



|            |             |           |               |
|------------|-------------|-----------|---------------|
| Melnikov   | Ryzhkova    | Ivukina   | Barkov        |
| Yury       | Natalya     | Helena    | Fedor         |
| Borisovich | Gennadievna | Sergeevna | Alexandrovich |

## Monitoring of a strategy proficiency as a tool of the pedagogical decision support system

Yekaterinburg, 2019

## Оглавление

|   |           |
|---|-----------|
| <b>1. Strategy of activity</b>          | <b>3</b>  |
| 1.1. Concept of activity goal . . . . . | 20        |
| Algebra of vectors: тест 2 . . . . .    | 36        |
| Algebra of vectors: тест 3 . . . . .    | 37        |
| Algebra of vectors: тест 4 . . . . .    | 38        |
| 1.5. Models of strategy . . . . .       | 39        |
| <b>2. Weighted strategy system</b>      | <b>47</b> |

# 1. Strategy of activity

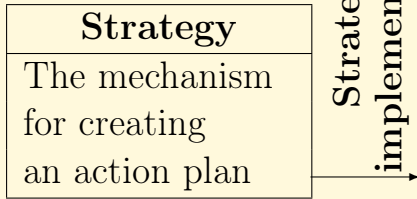
There are many different interpretations of the term “strategy”: plan (generalized or vice versa, detailed), direction, system, and others.

All of these interpretations allow accurate interpretation in the framework of the following scheme.

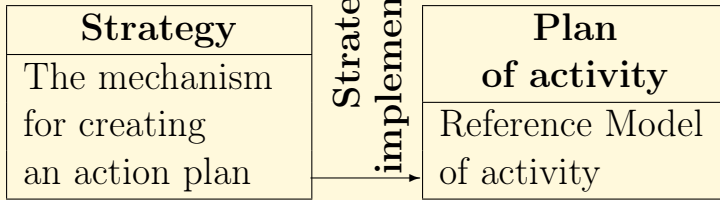
# 1. Strategy of activity

| <b>Strategy</b>                                 |
|---|
| The mechanism<br>for creating<br>an action plan |

