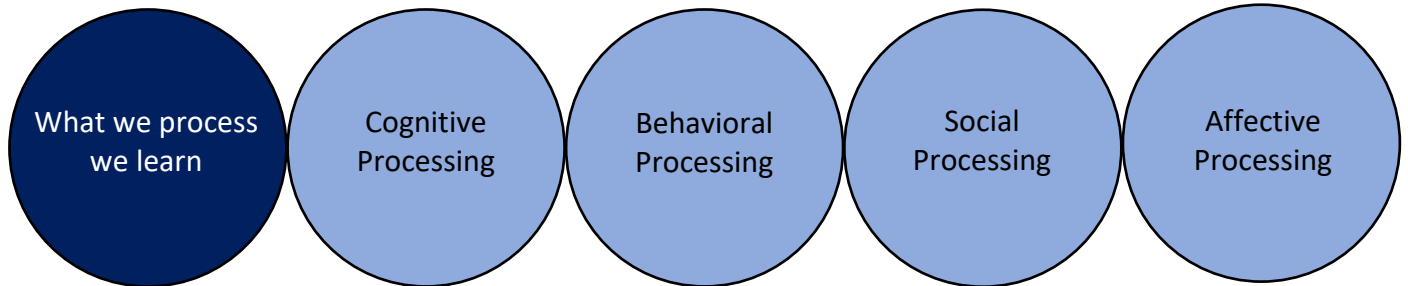


Integrating Learning & Experience in STEM

Fostering Deep and Flexible Learning

Peter Doolittle | 2020 STEM Teaching and Learning Workshop
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 Director, School of Education | February 21, 2020
 Virginia Tech, Blacksburg, Virginia | Coral Gables, Florida

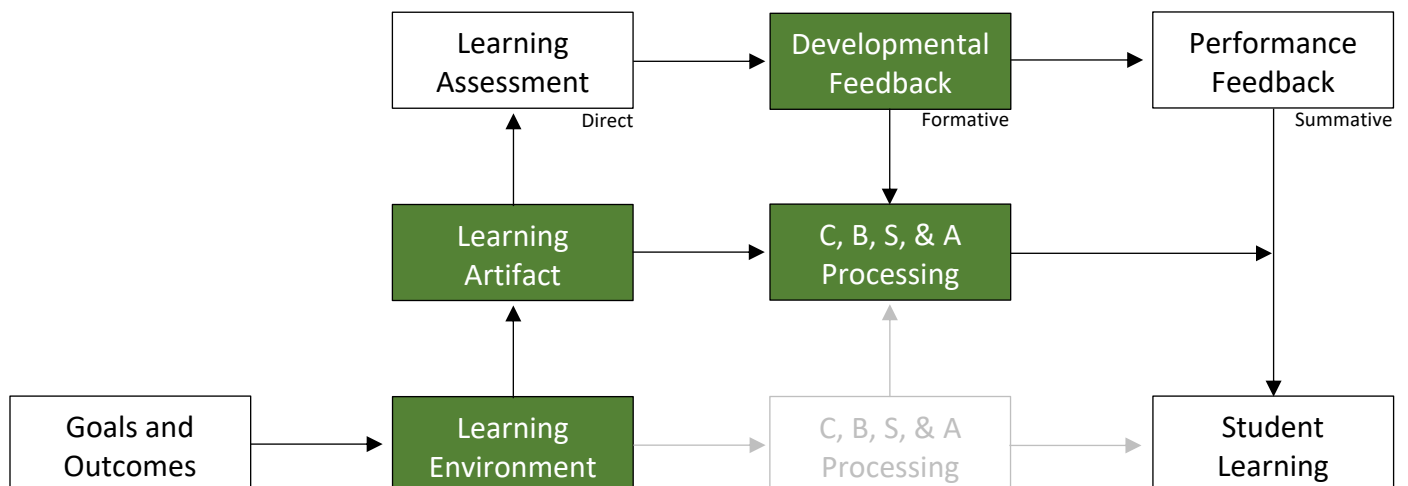
Deep and Flexible Learning



6 Principles of Deep and Flexible Learning

1. Learning through **practice at retrieval**
2. Learning through **varied tasks and purposes**.
3. Learning at the **principle level**.
4. Learning **awareness and control** (metacognition).
5. Learning in response to **developmental practice**.
6. Learning embedded in **prior knowledge and experience**.

Instructional Design with Embedded Assessment



The Seven C's of (Internal) Motivation

Challenge

Students are motivated to engage in tasks that they perceive as difficult, but attainable, with effort and persistence. If students become bored or frustrated they may choose not to engage. Attainment of challenging tasks conveys that learners are becoming more competent, which raises self-efficacy and perceived control over outcomes, and increases internal motivation.

