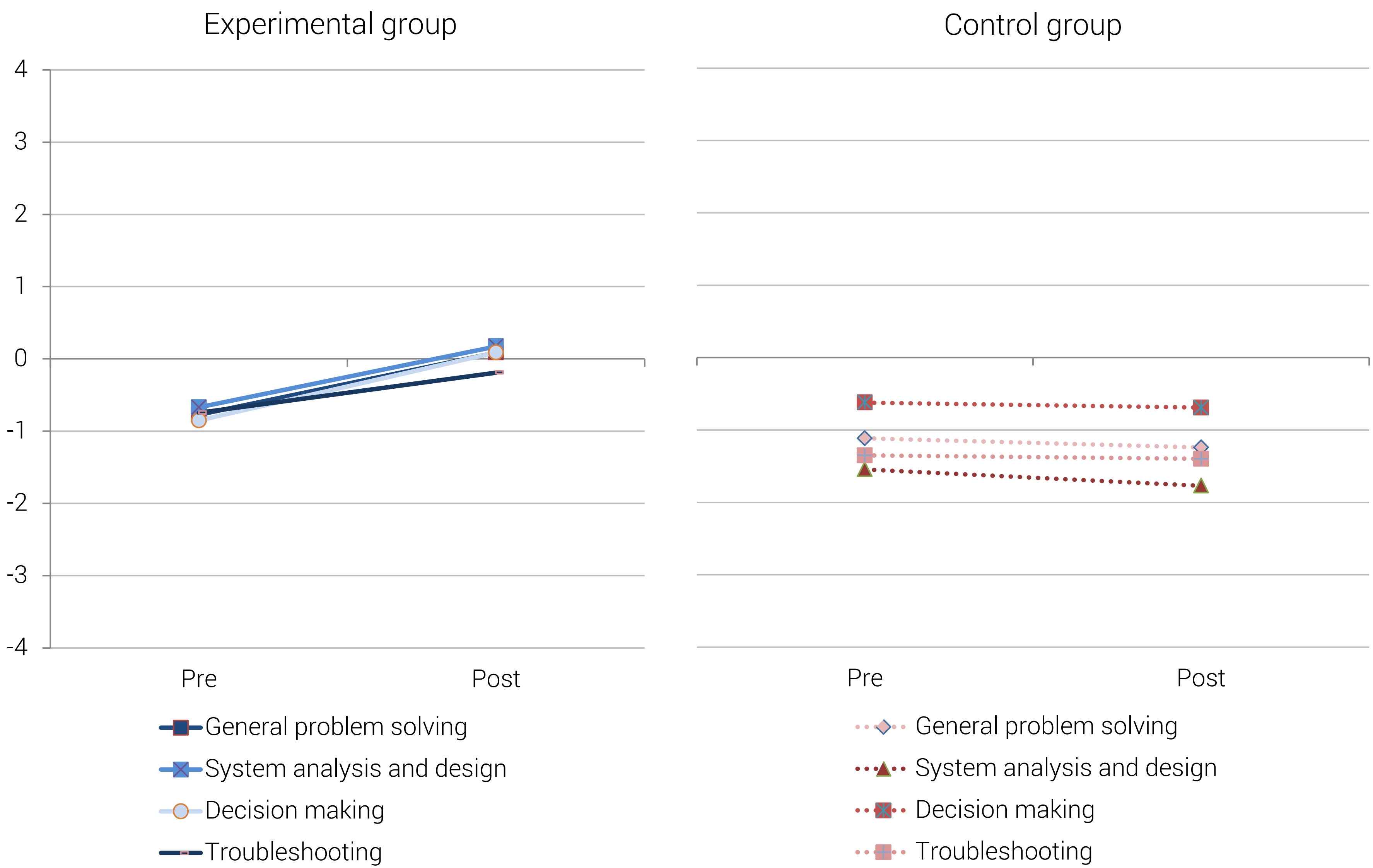
$n = 20$ - - - - → $n = 44$ ← - - - - $n = 24$