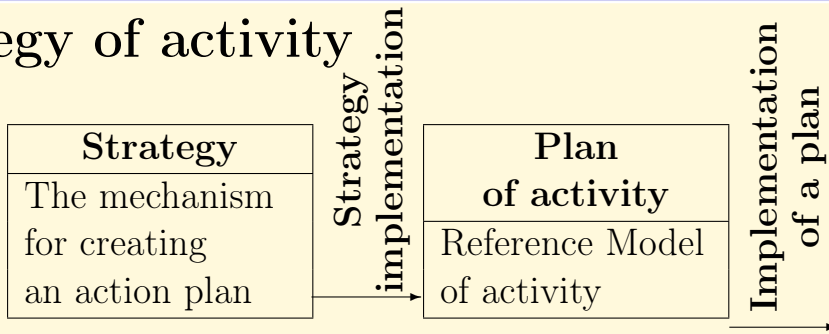
# 1. Strategy of activity



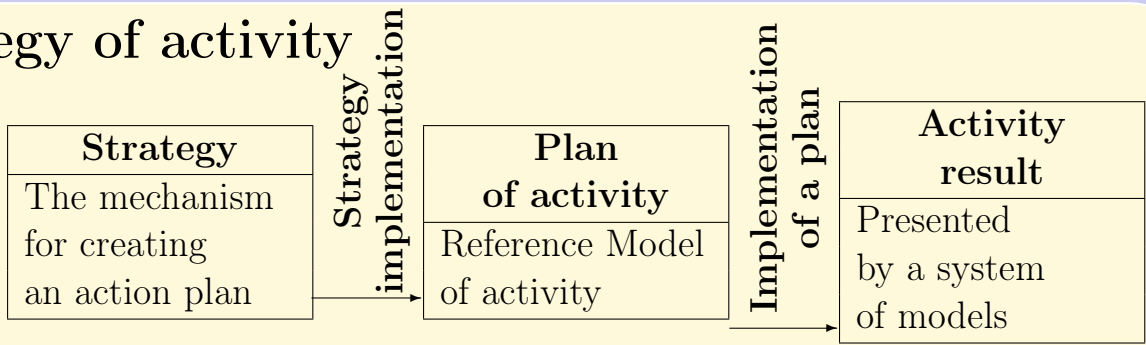
# 1. Strategy of activity



# 1. Strategy of activity

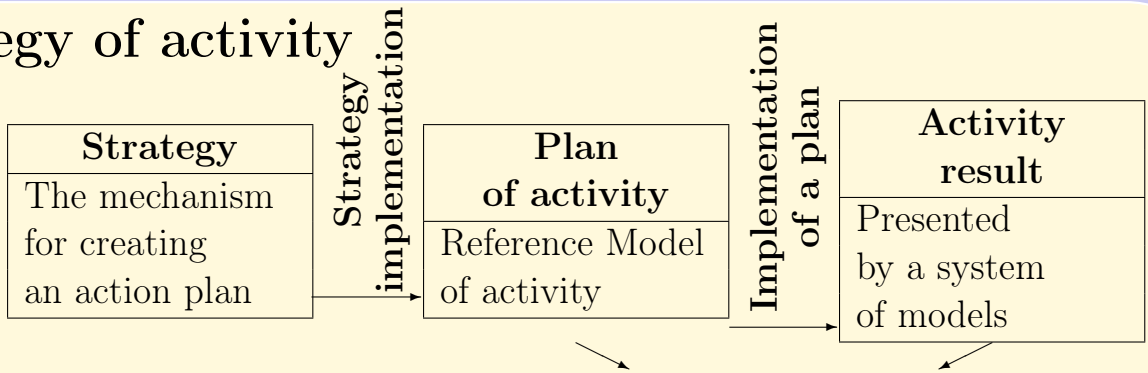


# 1. Strategy of activity

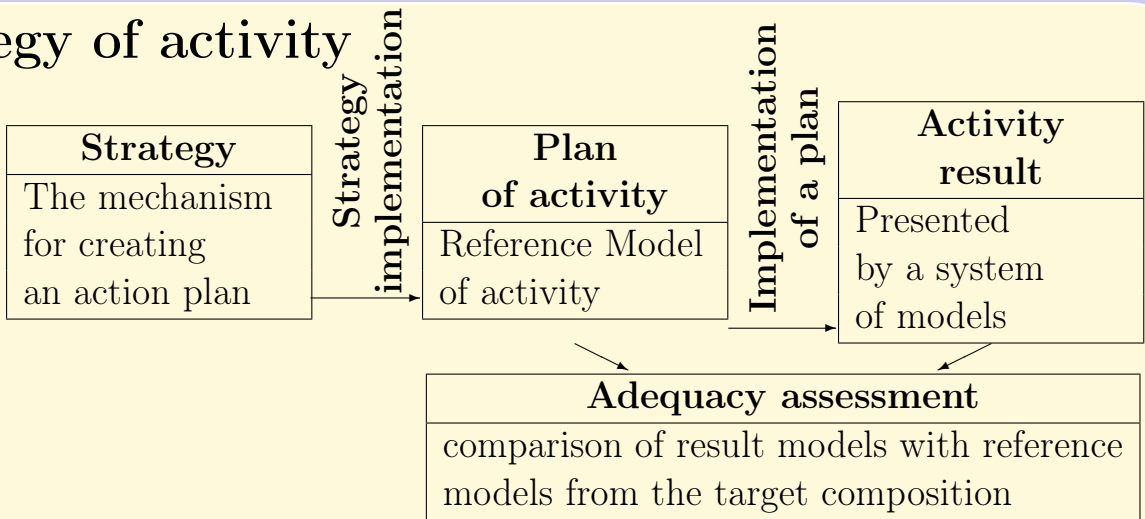




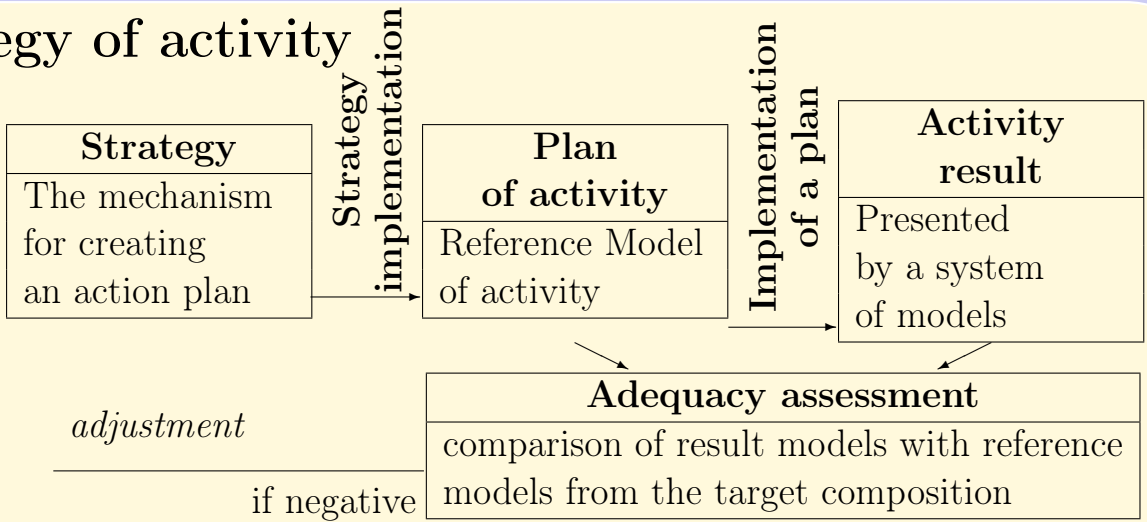
# 1. Strategy of activity



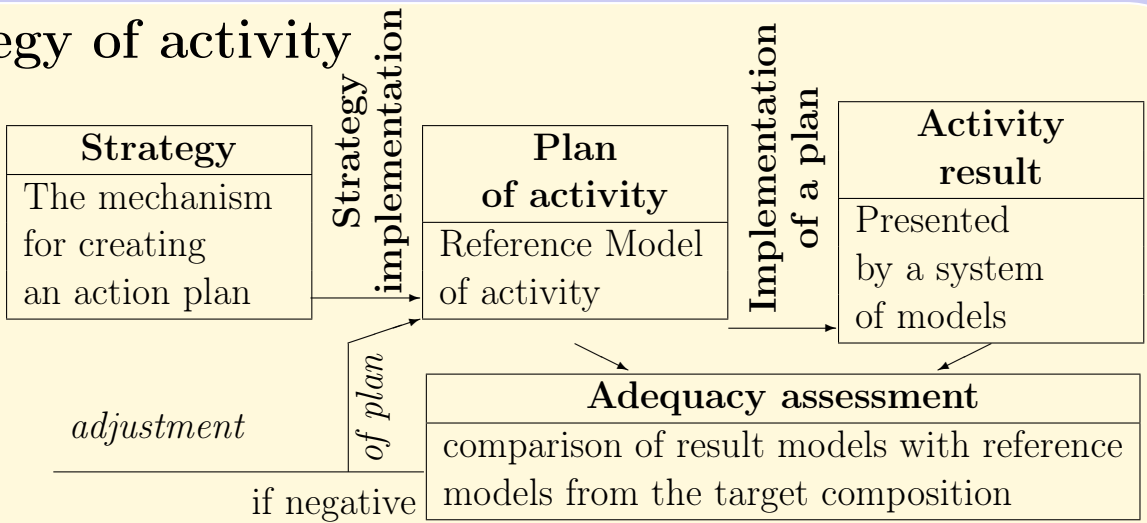
