

Reinforcement of Correct Answers with Points and Money Raised Stage of Performance in Traditional Non-Literates

Dristi Adhikari, Colby-Sawyer College, dristiadhikary@gmail.com

Michael Lamport Commons, Harvard Medical School, commons@tiac.net

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Introduction

- Several different methods could be used to promote stage transition
- One method investigated is to support and help the learner through the actual problem solving process (Commons & Davidson, 2015)
 - Using this method, a fellow team member can try to prompt or guide the correct response (Kitchener & Fischer, 1990)
- Commons & Goodheart (2008) suggested placing individuals on teams
 - Have participants work at separate tasks towards a group goal
 - It is significantly effective in successful individual performance (Johnson, Maruyama, Johnson, Nelson & Skon, 1981)
- Commons & Davidson (2015) recommended reinforcement of correct responses
 - The reinforcement of correct responses on frequent task trials have significant positive effect on the achievement of performance
 - This even holds true when transfer skill is between non-relevant and unfamiliar tasks

In the current study

- Nonliterate Nepalese adults were given two stage-based isolation-of-variables instruments:
 - The Thatched Roof problem
 - Laundry problem
- These instruments are derived from Inhelder and Piaget's (1958) pendulum problem
- The Thatched roof problem was very similar to the Laundry problem, only differing in content
 - The Thatched roof task was used as the training instrument
 - The Laundry task was used as the transfer task instrument
- The participants practiced on the Thatched roof problem instrument
- With the transfer task instrument, Laundry, correct answers were reinforced with money and points

Thatched Roof Problem Instrument

- Thatched roof was used as the training instrument
- The task was based on building a thatched roof in six different ways
- The participants were told the roof would either be strong or weak based on the following multiple variables:
 - Concrete Roof, Slate Roof
 - Yellow Hay, Green Hay
 - Tin Sheet, Plastic Sheet
 - Thick Twine with Wooden Frame, Thick Twine
- Participants were asked to identify a single causal variable that formed the result of either strong or weak roof

Thatched Roof Problem Instrument

There are six ways a roof can be built. Sometimes it will be Strong after being built and sometimes it will be Weak

Concrete Roof	Thick twine	Tin Sheet	Yellow Hay	→	Weak
Slate Roof	Thick twine + Wooden Frame	Plastic Sheet	Green Hay	→	Strong
Concrete Roof	Thick twine	Plastic Sheet	Green Hay	→	Weak
Slate Roof	Thick twine	Plastic Sheet	Yellow Hay	→	Weak
Concrete Roof	Thick twine + Wooden Frame	Tin Sheet	Green Hay	→	Strong
Slate Roof	Thick twine + Wooden Frame	Tin Sheet	Yellow Hay	→	Strong

Thatched Roof Problem Instrument

Look back at the examples. After being built, will the roof be Strong or Weak?

Slated Roof	Thick twine	Tin Sheet	Green Hay	Strong	Weak
Concrete Roof	Thick twine + Wooden Frame	Tin Sheet	Yellow Hay	Strong	Weak
Concrete Roof	Thick twine	Plastic Sheet	Yellow Hay	Strong	Weak
Slated Roof	Thick twine + Wooden Frame	Tin Sheet	Green Hay	Strong	Weak
Slated Roof	Thick twine	Tin Sheet	Yellow Hay	Strong	Weak
Slated Roof	Thick twine	Plastic Sheet	Green Hay	Strong	Weak
Concrete Roof	Thick twine + Wooden Frame	Plastic Sheet	Green Hay	Strong	Weak
Concrete Roof	Thick twine	Tin Sheet	Green Hay	Strong	Weak
Slated Roof	Thick twine + Wooden Frame	Plastic Sheet	Yellow Hay	Strong	Weak
Concrete Roof	Thick twine + Wooden Frame	Plastic Sheet	Yellow Hay	Strong	Weak

Laundry Problem Instrument

- Laundry was used as the transfer instrument
- The task was based on cleaning a stained piece of cloth in six different ways
- The participants were told the stained piece of cloth would either be clean or dirty based on the following multiple variables:
 - Brand A Bleach, Brand B Bleach
 - Pink Booster, White Booster
 - Hot Water, Cold Water
 - Powdered Soap, Liquid Soap
- Participants were asked to identify a single casual variable that formed the result of either clean or dirty cloth

Laundry Problem Instrument

Example of the Laundry Problem (1977)

A cloth was stained with red lipstick. There are six ways it can be washed. Sometimes it will be clean after being washed and sometimes it will be dirty.