Procedures


control
PRE
Problem solving
(PISA)
POST
Problem solving
(PISA)
experimental
GDL Program(~ 20 hrs)

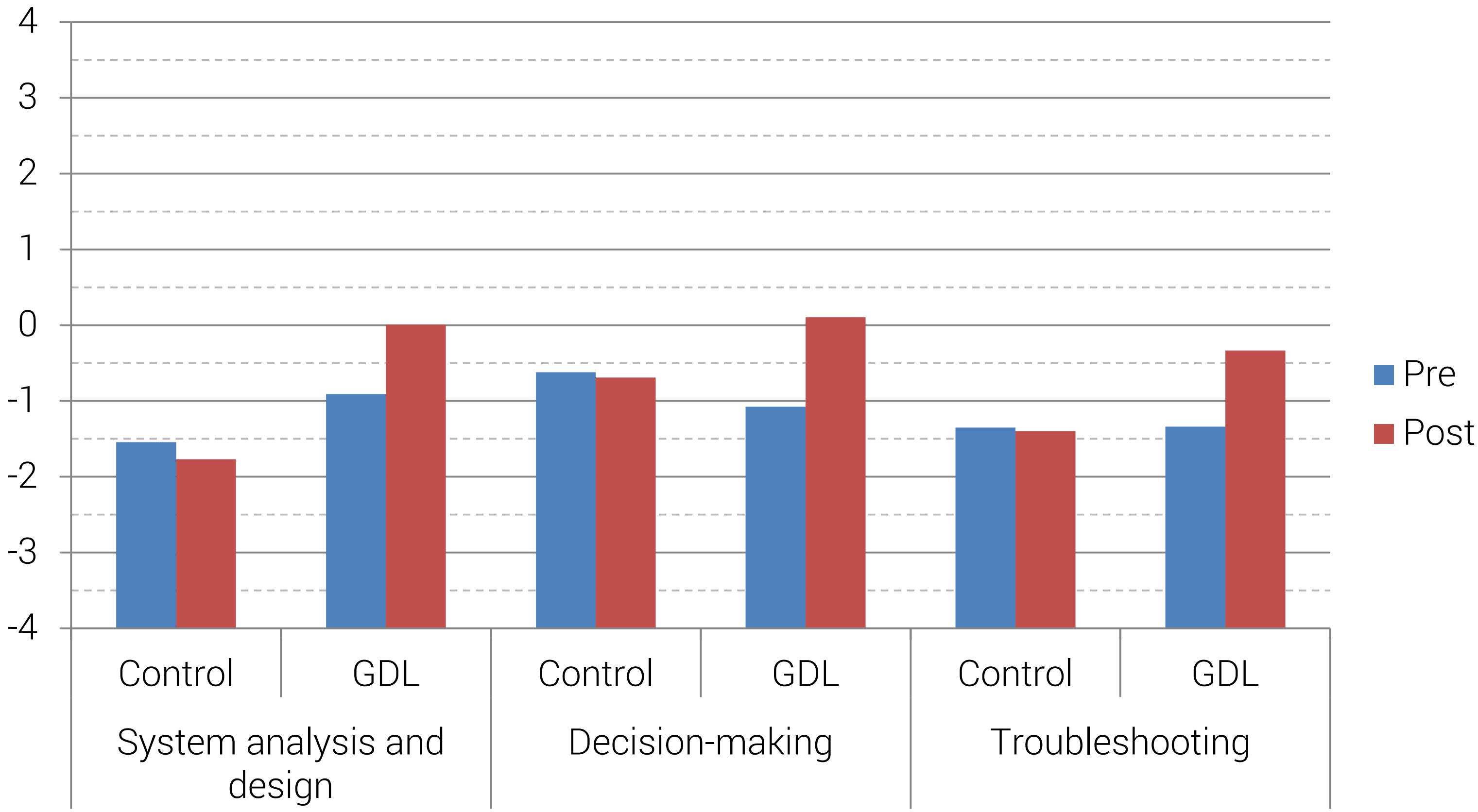
RQ

Are there differences between control and GDL students in terms of their gains in problem solving skills?

