The Curriculum
Of Data Warehouse

**Polkowice, August 2016**

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Developing the innovative methodology of teaching Business Informatics

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# General information

|  |  |
| --- | --- |
| Level of module | Bachelor, master |
| Faculty | Informatics |
| Language of instruction | English |
| Number of teaching hours | 20 |
| Number of ECTS credit allocated | 2 |
| Mode of delivery | face-to-face, team work, Lecture, labs, own work |

# Prerequisites and co-requisites

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| **Prerequisites and co-requisites** |
| 1 | Basic knowledge in MS Excel |
| 2 | Fundamentals of data warehousing and databases |
| 3 | Basic knowledge and skills related to ICT |

# The content of the subject

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| --- | --- | --- | --- |
| **No.** | **Name of module** | **Hours** | **ECTS** |
| 1 | From Databases to Data Warehouse | 4 | 0,4 |
| 2 | Data Warehouse Models  | 2 | 0,2 |
| 3 | Data Warehouse | 8 | 0,8 |
| 4 | Analytical Processing and DW Operations  | 2 | 0,2 |
| 5 | Distance management of SMEs using ICT solutions | 4 | 0,4 |
| Total | 20 | 2 |

# Description of the teaching units (modules)

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| **Module description** |
| The module relates to the presentation of modern databases as the main sources of using advanced ICT tools in order to perform analysis supporting managerial decision making. Database technology is used as the main framework to create and maintain Transaction Processing Systems (TPS), gathering information from many areas of functioning enterprises. Knowledge about communication with databases is essential to transform data into useful information and knowledge. The course creates fundamentals to develop and enhance the capabilities of users working with databases. During classes the students try to communicate with existing databases and create new database schemas for future applications. Therefore they are ready to use them in more advanced support of decision makers playing roles of managers as well as database technologists. The aim of the module is to understand the reasoning and basic assumptions of Data Warehouses (DW) essential in the next courses of the ISP.  |

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| **Module description** |
| The module has been devoted to the presentation of data warehouse models. Data warehousing as the tool to support decision making processes in enterprises needs special logical models (schemas) of data. These models are: star, snowflake and constellation of facts. Descriptions of these models as well as objects within models (such as fact table, dimension) have been presented. Then the creation of the fact table has been shown and next – dimension tables. Within dimension tables, attention has been paid to hierarchies, levels and unique identifiers. Special attention has been devoted to relationships between objects that enforce the business rules in DW. The next part presents measurements and dimensions in the OLAP model.  |

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| **Module description** |
| The module includes presentation of the properties and infrastructures of database systems; data modeliing a database architecture; query as a means of communication with databases; transaction features and processing; implementation of database properties; elements of database design; a concept of data warehouses; data warehouse models and architecture, and phases of business intelligence design and processing. |

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| **Module description** |
| The module has been devoted to the presentation of analytical processing and data warehouse operations. Data warehousing as the tool to support decision making processes in enterprises enables realization of operations on data collected in it. Analytical processing of data has been underlined in contrast to transactional processing. Types of data warehouses have been presented (ROLAP, MOLAP, HOLAP). Then typical analytical applications have been shown. Next, discussion on classes of analytical processing has been presented with underlined specificity of analytical applications. Then operations on data (pivoting, rolling up/drilling down, rotating, slicing and dicing, ranking) in data warehouse have been characterized.   |

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| **Module description** |
| The module concerns the use and implementation of Information and Communication Technology (ICT) , especially in distance managing Small and Medium Enterprises (SMEs). The course is a response to the nature of contemporary business management, with the constantly increasing amount of work, bureaucracy and the necessity to travel on business combined with the need to manage the company while away. During classes the students play the roles of the employees and entrepreneurs simultaneously, to gain the perspective from both points of view – supervised by the teachers. The aim of the module is to test the effectiveness of the available ICT remote management instruments addressed to SMEs. Therefore, our purpose is to prepare a study of implementation in real-life conditions, considering the advantages and disadvantages of the solutions tested, including possible future trends. Apart from the educational value of the course, the unique, dual perspective assumed by the students participating in it, provides them with a practical insight and skills to better understand and make better use of the conditions of managing and being managed.  |

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| **Module description** |
| The module relates to the presentation of modern databases as main sources of using advanced ICT tools in order to perform analysis supporting managerial decision making. Database technology is used as the main framework to create and maintain Transaction Processing Systems (TPS), gathering information from many areas of functioning enterprises. Knowledge about communication with databases is essential to transform data into useful information and knowledge. The course creates fundamentals to develop and enhance the capabilities of users working with databases. During classes the students try to communicate with existing databases and create new database schemas for future applications. Therefore they are ready to use them in more advanced support of decision makers playing roles of managers as well as database technologists. The aim of the module is to understand the reasoning and basic assumptions of Date Warehouses (DW) essential in the next courses of the ISP.  |

