Algorithmic Problem Solving and Novel Associations

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Challenging Tasks

Require competence in:

- reaching insight
- employing problem solving techniques
- combining algorithmic schemes

One More Aspect

Creativity

Creativity

Elements defined by Math Educators
(e.g., Silver 1997)

- fluency
- flexibility
- novelty

Creativity in Algorithm Design

Fluency

- in invoking relevant algorithmic schemes

Flexibility

- in adapting schemes to the task at hand

Novelty

- in employing schemes in unfamiliar ways

Algorithmic Tasks

Given an undirected graph G:

- tell if has a cycle

- tell if has a cycle of an odd length

- tell if has a cycle of an even length

A Creative Example

Given an undirected graph G, in which each node is of degree 3 or more

tell if has a cycle of length that is not a multiple of 3; if so – display it

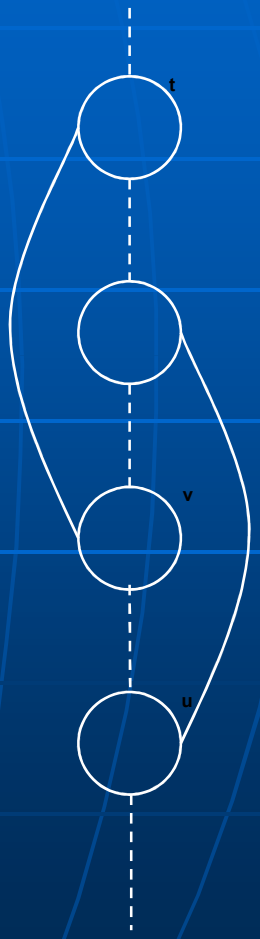
Fluency and Flexibility

- graph search algorithms: DFS, BFS
- utilization of back-edges in DFS
- utilization of cross-edges in BFS

Unsuccessful Attempts

Examine

all the DFS back-edges



Novel Association

Examine

very specific back-edges

Undesired Student Tendencies

- Sole operational perspective
- Hastiness, lack of rigor
- Limited fluency
- Limited flexibility
- Absence of novelty

Novel Associations

Recognition of unfamiliar links between:

The task characteristics and

Suitable algorithmic schemes

A relevant parameter:

the “amount of unfamiliarity”