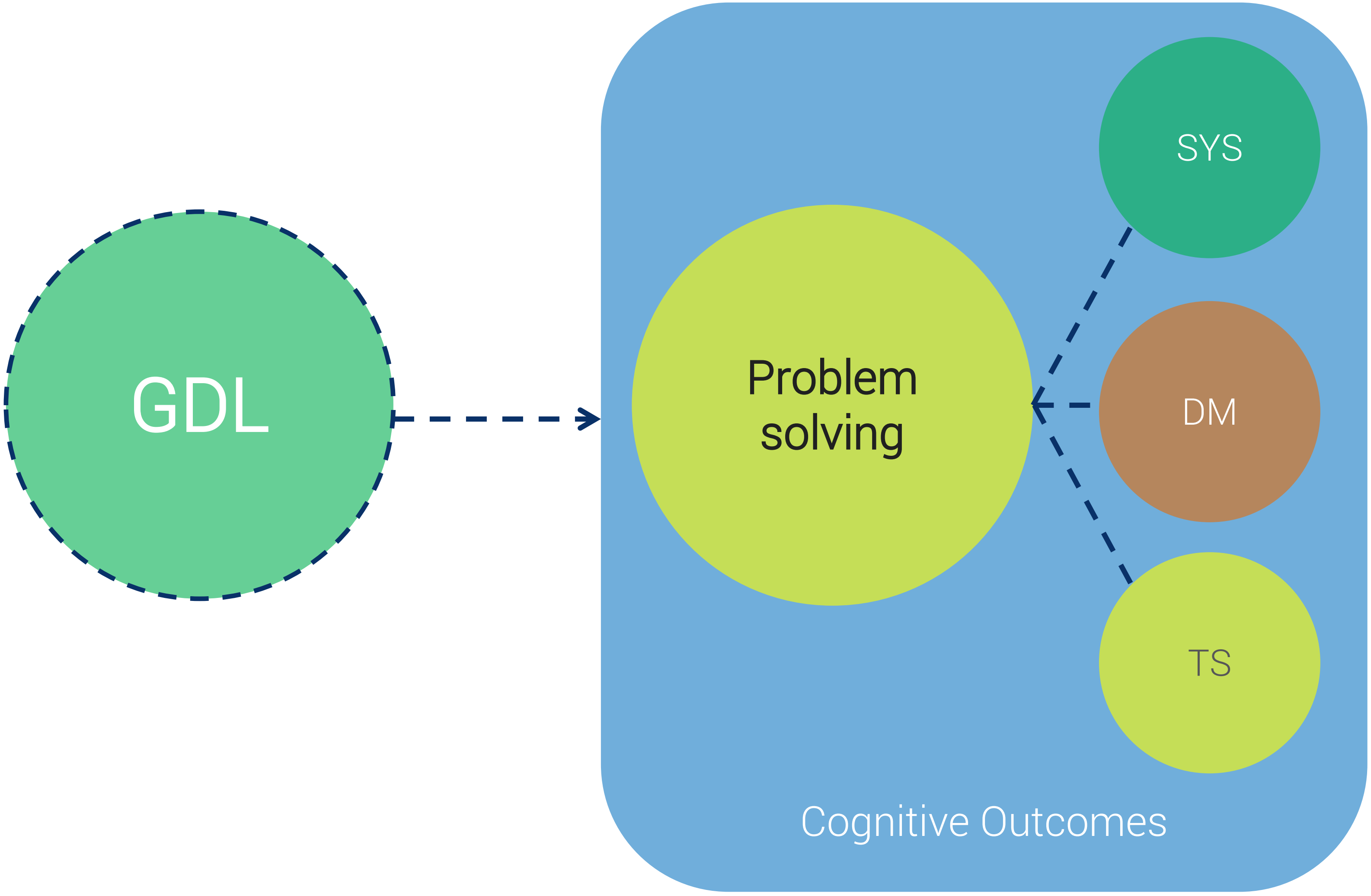


$(\textit{Wilks's}\ \Lambda = 0.733)$, $F(3, 40) = 3.0$, $p = 0.006$, $\eta = 0.267$