# Goals of the subject

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| **Goals** |
| Goal ID | Description of a Goal |
| G\_S1 | Understanding usability of modern Databases in Business Informatics. |
| G\_S2 | Demonstrating Data Warehouse genesis and concepts. |
| G\_S3 | Presenting fundamentals of Data Warehousing . |
| G\_S4 | Understanding of usability of modern approach to data analyses in enterprises. |
| G\_S5 | Presenting models of data in data warehouse (star, snowflake, fact constellation). |
| G\_S6 | Presenting objects of data models. |
| G\_S7 | Presentation of basic assumptions and theory of database technology. |
| G\_S8 | Database and data warehouse design and usage. |
| G\_S9 | Implementation of data warehouse based on database sources. |
| G\_S10 | Presenting OLAP models (ROLAP, MOLAP, HOLAP). |
| G\_S11 | Presenting specificity, need and classes of analytical processing. |
| G\_S12 | Presenting operations on data in data warehouse. |
| G\_S13 | Developing knowledge on management functions and the role of SMEs in the economy. |
| G\_S14 | Presenting some examples of ICT solutions for SMEs. |
| G\_S15 | Developing knowledge on the distance management of SMEs using ICT solutions. |

# Planned effects, knowledge

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| --- | --- |
| Effect ID | Knowledge type |
| K\_S1 | Knowledge about databases and Database Management Systems (DBMS) as platforms for the creation and maintenance of Transaction Processing Systems  |
| K\_S2 | Knowledge about methods of communication with databases and generating necessary information . |
| K\_S3 | Knowledge about usability of database applications in transforming data into managerial information using Data Warehousing concepts |
| K\_S4 | Knowledge about the dimensional model of data |
| K\_S5 | Knowledge about data warehouse logical models |
| K\_S6 | Knowledge about objects in data models  |
| K\_S7 | Understands the role and essence of databases as a technology supporting the creation and maintenance of information systems |
| K\_S8 | Defines commands in SQL to perform business tasks |
| K\_S9 | Designs database and data warehouse applications and components |
| K\_S10 | Knowledge about types of OLAP |
| K\_S11 | Knowledge about specificity, need and classes of analytical processing |
| K\_S12 | Knowledge about operations realized on data in data warehouse  |
| K\_S13 | Management functions and the role of SMEs in the economy. |
| K\_S14 | Gained knowledge about available ICT remote management instruments. |
| K\_S15 | Trends and recommendations for distance ICT implementation, with particular emphasis on SMEs may be expected. |

# Planned effects, skills

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| Effect ID | Skill type |
| S\_S1 | Skills in using databases as the source of managerial information (analytical reports) |
| S\_S2 | Is able to create and use database systems for future applications  |
| S\_S3 | Skills in the evaluation of Data Warehouse solutions for practical managerial jobs  |
| S\_S4 | Student understands why and what for data models in data warehouse are so important |
| S\_S5 | Student knows how to create data models, he/she understands differences between these models |
| S\_S6 | Student knows objects in data models |
| S\_S7 | Student understands differences among ROLAP, MOLAP, HOLAP |
| S\_S8 | Student knows specificity, need and classes of analytical processing |
| S\_S9 | Student knows operations realized on data |
| S\_S10 | Indicates properties and user requirements addressed to database technology |
| S\_S11 | Implements and uses database applications |
| S\_S12 | Organizes infrastructure and processes of data warehouses |
| S\_S13 | Skilled in using and implementing ICT remote management instruments in SMEs. |
| S\_S14 | Is able to prepare and create ICT environment for SMEs. |
| S\_S15 | Organizes means for communication in a team. |

# Planed effects, social competences

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| Effect ID | Competence type |
| C\_S1 | Ability to work in a group.. |
| C\_S2 | Perform projects in teams |
| C\_S3 | Ability to discuss in a group data models and their constructions |
| C\_S4 | Student works in a group to build data warehouse. |
| C\_S5 | Services in DBMS environment |
| C\_S6 | Perform projects in a team |
| C\_S7 | Ability to discuss in a group analytical processing in DW |
| C\_S8 | Student can work in group to carry out operations on data in DW |
| C\_S9 | Ability to work in a group. |
| C\_S10 | Perform projects in a team. |

# The cards of teaching units

## From Databases to Data Warehouse

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| Agenda of a Module |
| Module title | **From Databases to Data Warehouse**  |
| Level of module | bachelor |
| Faculty | Computer Science |
| Date | 17th September 2016 |
| Language of instruction | English |
| Number of teaching hours | 4 |
| Number of ECTS credit allocated | 0,4 |
| Mode of delivery | face-to-face, team work |

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| **Prerequisites and co-requisites** |
| 1. |  Basic knowledge and skills related to ICT |

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| **Goals** |
| GoalID | Description of a Goal |
| G1 | Understanding the usability of modern Databases in Business Informatics  |
| G2 | Demonstrating Data Warehouse genesis and concepts |
| G3 | Presenting the fundamentals of Data Warehousing  |

