Algorithm, ADT

Metodický koncept k efektivní podpoře klíčových odborných kompetencí s využitím cizího jazyka ATCZ62 - CLIL jako výuková strategie na vysoké škole

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Algorithm

- Exact instructions or procedures to solve the task type
- The theoretical principle of solving the problem (as opposed to precise implementation a particular programming language).
- Properties
  - Finality
  - Generalities
  - Determination
  - Output (Resultativity)
  - Elementarity

Algorithm

- Design methods
  - Top down - Explain the progress of the solution to simpler operations until we reach elementary steps
  - Bottom up - from the elementary steps we create resources that ultimately required to deal with the problem
  - The combination of both – to the Top down approach we will add "a partial step" bottom-up (use the library functions, high-level programming language or system programming ...)

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Algorithm

- Design methods
  - Divide and conquer - divides the problem into sub-tasks (to be independent), which is then solved, often implemented recursively or iteratively
  - Greedy algorithm - solving optimization problems, always chooses a local minimum in an attempt to find a global minimum
  - Dynamic programming - divides the problem into sub-tasks (may be dependent), which is then solved
  - Backtracking - way of solving algorithmic problems based on a search of the state tree, improved brute force search solution, based on depth-first search of possible solutions

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Algorithm

- Types of algorithms
  - Recursive algorithms - use (call) themselves.
  - Probabilistic (probabilistic) algorithms - make some decisions randomly or pseudo-randomly.
  - Parallel algorithms - split a job between multiple computers
  - Genetic algorithms - work on the basis of imitation of biological evolutionary processes
  - Heuristic algorithm - trying to find only some appropriate approximation; It is used in situations where available resources (eg time) are insufficient to use exact algorithms (or if no suitable exact algorithms are known at all).

ADT – Abstract data type

- Data types that are independent of their own implementation
- Goal - Simplify and clarify the program that performs operations with the given data type
- All ADTs can be implemented using basic algorithmic operations (assignment, addition, multiplication, conditional jump, ...)

ADT

- Properties
  - Generality of implementation - Once designed, ADT can be built-in and run smoothly in any program.
  - Exact description - The link between the implementation and the interface must be unambiguous and complete.
  - Simplicity - The user does not have to worry about internal implementation and administration of ADT in memory.
  - Encapsulation - The interface as a closed part, the user knows what ADT does, but not how it does
  - Integrity - The user can not interfere with the internal data structure
  - Modularity
- If ADT is object-oriented programmed, these properties are usually met.

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ADT

- Types of operations
  - Constructor - Creates a new ADT value, constructing a valid internal representation of the value based on the supplied parameters
  - Selector - is used to retrieve values that are components or attributes of a specific value of an abstract data type
  - Modifier - Changes the value of the data type

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