Problem-solving skill change for GDL vs Control



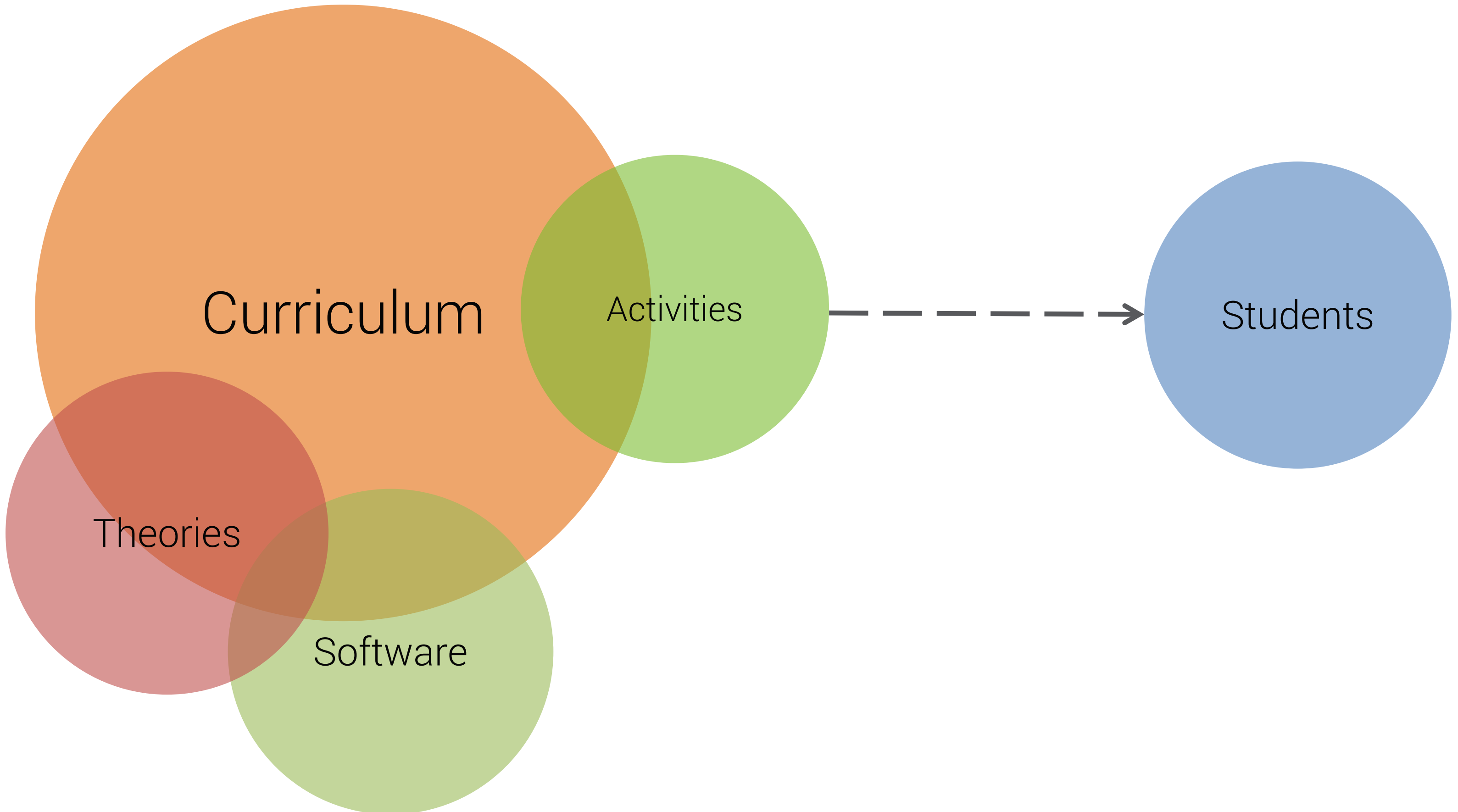
System analysis and design, $t(19) = 4.7$, $p < .001$, $d = 1.062$
Decision-making, $t(19) = 4.7$, $p < .001$, $d = 1.05$
Troubleshooting, $t(19) = 3.9$, $p < .001$), $d = 0.87$