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| **Planned effects** |
| Knowledge |
| Effect ID | Knowledge type | Goal ID |
| K1 | Knowledge about databases and Database Management Systems (DBMS) as platforms for the creation and maintenance of Transaction Processing Systems  | G1 |
| K2 | Knowledge about methods of communication with databases and generating necessary information . | G1, G2 |
| K3 | Knowledge about the usability of database applications in transforming data into managerial information using Data Warehousing concepts | G2,G3 |
| Skills |
| Effect ID | Skill type | Goal ID |
| S1 | Skills in using databases as the source of managerial information (analytical reports) | G1 |
| S2 | Is able to create and use database systems for future applications  | G2 |
| S3 | Skills in the evaluation of Data Warehouse solutions for practical managerial jobs  | G3 |
| Social competences |
| Effect ID | Competence type | Goal ID |
| C1 | Ability to work in a group work. | G1,G2,G3 |
| C2 | Perform projects in teams | G2, G3 |
| **Realized topics** |
| **ID** | **Topic** | **Hours** | **Goals** | **Effects** |
| L | LAB | EX | OTH |  |  |
| **1.** | Database fundamentals including definition of a database, models and architectures  | 0,25 |  |  |  | G1 | K1 |
| **2.** | SQL as an universal language of databases | 0,5 |  |  |  | G1 | K1 |
| **3.** | Performing queries using commercial Database Management Systems |  | 0,25 |  |  | G2,G3 | K2,S1, S2, C1 |
| **4.** | Comparison of OLTP and OLAP systems |  |  | 0,25 |  | G3 | K3, S3, C2 |
| **5.** | Databases as the source of advanced solutions for managers |  |  | 0,25 |  | G2,G3 | K2,K3 S1,S2,C1 |
| **6.** | Data Warehouse goals and features | 0,25 |  | 0,25 |  | G2,G3 | K2,K3 S1,S2S3 |
| **7.** | Data Warehouse architecture |  0,5 |  | 0,25 |  | G2,G3 | K2,K3 S1,S2S3 |
| **8.** | Data Warehouse types and structures |  0,5 |  | 0,25 |  | G2,G3 | K2,K3 S1,S2S3 |
| **9.** | Performing a project in a team  |  |  | 0,25 | 0,25 | G2,G3 | C1,C2 |
| **Total** | 2,0 | 0,25 | 1,5 | 0,25 |  |  |

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| **Topics for individual work** |
| ID | Topic | EffectsID | Goals ID | Hours |
| 1. | Analysis of DBMS features  | K1,K2,S1,S2, C1 | G1 | 0,5 |
| 2. | Analysis of available database schemas contents | K2,K3S1,S2 | G2,G3 | 0,5 |
| 3. | Performing individually defined queries  | K2,K3S1,S2, C1 | G2,G3 | 1 |
| 4. | Analysis of DW goals and features | K2,K3S3, C2 | G2,G3 | 1 |
| 5. | Discussion of DW models | K2,K3S1,S2S3 | G2,G3 | 1 |
| Total hours | 4 |

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| **Expected student involvement** |
| ID | Type of student’s activity | Hours |
| 1. | Classes | 4 |
| 2. | Individual work | 4 |
| 3. | Getting familiar with core literature related to the course and prepared course materials  | 1 |
| 4. | Preparation for laboratories | 1 |
| 5. | Preparation of own projects | 1 |
| 6. | Preparation to exam | 0 |
| 7. | Preparation of final projects | 1 |
| Total |  12  |

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| **Verification of expected effects** |
| **ID** | **Description** | **Exam** | **Project** | **Activity** | **Ownwork** | **Other\*** |
| K1 | Knowledge about databases and DBMSs as platforms for the creation and maintenance of TPS | - | + | + | + | + |
| K2 | Knowledge about methods of communication with databases and generating necessary information | - | + | + | + | + |
| K3 | Knowledge about the usability of database applications in transforming data into managerial information using Data Warehousing concepts | - | + | + | + | + |
| S1 | Skills in using databases as the source of managerial information (analytical reports) | - | + | + | + | + |
| S2 | Is able to create and use database systems for future applications  | - | + | + | + | + |
| S3 | Skills in the evaluation of Data Warehouse solutions for practical managerial jobs  | - | + | + | + | + |
| C1 | Ability to work in a group. | - | + | + |  | + |
| C2 | Perform projects in teams. | - | + |  | + | + |
| Wages in overall verification of expected effects in % (Total 100%) | - | 20% | 40 % | 20% | 10% |

\* Other methods of verification are described in the section “Description of traditional and innovative methods of teaching” of this document.

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| **Core literature** |
| 1. | Database Processing. Fundamentals Design and Implementation (2015). Kroenke D.M., Auer D. J. Pearson |
| 2. | Database, Data warehouse and Business Intelligence Questions and Answers (2014). Basandra S. Basandra Books  |
| 3. | Building the Data Warehouse (2005). Inmon W.H., Wiley Publishing |
| 4. | The Data Warehouse Lifecycle Toolkit. The Definitive Guide to Dimensional Modeling (2013). Kimball R., Ross M., Wiley Publishing |

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| **Further reading** |
| 1. | Fundamentals on Database Systems (2010). Elmasri R.A., Navathe S.B. Pearson  |
| 2 | Data Warehouse Design: Modern Principles and Methodologies (2009). Golfarelli M., Rizzi S. McGraw-Hill |

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| **Description of traditional and innovative methods of teaching**  |
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| **Remarks** |
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## Data Warehouse Models

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| Agenda of a Module |
| Module title | **Data Warehouse Models** |
| Level of module | Bachelor |
| Faculty | Computer Science |
| Language of instruction | English |
| Number of teaching hours | 2 |
| Number of ECTS credit allocated | 0,2 |
| Mode of delivery | Lecture, face-to-face |

