The Master's in Engineering Student: Does Industry Experience Change the Learner? Elizabeth A. Gross, Diane Peters, Kettering University, Shanna R. Daly, University of Michigan

Abstract

This research is part of a multi-phase National Science Foundation grant to investigate these aspects of graduate engineering education:

- Is knowledge construction different for Direct Pathway students and Returners? If so, how?
- Do Returners and Direct Pathway students construct new knowledge differently?
- How do Returners handle forgotten knowledge?
- Is there a difference in Returners' and Direct Pathway students' mental models?

Definitions

Direct Pathway students went into their master's program directly or <5 years after undergraduate work.

Returner students had a 5-or-more year gap between their undergraduate degree and graduate enrollment.

Preliminary Questions

- Does work experience influence engineering selfefficacy?
- Is software self-efficacy the same for returners and direct pathway students?

	Participants
Direct Pathway	211
Returner	89
Median Age	25

Methods

- Phase One: comprehensive, anonymized survey and analysis (data was collected over a 4-month span).
- Survey distributed to 330 domestic master's in engineering students throughout the country.
 - Attempted to have equal numbers of Direct Pathway and Returner students
 - Students were all US citizens or permanent residents in the US

Results



Perceived self-efficacy in engineering skills

in a project. best for your project. alternatives.

- 2. Apply an appropriate engineering technique or tool to accomplish a task.
- 1. Apply your engineering knowledge and skills to solve a real-world problem.

- 18. Identify your professional responsibilities within a large engineering project.
- 17. Identify an ethical dilemma when it occurs
- 16. Work with others to establish project objectives when different project tasks must be
- 15. Use technical literature or other information sources to fill a gap in your knowledge. 14. Identify and plan for risks in an engineering
- 13. Prepare a sketch of a design concept that is understood by your colleagues.
- 12. Analyze the tradeoffs between alternative design approaches and select the one that is
- 11. Apply technical, social, and environmental criteria to guide tradeoffs between design
- 10. Interpret a formal technical drawing in your engineering discipline.
- 9. Use mathematics to describe and solve engineering problems.
- 8. Make assumptions that successfully simplify a complex problem to make it easier to work
- 7. Identify the safety concerns that pertain to a project that you are working on.
- 6. Synthesize information to reach conclusions that are supported by data and needs.
- 5. Use your technical knowledge to participate in a design discussion.
- 4. Use your technical knowledge to participate in a design discussion.
- 3. Review your team's strengths and weaknesses and tell others where the team might need help.

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	(D=Direct Pathway R=Returner)	DP
		Programming Tools

Returner self-efficacy was higher in the following engineering skills:

- Analyze the tradeoffs between alternative design approaches and select the one that is best for your project. Identify the safety concerns that pertain to a project that
- you are working on.
- Synthesize information to reach conclusions that are supported by data and needs.

experiences were more varied.

- We're still looking at the data from the recently completed survey In preparation: face-to-face interviews to further explore mental models, along with tools such as
- Concept maps and concept inventories
- Other ways to parse knowledge construction in learners

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Research Findings

Software self-efficacy was consistent for both groups, but we did see a greater range of responses for Returners and Direct Pathway students, perhaps because Returners'

Future Research