Brand A Bleach	Powdered Soap	Blue Booster	Cold Water	→	Dirty
Brand B Bleach	Liquid Soap	Pink Booster	Hot Water	→	Clean
Brand A Bleach	Powdered Soap	Pink Booster	Hot Water	→	Dirty
Brand B Bleach	Powdered Soap	Pink Booster	Cold Water	→	Dirty
Brand A Bleach	Liquid Soap	Blue Booster	Hot Water	→	Clean
Brand B Bleach	Liquid Soap	Blue Booster	Cold Water	→	Clean

Laundry Problem Instrument

Six sample test tasks of the possible ten of the Laundry Problem

Look back at the examples. After being washed, will the cloth be clean or dirty?

Brand B Bleach	Powdered Soap	Blue Booster	Hot Water	→	-
Brand A Bleach	Liquid Soap	Pink Booster	Cold Water	→	Clean or Dirty?
Brand A Bleach	Powdered Soap	Blue Booster	Cold Water	→	Clean or Dirty?
Brand B Bleach	Powdered Soap	Pink Booster	Hot Water	→	Clean or Dirty?
Brand B Bleach	Liquid Soap	Pink Booster	Hot Water	→	Clean or Dirty?
Brand A Bleach	Liquid Soap	Blue Booster	Cold Water	→	Clean or Dirty?

Participants

- Thirty three non-literate residents (20 females and 13 males) from two rural villages in eastern Nepal participated
- Their ages ranged from 17-78 years
 - M age = 38.36 years, SD = 17.16

Procedure

- The training instrument, *the Thatched Roof*, was administered individually
 - The participants were not reinforced for correct answers
- The participants advanced to higher stages only after answering three questions correctly in a row
 - There was no time limit
 - For e.g.: If a participant answered three questions correctly in a row for Primary stage 8
 - They would advance to Concrete Stage 9
- The participants would be presented from task one stage lower if only two questions were answered correctly in a row
 - For e.g.: If a participant did not get three consecutive corrects for Formal Stage 1
 - They would be moved down a stage to Abstract Stage 10
 - They would have to answer three consecutive Abstract Stage 10 tasks correctly before moving to Formal Stage 11 again
- Feedback on how to identify casual variables were given at the higher stages
 - Systematic Stage 12 and Meta Systematic Stage 13
- The stage at which participants got stuck and could not advance any further was recorded *pretest stage*

Procedure Continued

- Transfer task, the Laundry instrument, was operated in a group
- The decision rule of advancing was very similar to the training instrument
- Each correct answer was reinforced with money and points
 - Correct answers at Primary Stage 8 and Concrete Stage 9 were reinforced with 2 Nepalese Rupees (\$0.2)
 - Correct answers at Abstract Stage 10, Formal stage 11, Systematic Stage 12 and Metasystematic Stage 13 were reinforced with 3 Nepalese Rupees (\$0.3)
 - The point that each individual participant received was counted towards group total
 - The winning group won an additional bonus sum
- The highest stage at which participants got stuck and could not advance any further despite reinforcing each trials was recorded as *posttest stage*