# 1. Strategy of activity



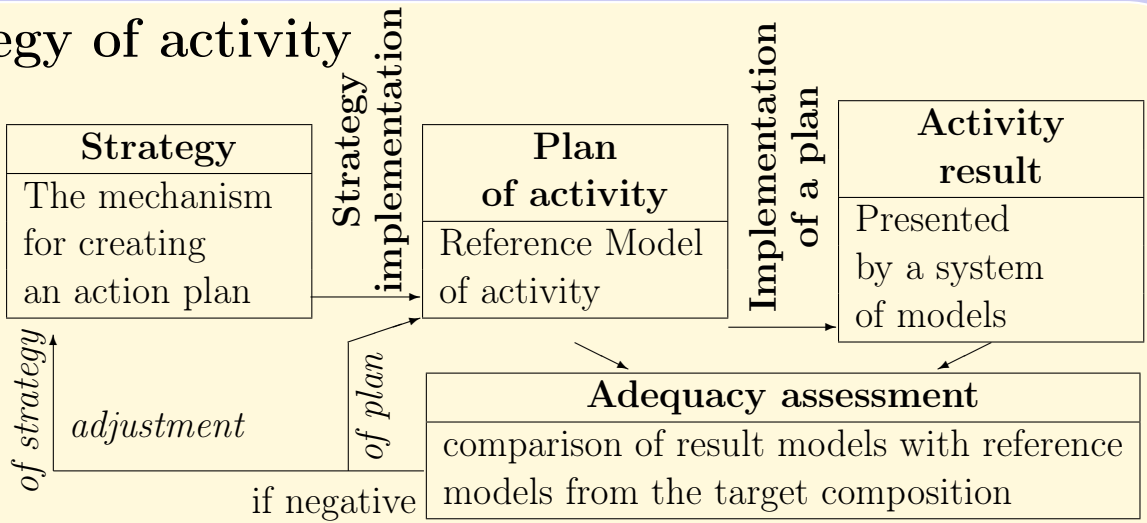
# 1. Strategy of activity



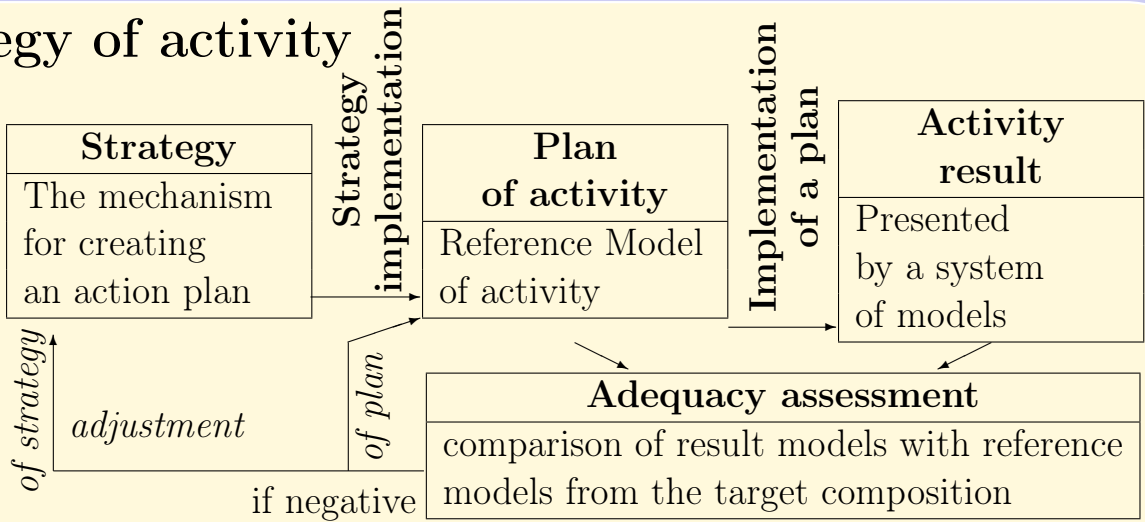
# 1. Strategy of activity



# 1. Strategy of activity

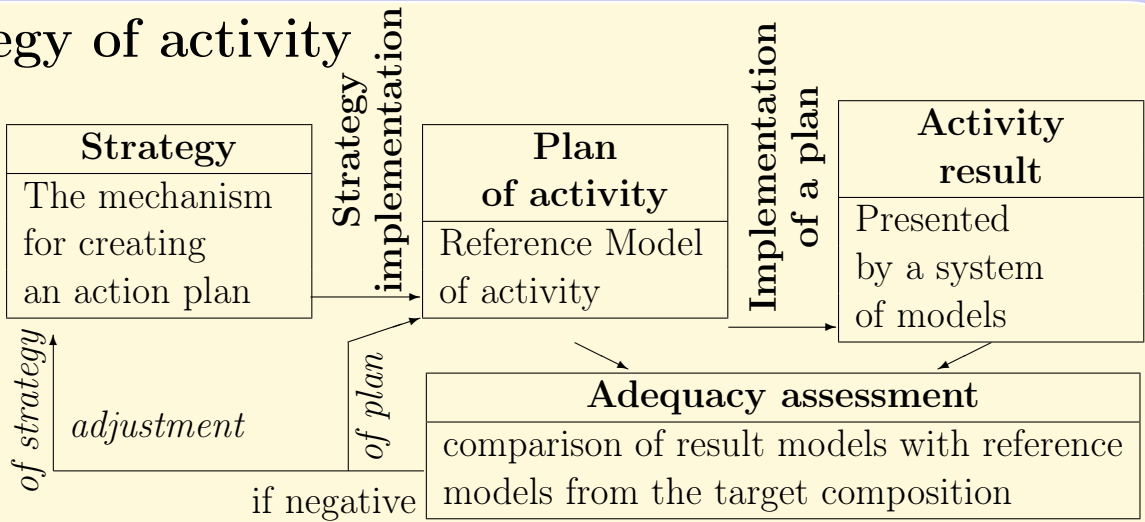


# 1. Strategy of activity



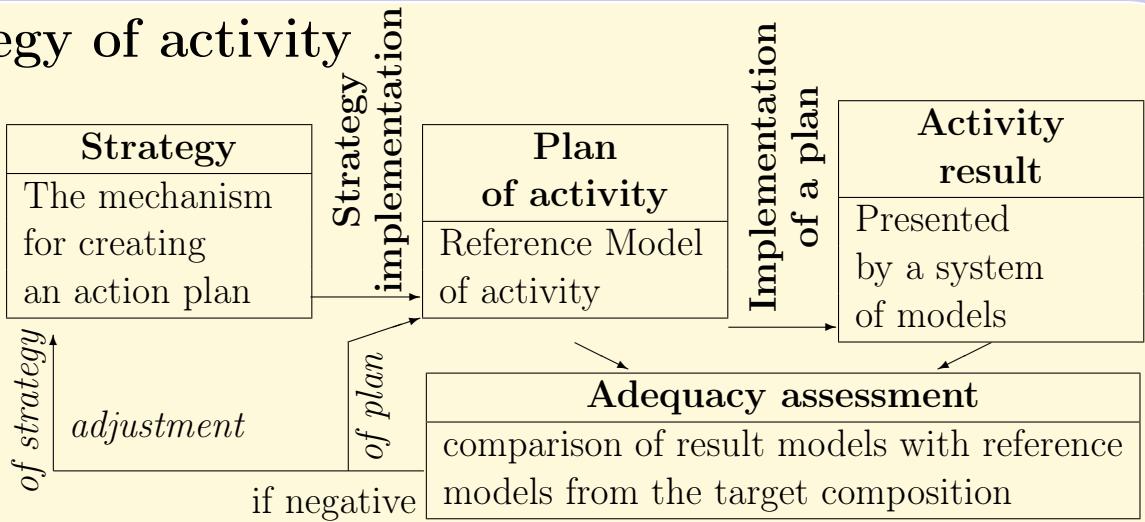
A plan item is perceived both by the developer and the contractor, or as

