UNIVERSITAS OSTRAVIENSIS

ANALYSIS OF RESULTS IN INQUIRY BASED INFORMATICS EDUCATION OF SELECTED TOPICS

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Content

- Inquiry based science education
- Project VEMIV
- Acquisition, processing and presentation of information
- The teaching methodology: the bit – unit of information
- Summary of research results of teaching
- Conclusion

Inquiry Based Science Education

- pupils progressively developing key scientific ideas,
- pupils use skills employed by scientists,
- aim is therefore, besides the conceptual comprehension of the curriculum, developing pupils' inquiry skills,
  - the formulation of the problem and planning the research,
  - the implementation of the research,
  - analysis and interpretation of the research results,
  - sharing and presentation of results,
  - application and other use of the results.

Project VEMIV

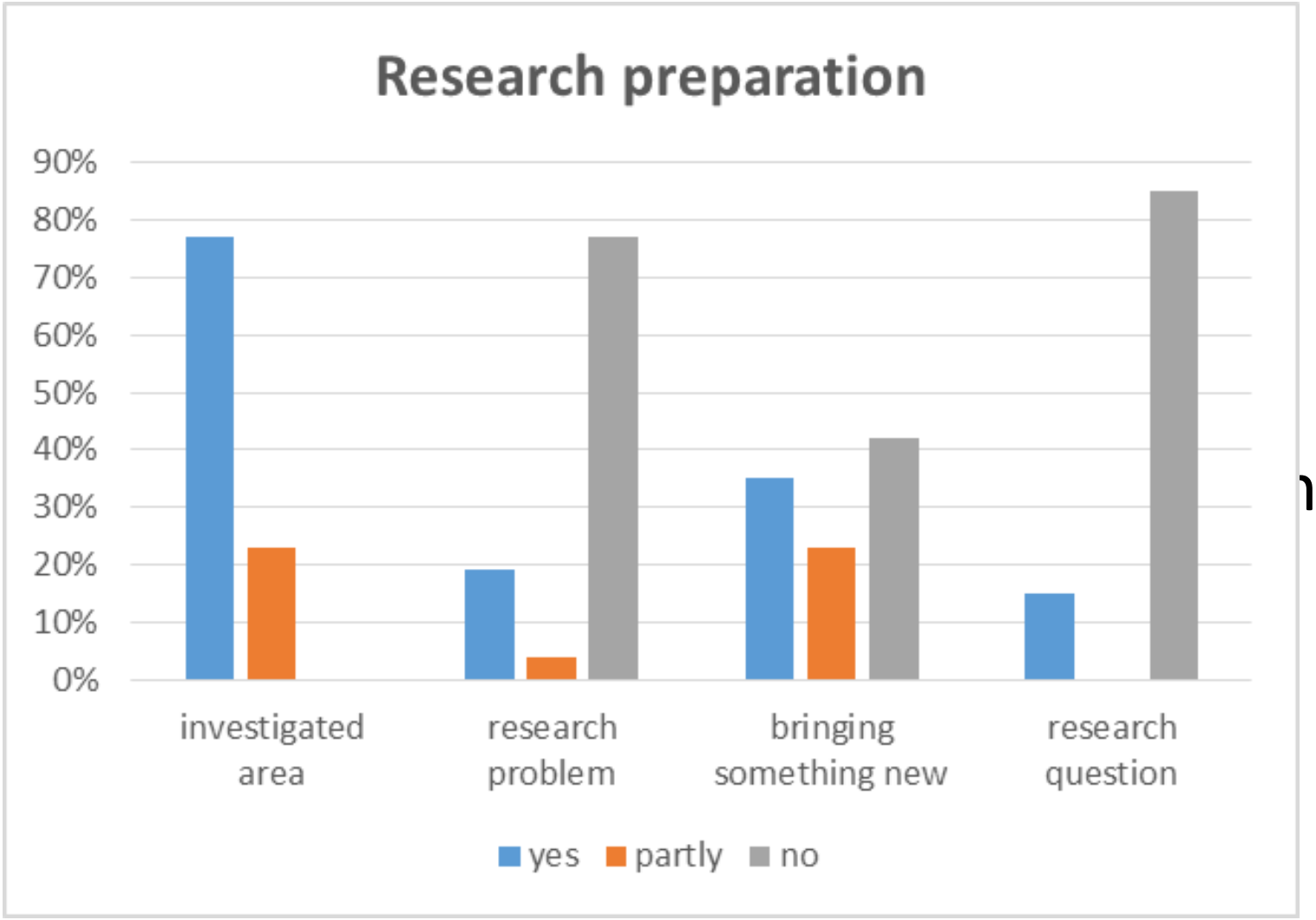
- research on the efficiency of innovative teaching methods of mathematics, physics and informatics,
- focused on developing methodological materials for inquiry-based education,
- verification of the proposed inquiry-based methodologies in schools,

