3250: Instructional Strategies
Instructional Strategies Report

Instruct

Categorizing Knowledge: Enhancing Student Engagement through Classifications

Author: Yuri Tricys
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Introduction

In “Student Engagement Techniques: A Handbook for College Faculty”, Barkley & Major outline 50 student engagement techniques, known as SETs, which ‘promote active learning by requiring students to participate in activities’ (Barkley & Major, 2020, pg 141). The focal point for this paper is the 8th SET in their list of sets, called ‘classify’.

Barkley & Major describe ‘classify’ as follows:

> *"Classify" helps students achieve two common learning goals. First, it helps students understand how a discipline or subject's information is organized, but it does so in a way that requires students to infer the principles, thus learning the system at a deeper level than if they were simply told about the system. Second, it helps students learn to identify component parts and determine how the parts relate to the whole, essential steps in analysis.*
>
> *(Barkely & Major, 2020, page 183)*

Barkley and Major go on to outline examples of implementing the classify engagement technique both in an in-person environment and in an online environment.

Their examples emphasize identifying categories and the principles that belong to them and then challenging students to match category to principle in interesting and possibly interactive ways.

The intuition is clearly that learning a principle along with its parent classification helps students structure networks of neurons into neurological schematics, which is how our brains achieve learning.

Classifications And Teaching Web Development

In my personal experience learning JavaScript, which is a fundamental language in the field of web development, understanding higher level classifications in the language was incredibly helpful in not only piecing together how the language works, but also how it works in relation to other languages. Moreover, learning the classifications enabled me to communicate about the language with other programmers more effectively.

What I’ve found in those communications, however, is that not all programmers know the higher level classifications. I believe this is because instructors don’t emphasize classifications, but instead focus more on direct problem solving and techniques for creating products. There is a lot of material to learn in web development, and I understand why instructors pass on teaching specifically the classifications, but I believe it shouldn’t take a lot of time to teach them, and learning them will empower students on their way toward mastery in their field.

The following list is an intermediary level JavaScript example of what I mean when I say ‘classifications’. Think of classifications as the headings of sections in a text book or curriculum (which is where the following classifications came from).

Classifications

- Syntax, naming conventions, literals
- Constants, variables, scope
- Data types and the template literal

- Arithmatic operators and expressions
- Window object
- Functions
- Conditional logic
- Loops
- Events
- Arrays
- Objects
- This
- Dates
- ECMAScript editions
- ES6 features
- Spread operator
- Arrow functions
- Enhanced object literals
- Object and array destructuring
- Prototypal inheritance
- Classes
- Modules

(Tricys, 2023)

To the extent a student can write out the classifications from memory, he or she should be able to understand and apply the principles and techniques within each classification more quickly and more effectively.

There are certainly many exciting and interactive ways to teach classifications, and from a motivational perspective those activities are definitely worth considering. However, all activities come with trade-offs. Too much time spent learning classifications, might take away from time spent learning the intricacies of each topic.

One technique teachers could use, which is subtle and not overly time consuming is to add classification problems as a supplement to traditional problems in tests and problem sets. Here is an example of adding classifications to problems, using problems similar to those I wrote for the web development course Correlation One delivered to Amazon employees.

1. Test your knowledge

Declaration & Assignment Syntax - True or False

```Javascript
1. JavaScript intepreters always add semi-colons when programmers forget them. [F]
2. If you declare multiple variables in one line adjacently, you should delimit them with semi-colons [F]
3. Use the strict equality operator '===' not the equal operator '=' to assign variables.[F]
4. 'Var a = 2;' is the correct way to declare and assign the hoisted variable identified as 'a' in JavaScript. [T]
```

(Tricys, 2022)

2. Classification

In what category does the previous question belong?

```Javascript
1. Prototypal inheritance [No]
2. Conditional logic [No]
```

```
3. Syntax, naming conventions, & literals [Yes]
4. Arithmatic operators and expressions [No]
```

The first problem above is a standard true or false question. The student needs to know that not all interpreters are created equally, some few interpreters actually fail to add semi-colons when coders forget them. Also, the question highlights that chained variable declarations are not delimited with semi-colons (they are delimited with commas), and that the strict equality operator is not an assignment operator. Finally the student should know the correct syntax to use 'Var' in a variable declaration and hoist it (technically to function scope).

The second problem prompts the student to classify the knowledge within the correct classification. Following up web development problems with their web development classifications is an easy and quick way to teach web development students the classifications, which will aid them in organizing their knowledge so that they may learn it and recall it more quickly.

Advantages And Disadvantages of Teaching Classifications

A group of researchers in 2019 published a paper in the official journal of the Society for Neuroscience that demonstrated how classification tasks dynamically reshape neural representations in the hippocampus, supporting schematic formation during concept acquisition.

The hippocampus is involved in binding information together, which facilitates retrieval and, by extension, influences how humans structure and relate different pieces of information.

The researcher saw that "as learning goals changed, hippocampal representations reorganized to reflect the diagnostic information important for the current task..." (Zeithamova et al., 2019), which suggests the "hippocampus plays a role in building flexible concept knowledge" (Zeithamova et al., 2019).

Thus one advantage of using classification as a learning technique is that it helps to both build and retrieve flexible concept knowledge, and intuitively enables faster category matching, which means ultimately faster problem solving.

Substitution, described in the field of economics as 'trade-offs' could be a disadvantage of classification activities. Too much time spent classifying concepts and problems will take away from time spent learning their intricacies or new principles, techniques, and languages.

Ultimately however, classification activities should be considered as a beneficial addition to a web development curriculum, since they not only speed up concept integration and retrieval, but also provide a bigger picture of concepts, which can help students in situating themselves within the field, in the same way a map in a mall that says 'you are here' can help shoppers find the goods they want to buy.

The Role of Teachers and Students in Learning Classifications

Classifications can be taught in both humanist, self-learning, environments and more traditional instructive behaviorist environments.

In a **humanist** learning environment, the student is autonomous and self-directed, and takes responsibility for his or her learning. The student is encouraged to explore and discover concepts at his or her own pace. The teacher acts as a facilitator or mentor, providing guidance and support while allowing the student to take ownership of his or her learning.

In a **behaviorist** learning environment, the student is a passive recipient of knowledge, responding to external stimuli and reinforcement. His or her behavior is shaped by the teacher's actions. The teacher is an authority figure who controls the learning environment, presenting information, providing reinforcement (e.g., rewards or punishment), and shaping the student's behavior through conditioning.

Again, in either environment classifications can be taught through careful curriculum design, or other more interactive activities or techniques.

References

Barkley, E. F., & Major, C. H. (2020). Student engagement techniques: A handbook for college faculty (2nd ed.). Wiley Jossey-Bass.

Zeithamova, D., Mack, M. L., Braunlich, K., Davis, T., Seger, C. A., van Kesteren, M. T. R., & Wutz, A. (2019). Brain Mechanisms of Concept Learning. The Journal of neuroscience : the official journal of the Society for Neuroscience, 39(42), 8259–8266. https://doi.org/10.1523/JNEUROSCI.1166-19.2019

Tricys, Y. (2022, October). Introduction to JavaScript day 1, part 2, Syntax, Naming Conventions, and Literals. Correlation One Web Development Course.

AI Disclosure

The ideas, structure, writing, and editing in this paper were performed by the author. Various AI models were used in collecting data, verifying data, and formatting various arguments.

AI models used:

- LLama 4 Maverick
- Claude 3.7 Sonnet
- Qwen 14B
- Llama 3.1 8B
- Mixtral 8x7B