# 1. Strategy of activity



A plan item is perceived both by the developer and the contractor, or as a link to a known algorithm, or as

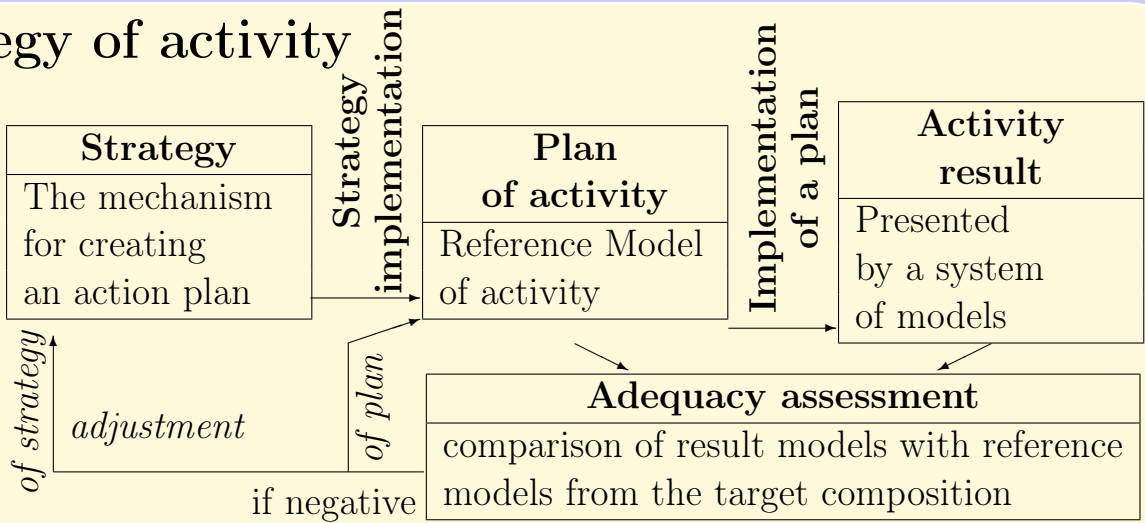
# 1. Strategy of activity



A plan item is perceived both by the developer and the contractor, or as a link to a known algorithm, or as a link to a (local) goal,

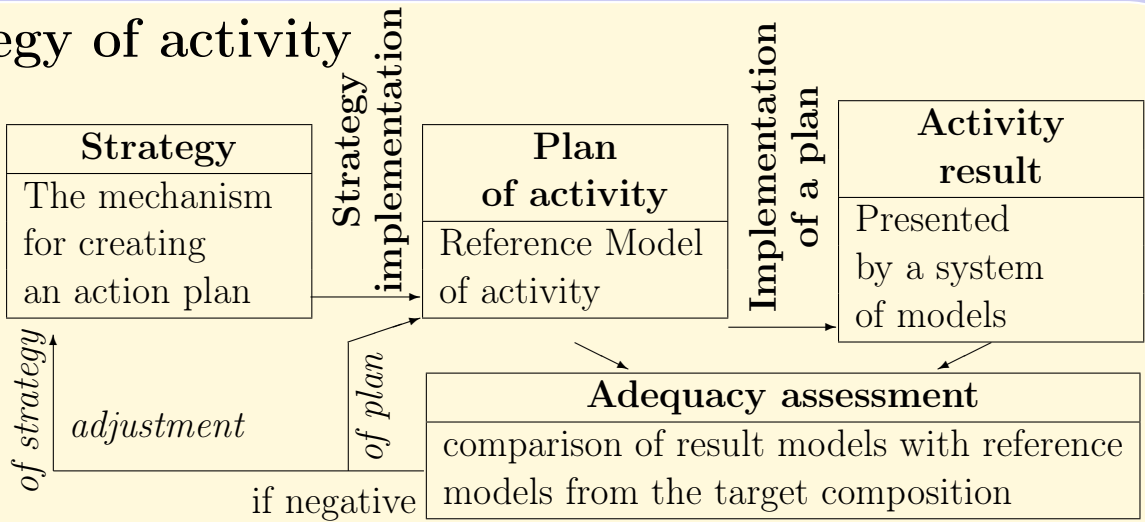


# 1. Strategy of activity



A plan item is perceived both by the developer and the contractor, or as a link to a known algorithm, or as a link to a (local) goal, for which a way to achieve it is not indicated.

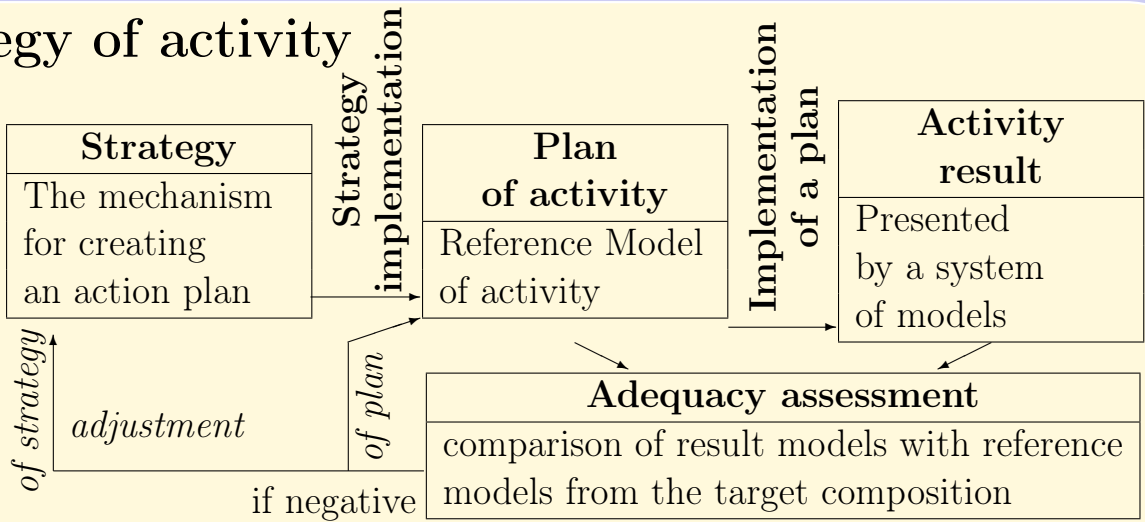
# 1. Strategy of activity



A plan item is perceived both by the developer and the contractor, or as a link to a known algorithm, or as a link to a (local) goal, for which a way to achieve it is not indicated.