- results of implementation two (of 10) designed inquiry-based methodologies,

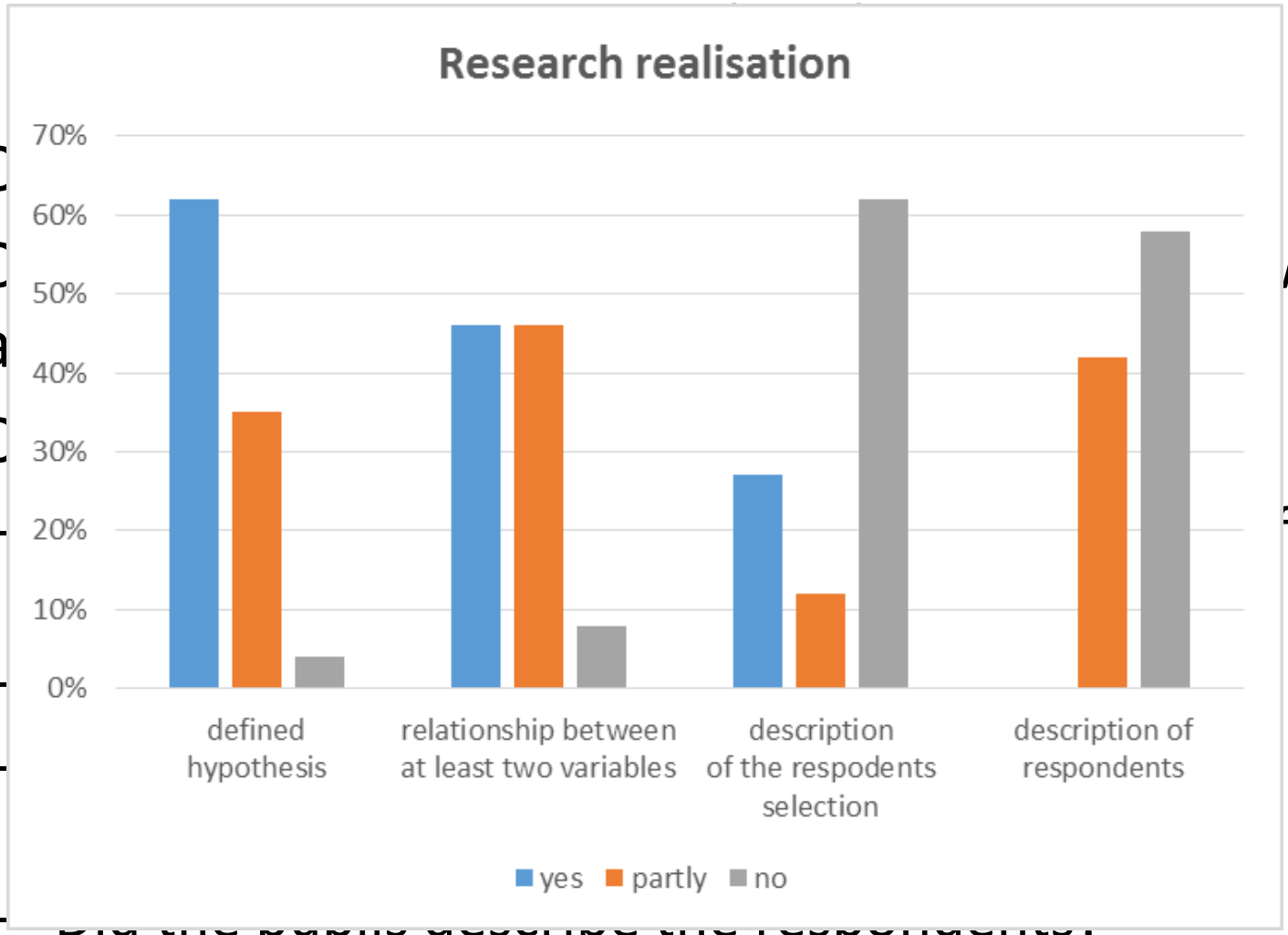
Acquisition, processing and presentation of information