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| **Module description** |
| The module has been devoted to the presentation of data warehouse models. Data warehousing as the tool to support decision making processes in enterprisesneeds special logical models (schemas) of data. These models are: star, snowflake and constellation of facts. Descriptions of these models as well as objects within models (such as fact table, dimension) have been presented. Then the creation of the fact table have been shown and next – dimension tables. Within dimension tables, attention has been paid to hierarchies, levels andunique identifiers. Special attention has been devoted to relationships between objects that enforce the business rules in DW. The next part presents measures and dimensions in OLAP model.  |

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| **Prerequisites and co-requisites** |
| 1. | Fundamentals of data warehousing and databases |

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| **Goals** |
| GoalID | Description of a Goal |
| G1 | Understanding of usability of the modern approach to data analyses in enterprises |
| G2 | Presenting models of data in data warehouse (star, snowflake, fact constellation) |
| G3 | Presenting objects of data models  |

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| **Planned effects** |
| Knowledge |
| Effect ID | Knowledge type | Goal ID |
| K1 | Knowledge about the dimensional model of data | G1,G2 |
| K2 | Knowledge about data warehouse logical models | G2,G3 |
| K3 | Knowledge about objects in data models | G3 |
| Skills |
| Effect ID | Skill type | Goal ID |
| S1 | Student understands why and what for data models in data warehouse are so important | G1, G2,G3 |
| S2 | Student knows how to create data models, he/she understands differences between these models | G2,G3 |
| S3 | Student knows objects in data models | G2,G3 |
| Social competences |
| Effect ID | Competence type | Goal ID |
| C1 | Ability to discuss in a group data models and their constructions | G1,G2,G3 |
| C2 | Student works in a group to build data warehouse. | G2, G3 |

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| **Realized topics** |
| **ID** | **Topic** | **Hours** | **Goals** | **Effects** |
| L | LAB | EX | OTH |  |  |
| **1.** | Knowledge about data warehouse objects, dimensional model in data warehouse  | 0,5 |  |  |  | G1 | K1 |
| **2.** | Presentation of data warehouse logical schemas | 0,5 |  |  |  | G1,G2 | K1 |
| **3.** | Characteristics of fact tables | 1,0 |  |  |  | G1, G2 | K1,K2S1,S2 |
| **4.** | Characteristics of dimension tables | 1,0 |  |  |  | G2,G3 | K2,K3 S1,S2 |
| **5.** | Presentations of hierarchies, levels, unique identifiers in dimensions | 2,0 |  |  |  | G2,G3 | K2,K3 S1,S2S3 |
| **6.** | Relationships between objects  | 2,0 |  |  |  | G2,G3 | K2,K3 S1,S2S3 |
| **7.** | Measurements and dimensions in OLAP model | 0,5 |  |  |  | G3 | K3 S1,S2S3 |
| **Total** | 7,5 |  |  |  |  |  |

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| **Topics for individual work** |
| ID | Topic | EffectsID | Goals ID | Hours |
| 1. | Analysis of business question from manager | K1, S1 | G1,G2 | 1,0 |
| 2. | Analysis of choice of appropriate model in a given situation | K2,K3S2 | G2,G3 | 1,0 |
| 3. | Analysis of how to create a data model  | K3S3 | G2,G3 | 2,0 |
| Total hours | 4 |

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| **Expected student involvement** |
| ID | Type of student’s activity | Hours |
| 1. | Classes | 2 |
| 2. | Individual work | 4 |
| 3. | Getting familiar with core literature related to the course and prepared course materials  | 3 |
| 4. | Preparation for laboratories | 1 |
| 5. | Preparation of own projects | 1 |
| 6. | Preparation to exam | 0 |
| 7. | Preparation of final projects | 1 |
| Total | 12 |

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| **Verification of expected effects** |
| **ID** | **Description** | **Exam** | **Project** | **Activity** | **Ownwork** | **Other\*** |
| K1,K3,S1,S2 | Knowledge about the dimensional model of data warehouse | - | + | + | + | - |
| K2 | Knowledge about types of data models  | - | + | + | + | - |
| K2,S3 | Knowledge about fact table, dimension tables | - | + | + | + | - |
| C1 | Ability to discuss in a group  | - | + | + |  | - |
| C2 | Perform projects in a teamworkl. | - | + | + | + | - |
| Wages in overall verification of expected effects in % (Total 100%) | - | 50% | 20% | 30% | 0% |

\* Other methods of verification are described in the section “Description of traditional and innovative methods of teaching” of this document.

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| **Core literature** |
| 1. | Inmon W. H.: Building the Data Warehouse, Wiley&Sons, 2002 |
| 2. | Todman C.: Designing a Data Warehouse, Prentice Hall, 2011 |
| 3. | Kimbal R., Ross M.: The Data Warehouse Tolkit, The Definitive Guide to Dimensional Modeling, 3th Edition, Wiley&Sons, 2013 |

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| **Further reading** |
| 1. | Kimbal R.: The Data Warehouse Lifecycle Toolkit, Wiley&Sons, 2009 |

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| **Description of traditional and innovative methods of teaching**  |
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| **Remarks** |
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## Data Warehouse

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| Agenda of a Module |
| Module title | **Data Warehouse** |
| Level of module | bachelor |
| Faculty | Computer Science |
| Language of instruction | English |
| Number of teaching hours | 8 |
| Number of ECTS credit allocated | 0,4 |
| Mode of delivery | face-to-face, laboratories, team work |