Choice

Students are motivated to engage in tasks where they believe that they can choose to participate (or not) and have choices regarding how to engage. Allowing student choices in activities and a voice in establishing criteria and processes fosters perceptions of control; however, perceptions of coercion decreases internal motivation and likelihood of engagement.

Control

Students are motivated to engage in tasks where they believe that they have control over their success and failure. Students have an intrinsic need to feel in control of themselves and their environment, as well as their success and failure. A perception of control allows for self-determination, which results in a sense of autonomy and increases intrinsic motivation

Caring (Interest/Value)

Students are motivated to engage in tasks about which they care, have an interest, or value. Students may care about or value a task because it is important to them, useful to them, or enjoyable to them. Caring and value lead to increased effort, persistence, and strategy use in completing the task; however, if the cost of engaging is too high, they may choose not to engage.

Collaboration/Connectedness

Students are motivated to engage in tasks when they feel a part of a group. Collaborative motivation is increased when individuals share a common goal, are working toward a challenging but achievable outcome, have individual responsibilities that allow each member to contribute, and feedback on individual and group progress is provided.

Competence

Students are motivated to engage in tasks in which they have been successful in the past. Students have an intrinsic need to feel competent, to have control and mastery over success. Success at challenging tasks leads to a belief in one's ability to succeed in both general and specific tasks, and results in the pursuit of mastery goals and increased intrinsic motivation.

Curiosity

Students are motivated to engage in tasks about which they are curious. Presenting students with experiences that are discrepant, relative to their previous experience, or that appear surprising or incongruous increases curiosity. Such discrepancies foster exploration and discovery. As with challenge, moderate discrepancies are more effective than large discrepancies.

CONSTRUCTIVISM AND EDUCATION – EDEP 6224

25-WORD SUMMARIES



Purpose: The purpose of this assignment is to provide students with the opportunity to reflect on each reading and to generate short, meaningful summaries. Creating thoughtful summaries requires considerable cognitive organization and reflection, and results in significant meaning making.



Rationale: The processes of reflection, knowledge organization, and the self-generation of meaning have proved to be quite effective in fostering meaningful learning (see Baddeley, 1999, and Haberlandt, 1999). Writing accurate very short summaries (e.g., 25-word summaries) requires you to reflect on the chapter read and abstract from the chapter the essential message or theme that characterize the author’s purpose in writing. This abstraction process can generate significant understanding and organization of the material.



Format: Each summary should be a clear, concise, and coherently organized statement of the main ideas in the reading. Specifically, each summary must be *25 words or less* and should focus on the essential ideas of the reading. It is important to remember that the task is to represent the *author’s* essential ideas (why was the article/chapter/book written?). Whether or not you agree with the essential ideas is a different issue. Ultimately, in expressing the author’s essential ideas, you will demonstrate your own understanding of the material in the reading.

The following guidelines/recommendations for completing 25-word summaries were extracted from interviews with students near the end of previous classes where 25-word summaries were completed.

- Provide time to read, annotate, write, and rewrite.
- Provide time between reading/annotating and writing.
- Develop a strategy for annotating.
- Look for important details while reading.
- Read the entire article before committing to main ideas.
- Every word counts – write and rewrite.
- Writing summaries develops over time.



Grading: Each 25-Word Summary is worth 100 points and will be assessed using the following criteria:

- | | |
|--|--------|
| 1. Structural Format | 20 pts |
| a. Is the summary 25 words or less? | |
| b. Is the summary a coherent sentence, or sentences? | |
| c. Does the summary avoid a simple listing of concepts, terms, or themes? | |
| 2. Clarity of Thought and Expression | 40 pts |
| a. Are the ideas expressed well, well thought out, and integrated? | |
| c. Does every word in the summary have a meaningful purpose? | |
| d. Are correct grammar and syntax used? | |
| 3. Delineation of Core Message | 40 pts |
| a. Does the summary accurately reflect the reading’s essential message(s)? | |
| b. Does the summary accurately integrate more than one essential message? | |





VII. Pragmatics:

1. Be thoughtful Think before you write.
2. Be concise There is much to include in a 25-word summary.
3. Be accurate Reflect on the author's main ideas, themes, and concepts.



VIII. References:

Baddeley, A. D. (1999). *Essentials of human memory*. East Sussex, UK: Taylor & Francis Group.
Haberlandt, K. (1999). *Human memory: Exploration and application*. Boston: Allyn and Bacon.



Honor Code: The Graduate Honor Code will be strictly enforced on this assignment. Any suspected violations of the Honor Code will be promptly reported to the Honor System. Students are allowed to discuss with other students the nature of this assignment, their understanding of their own observations, and the general concepts he or she will be discussing. Student should not, however, share their completed responses, before submission, with other students in the class. Beyond that, the Honor Code general principles of cheating, plagiarism, falsification, and academic sabotage are still applicable (see <http://graduateschool.vt.edu/>).