The perception of a plan item is subjective.

# 1. Strategy of activity



A plan item is perceived both by the developer and the contractor, or as a link to a known algorithm, or as a link to a (local) goal, for which a way to achieve it is not indicated.

Let's clarify the concept of the goal of activity.

## 1.1. Concept of activity goal

The purpose of the activity is

## 1.1. Concept of activity goal

The purpose of the activity is a system of reference models of the result of the activity.

## 1.1. Concept of activity goal

The purpose of the activity is a system of reference models of the result of the activity.

The goal of “find a triangle” includes such reference models as:

## 1.1. Concept of activity goal

The purpose of the activity is a system of reference models of the result of the activity.

The goal of “find a triangle” includes such reference models as:

- indicating the position of its vertices;

## 1.1. Concept of activity goal

The purpose of the activity is a system of reference models of the result of the activity.

The goal of “find a triangle” includes such reference models as:

- indicating the position of its vertices;
- an indication of the position of its parties;



## 1.1. Concept of activity goal

The purpose of the activity is a system of reference models of the result of the activity.

The goal of “find a triangle” includes such reference models as:

- indicating the position of its vertices;
- an indication of the position of its parties;
- an indication of either the lengths of the three sides, or the lengths of two sides and the magnitude of the angle between them, or the length of the side and the values of the sides adjacent to it;

## 1.1. Concept of activity goal

The purpose of the activity is a system of reference models of the result of the activity.

The goal of “find a triangle” includes such reference models as:

- indicating the position of its vertices;
- an indication of the position of its parties;
- an indication of either the lengths of the three sides, or the lengths of two sides and the magnitude of the angle between them, or the length of the side and the values of the sides adjacent to it;
- representation in the form of intersection of figures;

## 1.1. Concept of activity goal

The purpose of the activity is a system of reference models of the result of the activity.

The goal of “find a triangle” includes such reference models as:

- indicating the position of its vertices;
- an indication of the position of its parties;
- an indication of either the lengths of the three sides, or the lengths of two sides and the magnitude of the angle between them, or the length of the side and the values of the sides adjacent to it;
- representation in the form of intersection of figures;
- task as faces of a polyhedron;

## 1.1. Concept of activity goal

The purpose of the activity is a system of reference models of the result of the activity.

The goal of “find a triangle” includes such reference models as:

- indicating the position of its vertices;
- an indication of the position of its parties;
- an indication of either the lengths of the three sides, or the lengths of two sides and the magnitude of the angle between them, or the length of the side and the values of the sides adjacent to it;
- representation in the form of intersection of figures;
- task as faces of a polyhedron;
- task in the form of a section of a figure by a plane, etc.

## 1.1. Concept of activity goal

The purpose of the activity is a system of reference models of the result of the activity.

The more reference models in the target, the usually easier to find a solution to the problem.

## 1.1. Concept of activity goal

The purpose of the activity is a system of reference models of the result of the activity.

The more reference models in the target, the usually easier to find a solution to the problem.

We have proposed several classifications of reference models as part of the goal.

## 1.1. Concept of activity goal

The purpose of the activity is a system of reference models of the result of the activity.

The more reference models in the target, the usually easier to find a solution to the problem.

We have proposed several classifications of reference models as part of the goal.

For example, according to the level of abstractness:

## 1.1. Concept of activity goal

The purpose of the activity is a system of reference models of the result of the activity.

The more reference models in the target, the usually easier to find a solution to the problem.

We have proposed several classifications of reference models as part of the goal.

For example, according to the level of abstractness:  
the language of the model,



## 1.1. Concept of activity goal

The purpose of the activity is a system of reference models of the result of the activity.

The more reference models in the target, the usually easier to find a solution to the problem.

We have proposed several classifications of reference models as part of the goal.

For example, according to the level of abstractness:  
the language of the model, a specific reference sample,

## 1.1. Concept of activity goal

The purpose of the activity is a system of reference models of the result of the activity.

The more reference models in the target, the usually easier to find a solution to the problem.

We have proposed several classifications of reference models as part of the goal.

For example, according to the level of abstractness:  
the language of the model, a specific reference sample, template.

## 1.1. Concept of activity goal

The purpose of the activity is a system of reference models of the result of the activity.

The more reference models in the target, the usually easier to find a solution to the problem.

*When teaching mathematics as a mathematical and “near-mathematical” activity, it is important to form and control the completeness of assimilation by students of the composition of typical goals.*

# Algebra of vectors: тест 2 (Ixov Igrek Zetovich)

1. (2 б.) If  $\vec{a}$  is deferred

from the point number 145 (circled), then the end of the directed segment will be at the point with the number .  
Number of the point — the end of the directed segment, postponed to the left-upward from the point 145, **orthogonal** to  $\vec{a}$  and equal in length  $|\vec{a}|$ , is equal to .