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| **Module description** |
| The module includes the presentation of properties and infrastructures of database systems; data models a database architecture; query as means of communication with databases; transaction features and processing; implementation of database properties; elements of database design; a concept of data warehouses; data warehouse models and architecture and phases of business intelligence design and processing. |

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| **Prerequisites and co-requisites** |
| 1. | Knowledge of data bases, system modelling |

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| **Goals** |
| GoalID | Description of a Goal |
| G1 | Presentation of basic assumptions and theory of database technology |
| G2 | Database and data warehouse design and usage |
| G3 | Implementation of data warehouse based on database sources |

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| **Planned effects** |
| Knowledge |
| Effect ID | Knowledge type | Goal ID |
| K1 | Understands the role and essence of databases as a technology supporting the creation and maintenance of information systems | G1 |
| K2 | Define commands in SQL to perform business tasks | G2,G3 |
| K3 | Design database and data warehouse applications and components | G3 |
| Skills |
| Effect ID | Skill type | Goal ID |
| S1 | Indicates properties and user requirements addressed to database technology | G1 |
| S2 | Implements and uses database applications | G2,G3 |
| S3 | Organizes infrastructure and processes of data warehouses | G2,G3 |
| Social competences |
| Effect ID | Competence type | Goal ID |
| C1 | Services in the DBMS environment | G1,G2,G3 |
| C2 | Perform projects in a team | G2, G3 |

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| **Realized topics** |
| **ID** | **Topic** | **Hours** | **Goals** | **Effects** |
| L | LAB | EX | OTH |  |  |
| **1.** | Fundamentals of Database Technology | 0 | 0,5 | 0 | 0 | G1,G2,G3 | K1, K2, S1, S4 |
| **2.** | Communication with Databases | 0 | 0,5 | 0 | 0 | G3 | K3, S2 |
| **3.** | SQL as a Universal Query Language | 0 | 0,75 | 0,25 | 0 | G2,G3 | K3, S2, C1 |
| **4.** | Implementation of Database Properties | 0 | 0,5 | 0,25 | 0 | G2,G3 | K3, S2, C1 |
| **5.** | Future of Database Technology | 0 | 0,25 | 0,25 | 0 | G3 | K4, S3, C2,  |
| **6.** | Concept and Architecture of Data warehouses | 0 | 0,5 | 0,25 | 0 | G1,G2 | K1, K2 |
| **7.** | Concept and Architecture of Data warehouses | 0 | 0,5 | 0,25 | 0 | G1 | K1, S1 |
| **8.** | Basic Models of Data warehouses | 0 | 1 | 0,25 | 0 | G3 | S4, C2 |
| **9.** | Data warehouse Design Methodology | 0 | 1,5 | 0 | 0 | G2,G3 | K4, S3, C1, C2 |
| **10.** | OLAP with DW | 0 | 0,5 | 0 | 0 | G2,G3 | K3, S2, S4, C1, C2 |
| **Total** | 0 | 6,5 | 1,5 | 0 |  |  |

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| **Topics for individual work** |
| ID | Topic | EffectsID | Goals ID | Hours |
| 1. | Design of database application | K1, C1, S2, C2 | G2,G3 | 1 |
| 2. | Design of data warehouse components | K3, S2, C2 | G2,G3 | 1,5 |
| 3. | Practice with SQL commands | K2, S2 | G2 | 1 |
| 4. | Practice with OLAP | S1, S2, S3, C2 | G2,G3 | 1,5 |
| Total hours | 5 |

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| **Expected student involvement** |
| ID | Type of student’s activity | Hours |
| 1. | Classes | 8 |
| 2. | Individual work | 5 |
| 3. | Getting familiar with core literature related to the course and prepared course materials  | 1 |
| 4. | Preparation for laboratories | 1 |
| 5. | Preparation of own projects | 1 |
| 6. | Preparation to exam | 0,5 |
| 7. | Preparation of final projects | 1 |
| Total | 17,5 |

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| **Verification of expected effects** |
| **ID** | **Description** | **Exam** | **Project** | **Activity** | **Ownwork** | **Other\*** |
| K1 | Understands the role and essence of databases as a technology supporting the creation and maintenance of information systems | - | - | + | + | + |
| K2 | Defines commands in SQL to perform business tasks | + | + | + | + | + |
| K3 | Designs database and data warehouse applications and components | + | - | - | + | - |
| S1 | Indicates properties and user requirements addressed to database technology | + | + | - | + | + |
| S2 | Implements and uses database applications | - | - | + | + | + |
| S3 | Organizes infrastructure and processes of data warehouses | - | - | + | - | + |
| C1 | Services in the DBMS environment | - | - | - | + | + |
| C2 | Perform projects in a team | - | - | + | + | - |
| Wages in overall verification of expected effects in % (Total 100%) | - | 40% | 30% | 10% | 10% |

\* Other methods of verification are described in the section “Description of traditional and innovative methods of teaching” of this document.