- primarily focused on scientific research methods feasible in environment of school informatics,
- relational research problem,
- the methodology was followed by 42 pupils in 26 working groups, 3 teachers,
- we analyzed the results of each pupil (or of each working group).

Acquisition, processing and



Acquisition, processing and



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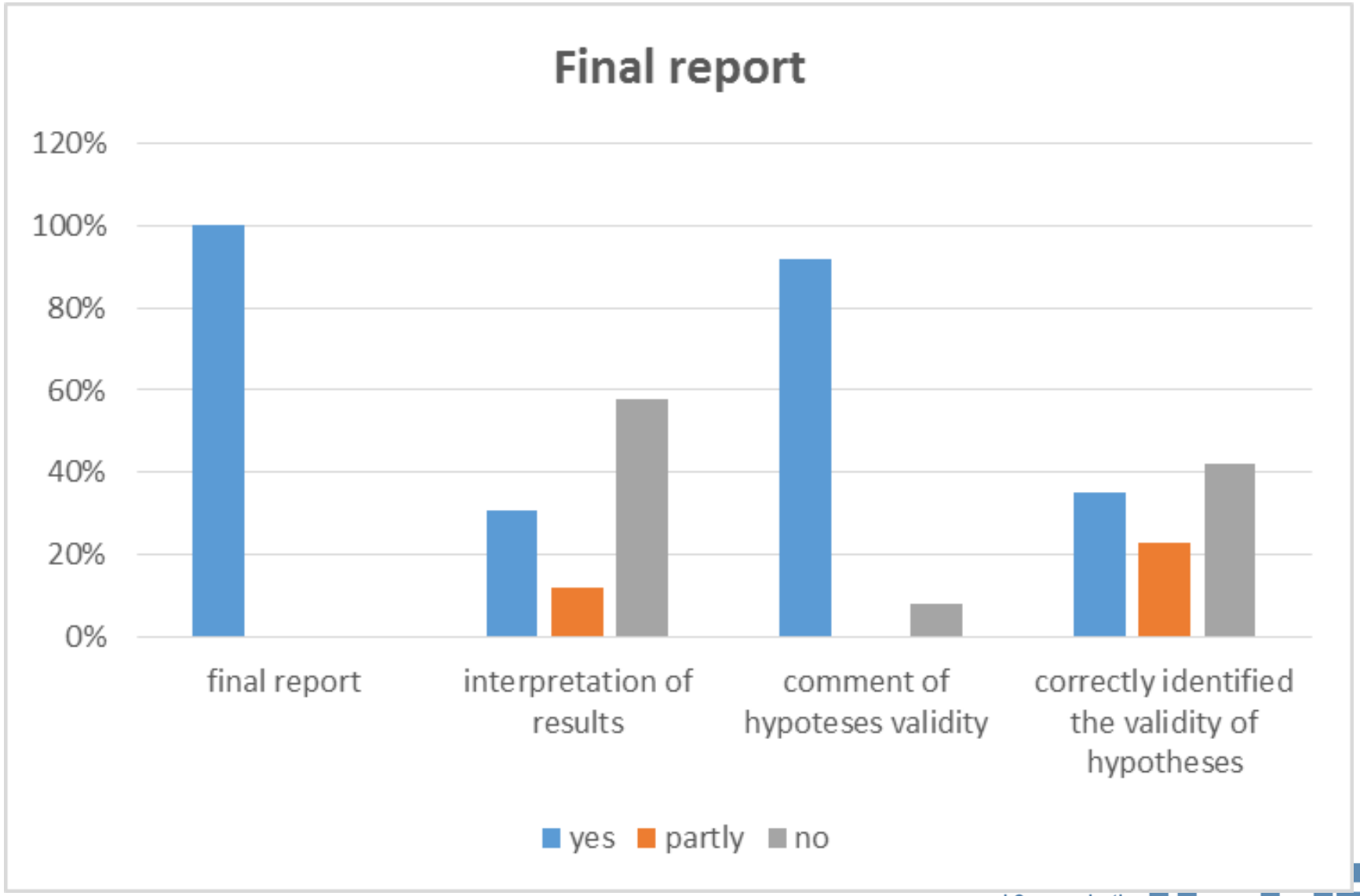
Did the pupils describe the respondents?