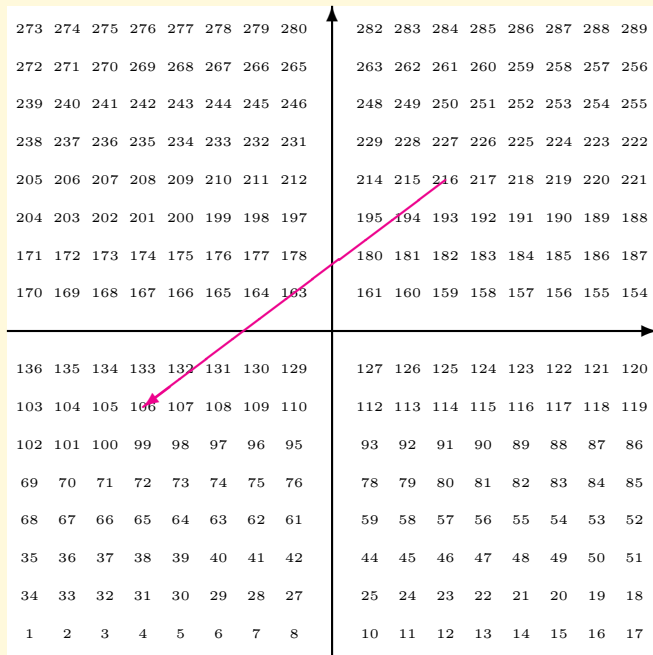
|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 273 | 274 | 275 | 276 | 277 | 278 | 279 | 280 | 281 | 282 | 283 | 284 | 285 | 286 | 287 | 288 | 289 |
| 272 | 271 | 270 | 269 | 268 | 267 | 266 | 265 | 264 | 263 | 262 | 261 | 260 | 259 | 258 | 257 | 256 |
| 239 | 240 | 241 | 242 | 243 | 244 | 245 | 246 | 247 | 248 | 249 | 250 | 251 | 252 | 253 | 254 | 255 |
| 238 | 237 | 236 | 235 | 234 | 233 | 232 | 231 | 230 | 229 | 228 | 227 | 226 | 225 | 224 | 223 | 222 |
| 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 |
| 204 | 203 | 202 | 201 | 200 | 199 | 198 | 197 | 196 | 195 | 194 | 193 | 192 | 191 | 190 | 189 | 188 |
| 171 | 172 | 173 | 174 | 175 | 176 | 177 | 178 | 179 | 180 | 181 | 182 | 183 | 184 | 185 | 186 | 187 |
| 170 | 169 | 168 | 167 | 166 | 165 | 164 | 163 | 162 | 161 | 160 | 159 | 158 | 157 | 156 | 155 | 154 |
| 137 | 138 | 139 | 140 | 141 | 142 | 143 | 144 | 145 | 146 | 147 | 148 | 149 | 150 | 151 | 152 | 153 |
| 136 | 135 | 134 | 133 | 132 | 131 | 130 | 129 | 128 | 127 | 126 | 125 | 124 | 123 | 122 | 121 | 120 |
| 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 |
| 102 | 101 | 100 | 99  | 98  | 97  | 96  | 95  | 94  | 93  | 92  | 91  | 90  | 89  | 88  | 87  | 86  |
| 69  | 70  | 71  | 72  | 73  | 74  | 75  | 76  | 77  | 78  | 79  | 80  | 81  | 82  | 83  | 84  | 85  |
| 68  | 67  | 66  | 65  | 64  | 63  | 62  | 61  | 60  | 59  | 58  | 57  | 56  | 55  | 54  | 53  | 52  |
| 35  | 36  | 37  | 38  | 39  | 40  | 41  | 42  | 43  | 44  | 45  | 46  | 47  | 48  | 49  | 50  | 51  |
| 34  | 33  | 32  | 31  | 30  | 29  | 28  | 27  | 26  | 25  | 24  | 23  | 22  | 21  | 20  | 19  | 18  |
| 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  | 12  | 13  | 14  | 15  | 16  | 17  |

за задачи

за коэфф-ты

# Algebra of vectors: тест 3 (Ixov Igrek Zetovich)

1. (1 б.) The figure shows the directed segment obtained by plotting the vector  $\vec{a}$  from the point number 216. The point whose coordinates coincide with the coordinates of the vector  $\vec{a}$ , have the number .

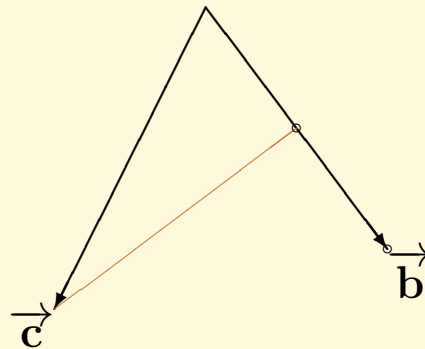


за задачи

за коэфф-ты

# Algebra of vectors: тест 4 (Ixov Igrek Zetovich)

1. (2 б.) It is known that  $|\vec{b}| = 4$  and the perpendicular from the end of  $\vec{c}$  is omitted on  $\vec{b}$  (shown in brown color). The segment  $\vec{b}$  is divided into equal parts by signs  $\circ$ . Then for **projection** and **scalar product**



$$\text{пр}_{\vec{b}} \vec{c} = \quad , \quad (\vec{b}, \vec{c}) =$$

за задачи      за коэфф-ты

## 1.5. Models of strategy

Such a multidimensional concept as a « strategy of activity » is impractical to introduce deductively, using the definition.

We preferred the inductive method, in this case, reducing to the formation of a system of strategy models.

## 1.5. Models of strategy

We apply the algebraic approach to the description of the strategy, which, in our opinion, consists of three components:



## 1.5. Models of strategy

1) system

of base

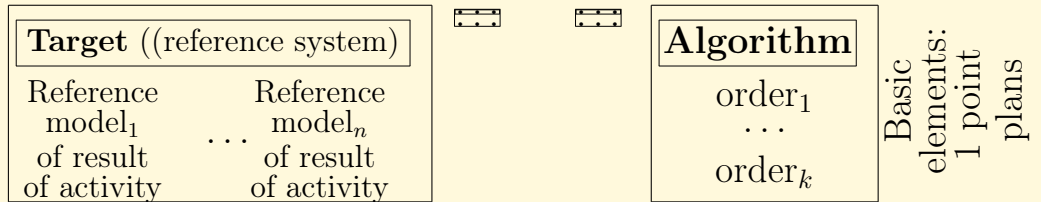
models;

# 1.5. Models of strategy

1) system

of base

models;



# 1.5. Models of strategy

1) system

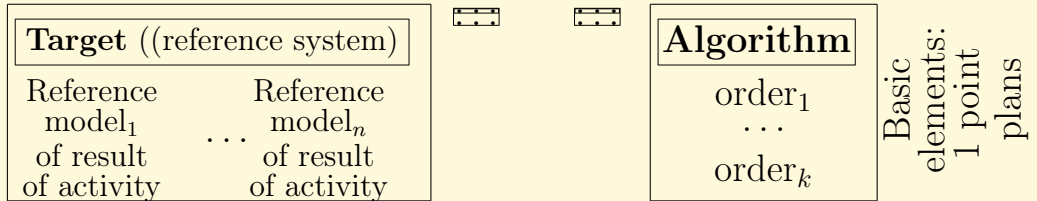
of base  
models;

2) system

of standard  
transformations

and standard  
combinations

of models;



# 1.5. Models of strategy

1) system

of base

models;