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| **Core literature** |
| 1. | Kroeneke D.M., Database Processing. Fundamentals Design and Implementation, Prentice-Hall, Englewood Cliffs 2009 |
| 2. | Shah N., Database Systems using Oracle. A Simplified Guide to SQL and PL/SQL, Prentice-Hall, Englewood Cliffs 2004 |
| 3. | Silberschatz A., Korth H.F., Sudrshan S., Database System Concepts, McGraw-Hill, 2006 |
| 4. | Inmon W.H., Building the Data Warehouse, Wiley Publishing, Indianapolis 2005 |
| 5. | Kimball R. et al., The Data Warehouse Lifecycle Toolkit, Wiley Publishing, Indianapolis 2008 |

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| **Further reading** |
| 1. | Golfarelli M., Rizzi S., Data Warehouse Design: Modern Principles and Methodologies, McGraw-Hill, 2009 |
| 2 | Hoffer J.A., Prescott M., McFadden F., Modern Database Management, Prentice-Hall, Englewood Cliffs 2006 |
| 3. | Elmasri R.A., Navathe S.B., Fundamentals on Database Systems, Addison-Wesley, 2006 |

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| **Description of traditional and innovative methods of teaching**  |
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| **Remarks** |
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## Analytical Processing and DW Operations

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| Agenda of a Module |
| Module title | **Analytical Processing and DW Operations** |
| Level of module | Bachelor |
| Faculty | Computer Science |
| Language of instruction | English |
| Number of teaching hours | 2 |
| Number of ECTS credit allocated | 0,2 |
| Mode of delivery | Lecture, face-to-face |

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| **Module description** |
| The module has been devoted to the presentation of analytical processing and data warehouse operations. Data warehousing as the tool to support decision making processes in enterprisesenables the realization of operations on data collected in it. Analytical processing of data has been underlined in contrast to transactional processing. Types of data warehouses have been presented (ROLAP, MOLAP, HOLAP). Then typical analytical applications have been shown. Next, discussion on classes of analytical processing has been presented with underlined specificity of analytical applications. Then operations on data (pivoting, rolling up/drilling down, rotating, slicing and dicing, ranking) in data warehouse have been characterized.  |

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| **Prerequisites and co-requisites** |
| 1. | Fundamentals of data warehousing and databases, data models in DW |

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| **Goals** |
| GoalID | Description of a Goal |
| G1 | Presenting OLAP models (ROLAP, MOLAP, HOLAP) |
| G2 | Presenting specificity, need and classes of analytical processing |
| G3 | Presenting operations on data in data warehouse  |

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| **Planned effects** |
| Knowledge |
| Effect ID | Knowledge type | Goal ID |
| K1 | Knowledge about types of OLAP | G1,G2 |
| K2 | Knowledge about specificity, need and classes of analytical processing | G2,G3 |
| K3 | Knowledge about operations realized on data in data warehouse | G3 |
| Skills |
| Effect ID | Skill type | Goal ID |
| S1 | Student understands differences between ROLAP, MOLAP, HOLAP | G1, G2,G3 |
| S2 | Student knows specificity, need and classes of analytical processing | G2,G3 |
| S3 | Student knows operations realized on data | G2,G3 |
| Social competences |
| Effect ID | Competence type | Goal ID |
| C1 | Ability to discuss in a group analytical processing in DW | G1,G2,G3 |
| C2 | Student can work in a group to carry out operations on data in DW | G2, G3 |

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| **Realized topics** |
| **ID** | **Topic** | **Hours** | **Goals** | **Effects** |
| L | LAB | EX | OTH |  |  |
| **1.** | Knowledge about data warehouse types | 0,5 |  |  |  | G1 | K1,S1 |
| **2.** | Characteristics of analytical processing | 1,5 |  |  |  | G1,G2 | K1,K2,S2 |
| **3.** | Typical analytical applications | 1,0 |  |  |  | G1, G2 | K1,K2S1,S2 |
| **4.** | Classes of analytical processing | 1,0 |  |  |  | G2,G3 | K2,K3 S1,S2 |
| **5.** | Specificity of analytical processing | 1,0 |  |  |  | G2,G3 | K2,K3 S1,S2S3 |
| **6.** | Operations on data in DW | 2,0 |  |  |  | G2,G3 | K2,K3 S1,S2S3 |
| **Total** | 7,0 |  |  |  |  |  |

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| **Topics for individual work** |
| ID | Topic | EffectsID | Goals ID | Hours |
| 1. | OLAP models in DW | K1, S1 | G1,G2 | 1,0 |
| 2. | Analytical processing versus transactional processing | K2,K3S2 | G2,G3 | 1,0 |
| 3. | Operations on data in DW | K3S3 | G2,G3 | 2,0 |
| Total hours | 4 |

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| **Expected student involvement** |
| ID | Type of student’s activity | Hours |
| 1. | Classes | 2 |
| 2. | Individual work | 4 |
| 3. | Getting familiar with core literature related to the course and prepared course materials  | 3 |
| 4. | Preparation for laboratories | 1 |
| 5. | Preparation of own projects | 1 |
| 6. | Preparation to exam | 0 |
| 7. | Preparation of final projects | 1 |
| Total | 12 |

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| **Verification of expected effects** |
| **ID** | **Description** | **Exam** | **Project** | **Activity** | **Ownwork** | **Other\*** |
| K1,K3,S1,S2 | Knowledge about dimensional model of data warehouse | - | + | + | + | - |
| K2 | Knowledge about types of data models  | - | + | + | + | - |
| K2,S3 | Knowledge about fact table, dimension tables | - | + | + | + | - |
| C1 | Ability to discuss in a group  | - | + | + |  | - |
| C2 | Perform projects in a team. | - | + | + | + | - |
| Wages in overall verification of expected effects in % (Total 100%) | - | 50% | 20% | 30% | 0% |

\* Other methods of verification are described in the section “Description of traditional and innovative methods of teaching” of this document.