Acquisition, processing and



Acquisition, processing and presentation of information

- little experience and fear of failure => 58 % of research was previously almost clear that the results only confirm the already known facts,
- half of the pupils do not distinguish between dependent and independent variable,
- in only 36 % of cases was used the correlation coefficient,
- incorrect conclusions (42 %) is probably caused by the vague formulation in research,
- influence of teacher to pupil was strong.

Teaching methodology: the bit – unit of information

- Structure of an inquiry methodology
  - **Basic information** (topic name, *reviewers*, *methodology version*, time allocation of a lesson, target group, prior knowledge and skills, cognitive and affective objectives, *expected inquiry skills, didactic problem*, didactic means)
  - **Preparation** (worksheets, applets, diagrams, table, concepTest, set of tasks for verifying the prior knowledge)
  - **Course of instruction** (5E learning cycle)
  - **Observations and findings from teaching**
  - **Alternatives of the methodology**

Teaching methodology: the bit – unit of information

- Pilot run (2014/2015)
  - 34 pupils (5 classes, 4 schools)
- Ordinary run (2015/2016)
  - 39 pupils (4 classes, 3 schools)
- Evaluation tools
  - pupils' worksheets (13 tasks) and concepTests (10 items)
  - teachers' participatory observations – questionnaires

http://ics.upjs.sk/~snajder/bovi/2_bit/

Teaching methodology: the bit – unit of information

- Analysis of research results of teaching
  - Worksheet (tasks: 1, 5, 6)
    - binary search algorithm discovered and used by 21 % -> 44 % (after adding picture)
    - new and interesting (condensed) types of questions
    - after discussion in pairs improvement: 44 % -> 46 %
    - correct number of question: color 74 %, value 59 %
    - 87 % identified a card from given binary code (5 questions)
    - 95 % correctly concluded uniqueness of encoding, only 23 % approached to correct argumentation

Teaching methodology: the bit – unit of information

- ConcepTest (10 multiple-choice items)
  - experimental group (53 pupils): 59 %
  - control group (28 pupils): 12 % (< 25 % random guessing)
  - 9 from 30 distractors had lower frequency than 10 % (replace)
  - 7 distractor had a higher frequency than correct answer (leave)
    -> teach this subject matter more carefully
- Teachers' feedback after lessons
  - 90' sufficient for basic subject matter, all teachers used worksheets, but only some used applets
  - activities – rather interesting and rather difficult for pupils (scale)
  - teacher and also pupils provide help to other pupils

Summary of research results of teaching

- IBE is time consuming and requiring high-level cognitive functions of pupils and teachers
- Solving problems in the form of magic and games more stimulate pupils to develop their inquiry skills
- Importance of worksheets
  - framework for inquiry way of learning and teaching
  - tool for the diagnosis and development inquiry skills
  - helpful for further educational interventions

  (consistently completed pupils' worksheets -> precise results)

Summary of research results of teaching

- Importance of methodological materials
  - structure: specific objectives, tools, course of teaching …
  - teachers' observations and findings (IBE know-how)
  - alternatives (ideas for the methodology adaptation)
- More scientific approach of IBE learning and teaching
  - results of worksheets and concepTests give more information about pupils' level of understanding of the subject matter and their level of inquiry skills
  - improving methodology based on teachers' feedback after their IBE lessons

Conclusions

- Implementation of IBE in informatics subject
  - IBE methodologies for teachers, materials for pupils (table, diagrams, worksheets, applets …)
  - 2 types of methodologies (stress -> content, inquiry skills)
  - 3-stage process of teacher training on IBE (roles: inquiry pupil -> inquiry teacher -> author of IBE methodology)
  - cooperation with didactics of physics and mathematics -> beneficial for research and implementation of IBE and STEM.
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