2) system

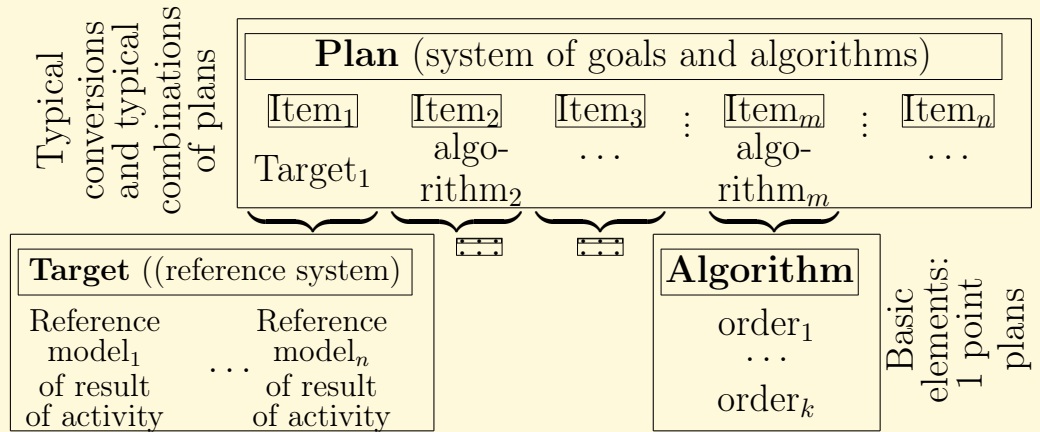
of standard

transformations

and standard

combinations

of models;



# 1.5. Models of strategy

1) system

of base

models;

2) system

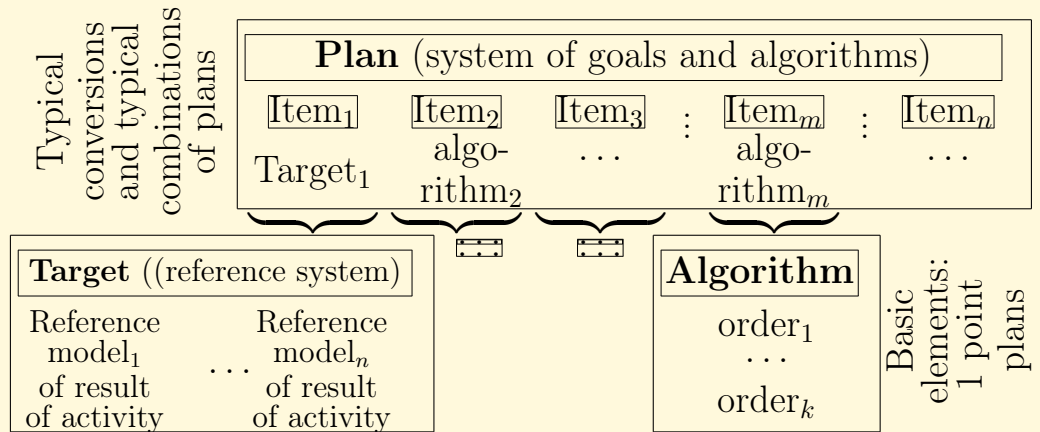
of standard

transformations

and standard

combinations

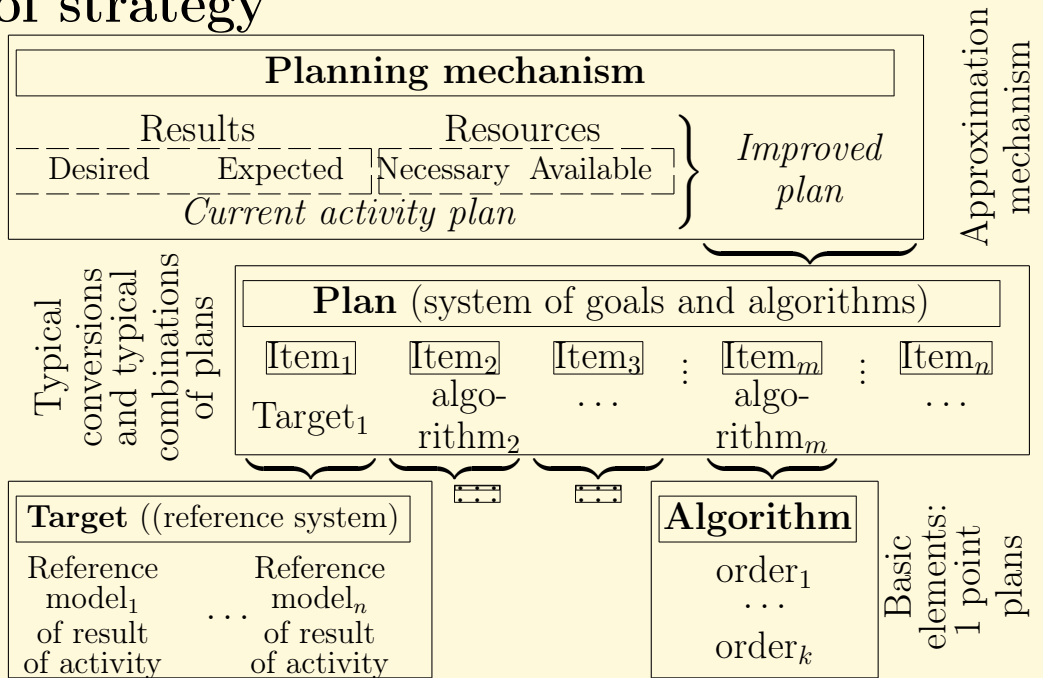
of models;



3) approximation mechanism designed for (approximate) representation of the model as the result of typical transformations and typical combinations of basic models.

# 1.5. Models of strategy

1) system of base models;  
 2) system of standard transformations and standard combinations of models;



3) approximation mechanism designed for (approximate) representation of the model as the result of typical transformations and typical combinations of basic models.

## 2. Weighted strategy system

The goal of teaching mathematics is to achieve the required level of proficiency in strategies.

## 2. Weighted strategy system

The goal of teaching mathematics is to achieve the required level of proficiency in strategies.

To measure the level of ownership of strategies, we introduced a system of indicators.



## 2. Weighted strategy system

The goal of teaching mathematics is to achieve the required level of proficiency in strategies.

To measure the level of ownership of strategies, we introduced a system of indicators.

A strategy with a system of indicators of the level of mastery of this strategy by a particular student, we called the enlightened strategy.