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| **Core literature** |
| 1. | Inmon W. H.: Building the Data Warehouse, Wiley&Sons, 2002 |
| 2. | Todman C.: Designing a Data Warehouse, Prentice Hall, 2011 |
| 3. | Kimbal R., Ross M.: The Data Warehouse Tolkit, The Definitive Guide to Dimensional Modeling, 3th Edition, Wiley&Sons, 2013 |

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| **Further reading** |
| 1. | Kimbal R.: The Data Warehouse Lifecycle Toolkit, Wiley&Sons, 2009 |

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| **Description of traditional and innovative methods of teaching**  |
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| **Remarks** |
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## Distance management of SMEs using ICT solutions

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| Agenda of a Module |
| Module title | **Distance management of SMEs using ICT solutions** |
| Level of module | bachelor |
| Language of instruction | English |
| Number of teaching hours | 4 |
| Number of ECTS credit allocated | 0,4 |
| Mode of delivery | face-to-face, team work |

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| **Module description** |
| The module concerns the use and implementation of Information and Communication Technology (ICT) , especially in distance managing Small and Medium Enterprises (SMEs). The course is a response to the nature of contemporary business management, with the constantly increasing amount of work, bureaucracy and the necessity to travel on business combined with the need to manage the company while away. During classes the students play the roles of the employees and entrepreneurs simultaneously to gain the perspective from both points of view – supervised by the teachers. The aim of the module is to test the effectiveness of the available ICT remote management instruments addressed SMEs. Therefore, our purpose is to prepare a study of implementation in real-life conditions, considering the advantages and disadvantages of the solutions tested, including possible future trends. Apart from the educational value of the course, the unique, dual perspective assumed by the students participating in it, provides them with a practical insight and skills to better understand and make better use of the conditions of managing and being managed. |

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| **Prerequisites and co-requisites** |
| 1. |  Basic knowledge and skills related to ICT |

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| **Goals** |
| GoalID | Description of a Goal |
| G1 | Developing knowledge on management functions and the role of SMEs in the economy. |
| G2 | Presenting some examples of ICT solutions for SMEs. |
| G3 | Developing knowledge on distance management of SMEs using ICT solutions. |

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| **Planned effects** |
| Knowledge |
| Effect ID | Knowledge type | Goal ID |
| K1 | Management functions and the role of SMEs in the economy. | G1 |
| K2 | Gained knowledge about available ICT remote management instruments. | G2,G3 |
| K3 | Trends and recommendations of distance ICT implementation, with particular emphasis on SMEs may be expected. | G2,G3 |
| Skills |
| Effect ID | Skill type | Goal ID |
| S1 | Skilled in using and implementing of ICT remote management instruments in SMEs. | G2,G3 |
| S2 | Is able to prepare and create ICT environment for SMEs. | G2,G3 |
| S3 | Organizes means for communication in a team. | G2,G3 |
| Social competences |
| Effect ID | Competence type | Goal ID |
| C1 | Ability to work in a group. | G1,G2,G3 |
| C2 | Perform projects in a team. | G2, G3 |

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| **Realized topics** |
| **ID** | **Topic** | **Hours** | **Goals** | **Effects** |
| L | LAB | EX | OTH |  |  |
| **1.** | Presenting management functions: planning, organizing, leading and controlling. | 0,5 |  |  |  | G1 | K1 |
| **2.** | The role of SMEs in the economy. | 0,5 |  |  |  | G1 | K1 |
| **3.** | Using and implementing ICT in SMEs. |  |  | 0,25 |  | G2,G3 | K2,K3S1,S2S3 |
| **4.** | Information on emerging tools and description of the basic function of each type. |  |  | 0,25 |  | G2,G3 | K2,K3 S1,S2S3 |
| **5.** | Presentation of examples of distance management of SMEs using ICT solutions |  |  | 0,25 |  | G2,G3 | K2,K3 S1,S2S3 |
| **6.** | Use of Internet services and social media in business |  |  | 0,25 |  | G2,G3 | K2,K3 S1,S2S3 |
| **7.** | Creating an ICT environment for SMEs. |  |  | 0,25 |  | G2,G3 | K2,K3 S1,S2S3 |
| **8.** | The role of mobile technologies in SMEs. |  |  | 0,25 |  | G2,G3 | K2,K3 S1,S2S3 |
| **9.** | Organizing means for communication in a team. |  |  |  | 0,25 | G2,G3 | C1,C2 |
| **10.** | Performing a project in a team  |  |  |  | 1,25 | G2,G3 | C1,C2 |
| **Total** | 1 |  | 1,5 | 1,5 |  |  |

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| **Topics for individual work** |
| ID | Topic | EffectsID | Goals ID | Hours |
| 1. | Analysis and selection of social media solutions for business | K2,K3S1,S2S3, C1,C2 | G2,G3 | 0,5 |
| 2. | Analysis of a selected ERP system dedicated to SMEs | K2,K3S1,S2S3 | G2,G3 | 0,5 |
| 3. | Analysis of selected Cloud Computing solutions dedicated to SMEs | K2,K3S1,S2S3 | G2,G3 | 1 |
| 4. | Analysis of selected CRM systems dedicated to SMEs | K2,K3S1,S2S3 | G2,G3 | 1 |
| 5. | Analysis of selected Business Intelligence systems dedicated to SMEs | K2,K3S1,S2S3 | G2,G3 | 0,75 |
| Total hours | 3,75 |