SYS = system analysis and design, DM = decision-making, TS = Troubleshooting

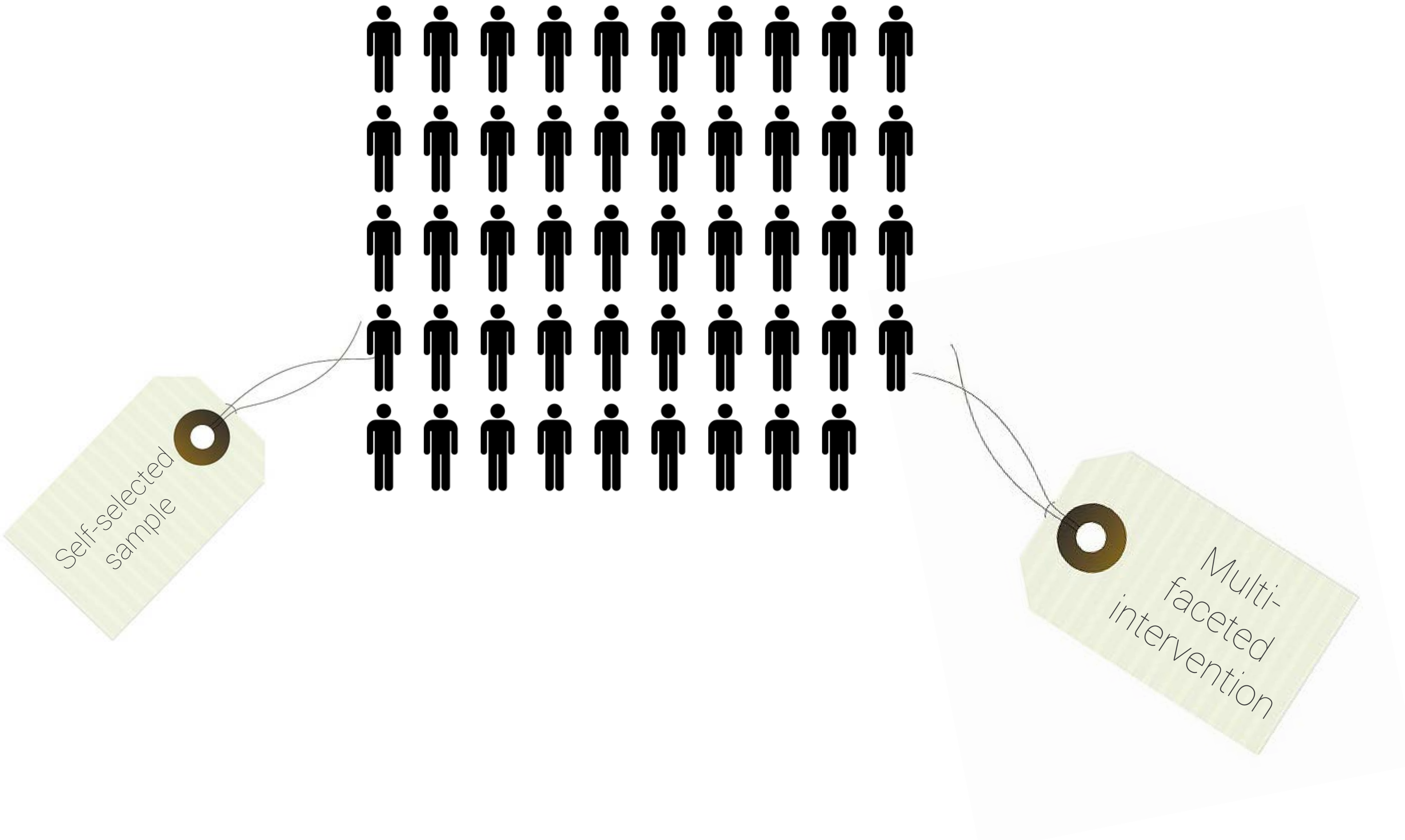
Discussion

Intervention worked



Limitations

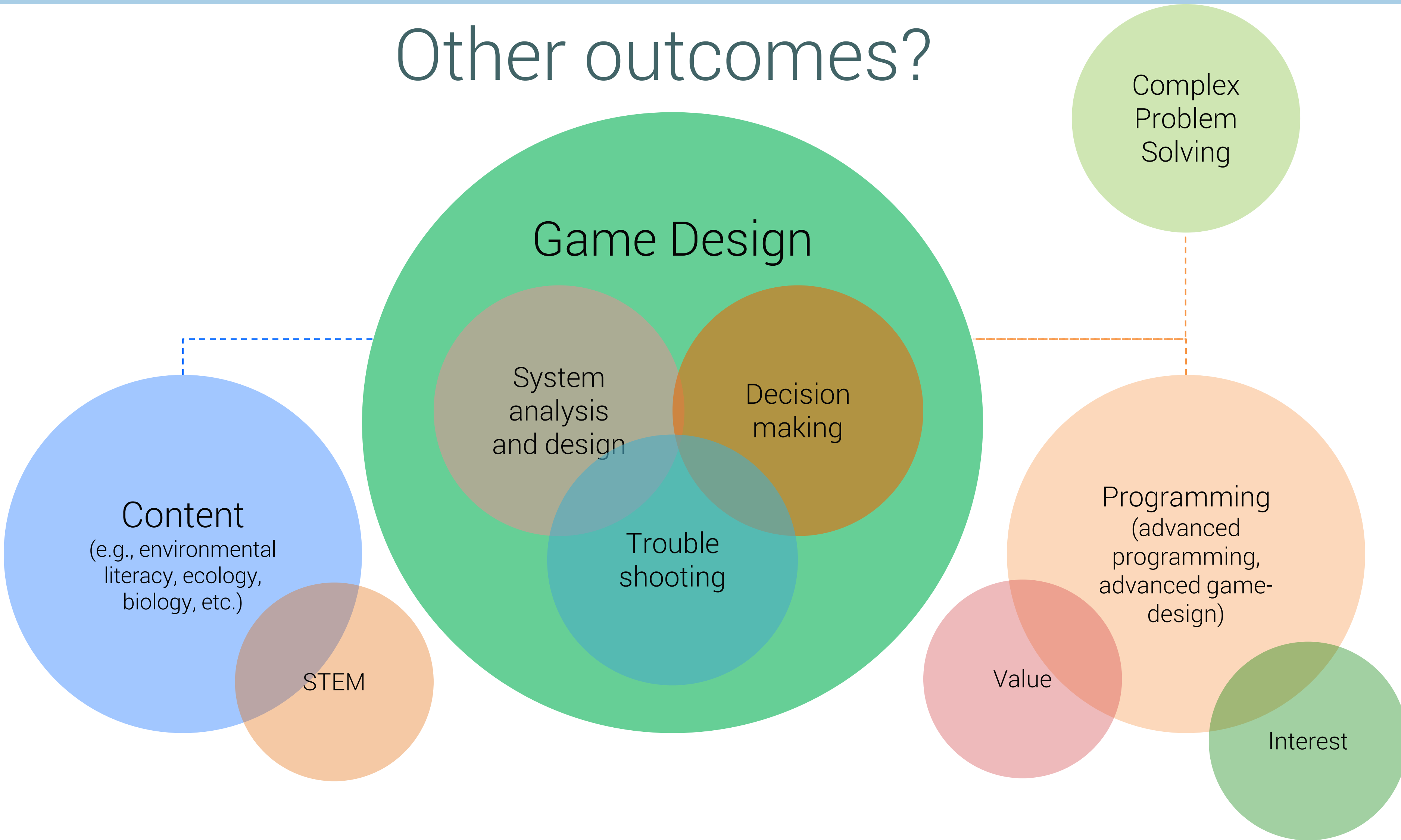
Quasi-experimental research



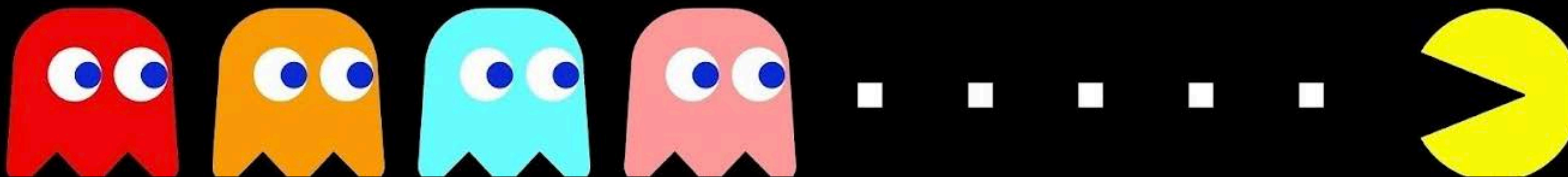
Implications

Future

Other outcomes?




CONSUMERS -> PRODUCERS



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Game-Design and Learning Programs

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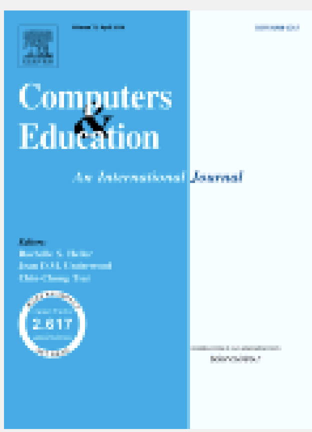
Research