## 2. Weighted strategy system

Strategy

Initial  
estimates  
of strategy  
proficiency  
( $a_1; \dots; a_{k_1}$ )

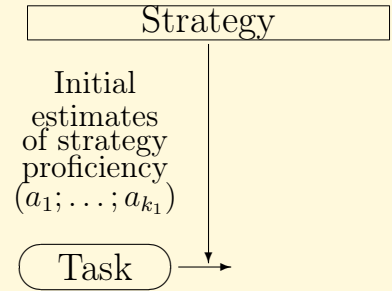
## 2. Weighted strategy system

Strategy

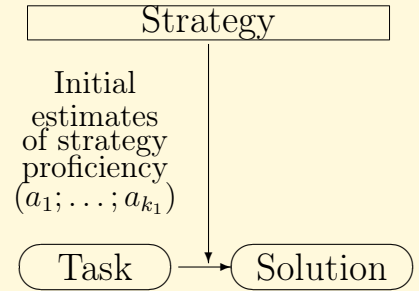
Initial  
estimates  
of strategy  
proficiency  
( $a_1; \dots; a_{k_1}$ )

Task

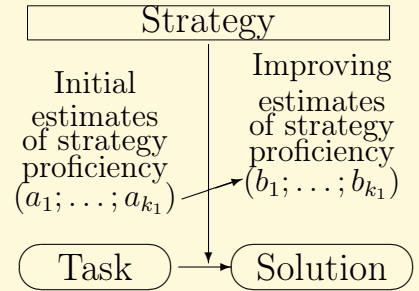
## 2. Weighted strategy system



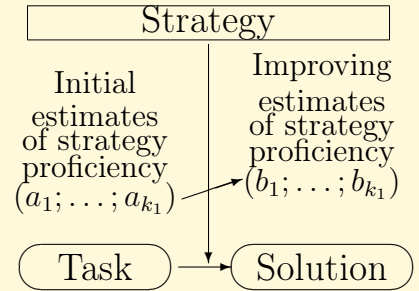
## 2. Weighted strategy system



## 2. Weighted strategy system

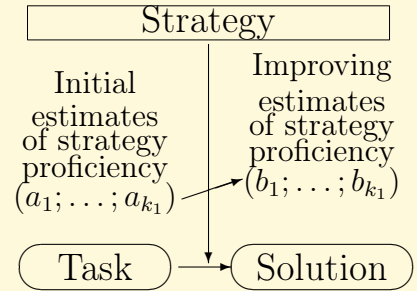


## 2. Weighted strategy system



An example of a scale, i.e. indicators of the level of ownership of strategies:

## 2. Weighted strategy system

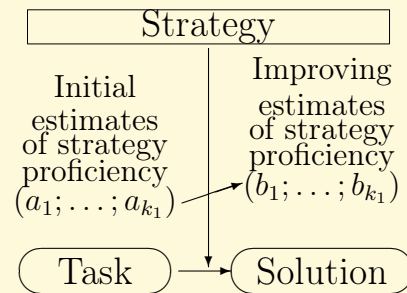


An example of a scale, i.e. indicators of the level of ownership of strategies:

1) the duration of the perception of the text of the task;



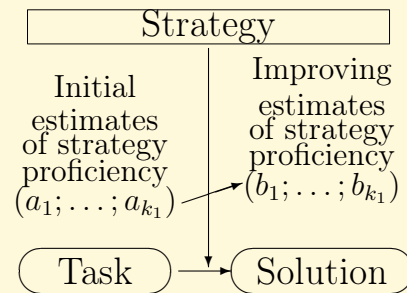
## 2. Weighted strategy system



An example of a scale, i.e. indicators of the level of ownership of strategies:

- 1) the duration of the perception of the text of the task;
- 2) the duration of the search for a solution to the problem;

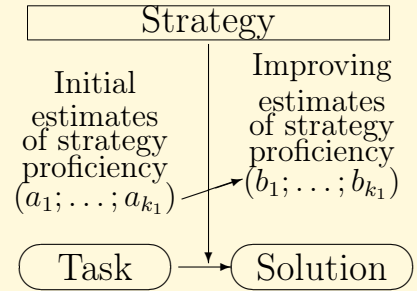
## 2. Weighted strategy system



An example of a scale, i.e. indicators of the level of ownership of strategies:

- 1) the duration of the perception of the text of the task;
- 2) the duration of the search for a solution to the problem;
- 3) the number of completed tasks in a certain time;

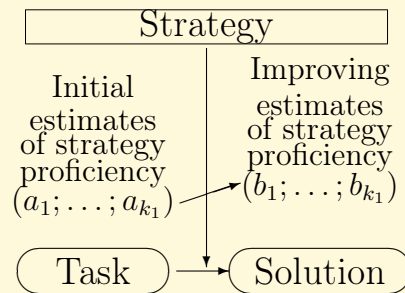
## 2. Weighted strategy system



An example of a scale, i.e. indicators of the level of ownership of strategies:

- 1) the duration of the perception of the text of the task;
- 2) the duration of the search for a solution to the problem;
- 3) the number of completed tasks in a certain time;
- 4) the number and nature of errors, etc.

## 2. Weighted strategy system



An example of a scale, i.e. indicators of the level of ownership of strategies:

- 1) the duration of the perception of the text of the task;
- 2) the duration of the search for a solution to the problem;
- 3) the number of completed tasks in a certain time;
- 4) the number and nature of errors, etc.

The goal is to “drive” the vector of weights (that is, indicators of the level of possession of strategies) in a certain area.

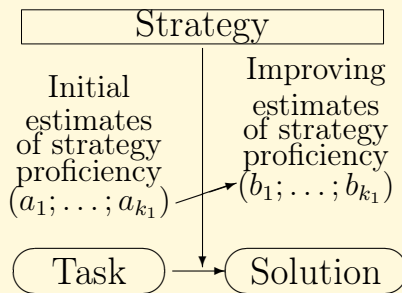
## 2. Weighted strategy system

*The system of support for pedagogical decisions created at the Ural State Economic University should give a recommended set of tasks for an individual student or a subgroup of students.*

An example of a scale, i.e. indicators of the level of ownership of strategies:

- 1) the duration of the perception of the text of the task;
- 2) the duration of the search for a solution to the problem;
- 3) the number of completed tasks in a certain time;
- 4) the number and nature of errors, etc.

The goal is to “drive” the vector of weights (that is, indicators of the level of possession of strategies) in a certain area.



*An electronic manual is a manual that cannot be printed!*

The manual "Elementary mathematics"

<http://lib.usue.ru/resource/free/14/MelnikovAlgebra5/index.html>

The manual "Mathematical analysis"

<http://lib.usue.ru/resource/free/15/MelnikovAlgebra6/index.html>

Textbook "Higher Mathematics. Linear Algebra and Geometry"

<http://lib.usue.ru/resource/free/17/MelnikovAlgebra7/index.html>

**Thanks for attention!**

[UriiMelnikov58@gmail.com](mailto:UriiMelnikov58@gmail.com)

**+7-965-52-88-941**

[www.usue.ru](http://www.usue.ru)