Results

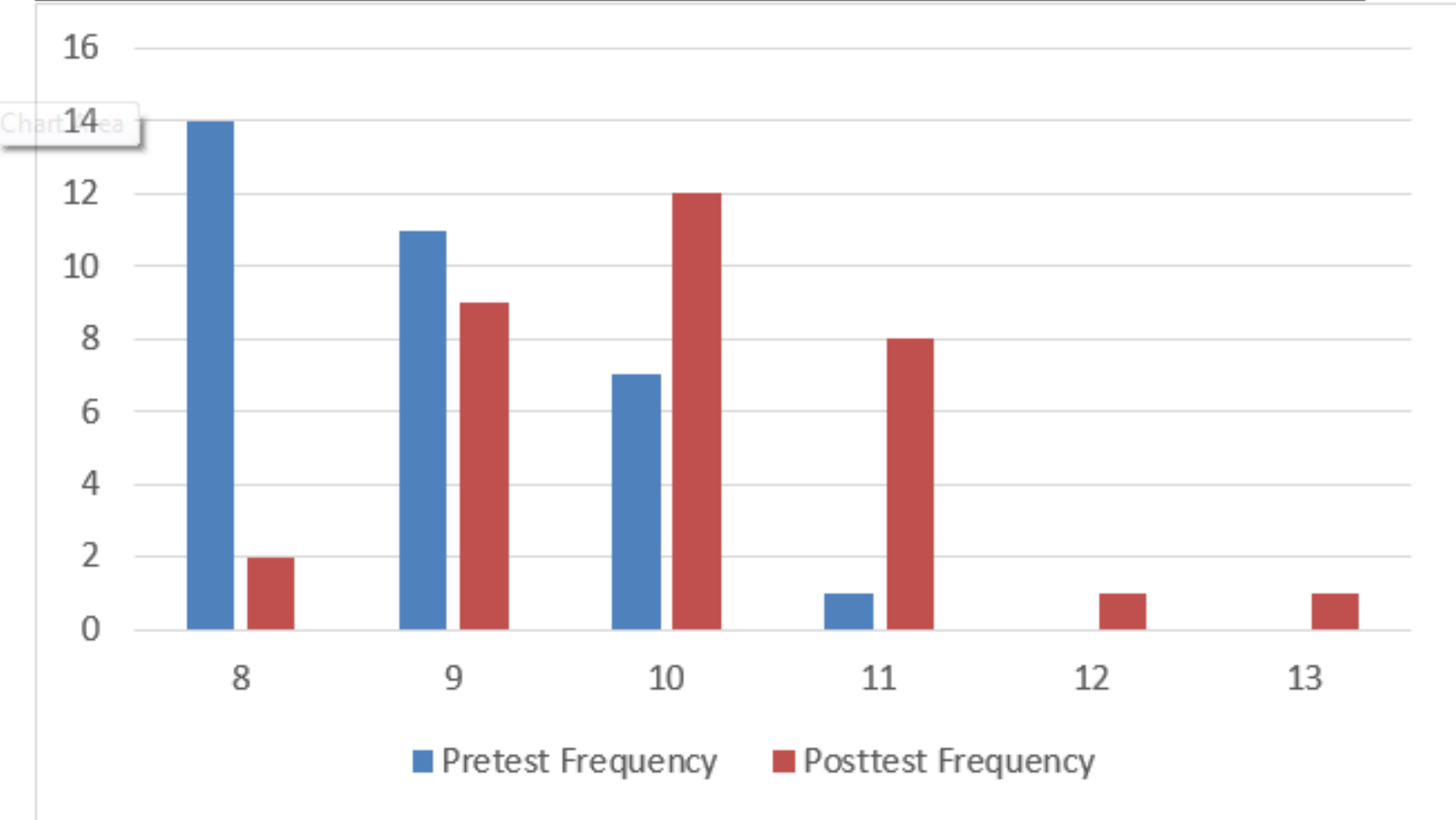
- The mean stage increased from $M = 8.85$ ($SD = 0.86$) to $M = 10.00$ ($SD = 1.07$)
 - $t(32) = 7.60, p = .000$
 - Cohen's $d = 1.18$
- Individuals' posttest scores were predicted by their pretest score
 - Posttest scores were compared to pretest scores by running a simple linear regression
 - The pretest and posttest correlated with an $r = .613, p = 000$.

Results Continued

Pretest and Posttest frequency for the stages

Stage	Pretest frequency	posttest frequency
8	14	2
9	11	9
10	7	12
11	1	8
12	0	1
13	0	1

Results Contd.



Discussion

- Reinforcement of correct answers and being on team increased stage of the participants at least by one
 - Participants who performed at the Concrete Stage 10 in the pretest were likely to perform at the Formal Stage 11 in the posttest
- Performance observed in this study was achieved because of the support provided in the form of reinforced correct answers (money and points) and practice (Fischer, Hand & Russell, 1984)
- This finding recommends that all assessments should include frequent exhibition of very similar items
 - The correct answers should be reinforced

Future Directions

- Half the participants will be run with laundry task and half with thatched roof
 - Through this we will be able to compare the acquisition slope
 - How long it takes before the acquisition starts to take place?
- If the participants do not improve by the third or fourth trial, larger amount of money will be provided that is
 - After the rest of the participants have completed the study in that particular village

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