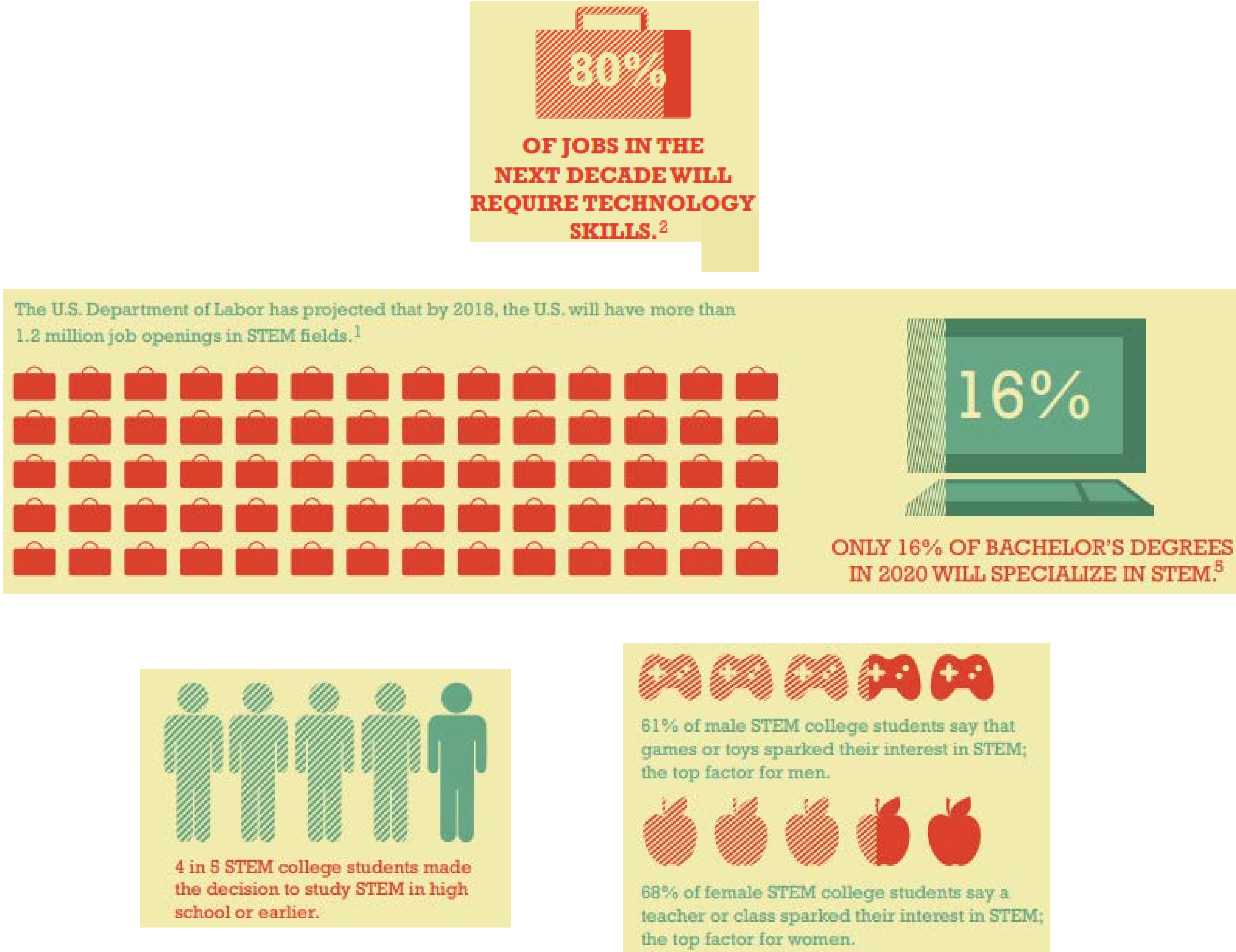
Study #1

Akcaoglu, M. (2104). Learning problem-solving through making games. *Educational Technology Research & Development. 62*(5), 583-600. doi: 10.1007/s11423-014-9347-4

Study #2



Akcaoglu, M. & Koehler, M. J. (2014). Cognitive outcomes from the Game-Design and Learning (GDL) after-school program. *Computers & Education*. doi: 10.1016/j.compedu.2014.02.003



Source: Our Future Demands – Microsoft
http://www.microsoft.com/en-us/news/presskits/citizenship/docs/STEM-IG.pdf

Collapsing two groups into one

- Our analysis indicated that there were not any significant differences between the experimental groups in terms of their initial levels of problem solving, (Wilks's Λ = .866), F (3, 16) = 0.827, p = .498, η^2 =.13;
- as well as the gains they showed after attending the GDL program, (Wilks's Λ = .903), F (3, 16) = 0.571, p = .642, η^2 =.097.
- The two GDL groups, therefore, were combined and treated as one group for the further analyses.

RM-MANOVA - group

- To answer the research question, the gain difference between control and the GDL group students in three problem-solving skills, a repeated-measures multivariate analysis of variance (RM-MANOVA), having two levels of time (pre vs. post) as within subjects factors, and two levels of group (control vs. experimental) as between subjects factor (i.e., mixed-factorial design) was conducted on the dependent variables.
- The multivariate omnibus for time was significant (Wilks's Λ = .616), F (3, 40) = 8.328, p <.001, η^2 =.384; as well as the omnibus for group, (Wilks's Λ = .733), F (3, 40) = 3.0, p =.006, η^2 =.267; and the interaction between time and group, (Wilks's Λ = .505), F (3, 40) = 13.063, p <.001, η^2 =.495.
- The results indicate that compared to the control group, the students in the GDL group showed significantly larger gains in the three problem-solving skills. In fact, the control group did not improve in any of the problem-solving skills.

Follow up T-tests

- The results of the *t*-tests indicated that the GDL group demonstrated significant improvements in all three problem-solving skills
  - (system analysis and design, $t(19) = 4.700$, $p < .001$;
  - decision-making, $t(19) = 4.694$, $p < .001$;
  - troubleshooting, $t(19) = 3.853$, $p = .001$).
- All the effect sizes were large according to Cohen's criteria for effect size interpretation (1988):
  - system analysis and design, $d = 1.062$;
  - decision-making, $d = 1.05$;
  - troubleshooting $d = 0.87$.