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| **Expected student involvement** |
| ID | Type of student’s activity | Hours |
| 1. | Classes | 4 |
| 2. | Individual work | 3,75 |
| 3. | Getting familiar with core literature related to the course and prepared course materials  | 1 |
| 4. | Preparation for laboratories | 1 |
| 5. | Preparation of own projects | 1 |
| 6. | Preparation to exam | 0 |
| 7. | Preparation of final projects | 1 |
| Total | 11,75 |

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| **Verification of expected effects** |
| **ID** | **Description** | **Exam** | **Project** | **Activity** | **Ownwork** | **Other\*** |
| K1 | Management functions and the role of SMEs in the economy. | - | + | + | + | + |
| K2 | Gained knowledge on available ICT remote management instruments. | - | + | + | + | + |
| K3 | Trends and recommendations of distance ICT implementation, with particular emphasis on SMEs may be expected. | - | + | + | + | + |
| S1 | Skilled in using and implementing ICT remote management instruments in SMEs. | - | + | + | + | + |
| S2 | Is able to prepare and create an ICT environment for SMEs. | - | + | + | + | + |
| S3 | Organizes means for communication in a team. | - | + | + | + | + |
| C1 | Ability to work in a group. | - | + | + |  | + |
| C2 | Perform projects in a team. | - | + |  | + | + |
| Wages in overall verification of expected effects in % (Total 100%) | - | 50% | 10% | 20% | 20% |

\* Other methods of verification are described in the section “Description of traditional and innovative methods of teaching” of this document.

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| **Core literature** |
| 1. | [Yahya Al Sharji](https://www.amazon.com/s/ref%3Ddp_byline_sr_book_1?ie=UTF8&text=Yahya+Al+Sharji&search-alias=books&field-author=Yahya+Al+Sharji&sort=relevancerank)(2011), A framework for the influencing factors in the adoption of ICT in SMEs: Adoption factors in determining successful usage of ICT in Small and Medium Enterprises, LAP LAMBERT Academic Publishing |
| 2. | Kenneth C. Laudon and Jane P. Laudon (2009), Essentials of business information systems, seventh edition, Prentice-Hall, NY, 2006 |
| 3. | Simon Melchioly (2009), ICTs and Development: Role of Mobile Phones use in SMEs Economic Development, VDM Verlag |
| 4. | [Online], http://ec.europa.eu/growth/smes/business-friendly-environment/sme-definition/, Accessed[24 Aug 2016]. |
| 5. | [Online], <http://www.unicornsystems.eu/en/news/article/what-is-the-task-of-ict-in-a-company-or-organization.html>,Accessed[24 Aug 2016]. |

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| **Further reading** |
| 1. | [Online], http://smallbusiness.chron.com/four-basic-functions-make-up-management-process-23852.html,Accessed[24 Aug 2016]. |
| 2 | [Simha R. Magal](https://www.amazon.com/s/ref%3Ddp_byline_sr_book_1?ie=UTF8&text=Simha+R.+Magal&search-alias=books&field-author=Simha+R.+Magal&sort=relevancerank), Jeffrey Word (2009), [Essentials of Business Processes and Information Systems, Wiley](https://www.amazon.com/Essentials-Business-Processes-Information-Systems/dp/0470230592/ref%3Dsr_1_3?s=books&ie=UTF8&qid=1474395784&sr=1-3&keywords=ICT+in+business) |
| 3. | [Online], Available: https://ec.europa.eu/research/evaluations/pdf/archive/fp6-evidence-base/evaluation\_studies\_and\_reports/evaluation\_studies\_and\_reports\_2007/study\_on\_innovative\_ict\_smes\_in\_europe\_-\_final\_study\_report\_2007.pdf, Accessed[24 June 2016]. |

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| **Description of traditional and innovative methods of teaching**  |
| During classes teachers  provide concrete, real-world examples to demonstrate useful (practical) ideas and then allow the students to work independently and collaboratively to solve the proposed problem. The intended result is that students will make intuitive or global observations about the assigned subject, then use deductive reasoning to provide answers. Moreover, the learning environment embraces the use of [technology in the classroom](http://www.weareteachers.com/blogs/post/2015/04/03/10-rules-for-a-successful-one-to-one-classroom). The teacher selects a specific device, then issues the device to students and educators. Everyone uses the similar device and all are equipped with the similar software and features, so maintaining and managing them is fairly simple. Class instruction and activities are designed around the use of these tools.This model requires districts to  shell out a sizeable sum for startup and maintenance. If a university isn’t equipped to take on such a feat, you can use the concept through **BYOD (Bring Your Own Device)[[1]](#footnote-1)** pedagogy, where students can use their personal devices for classroom use. However, the lecturer has to be inclusive, and though it certainly seems like it, not every student is sure to own a mobile device. If this is the case, students can perform tasks and activities in groups.That approach, known as **collaborative learning**, refers to a variety of teaching methods that involve groups of students or students and teachers working together on a class project. Many university districts across the world are adopting this new method.Collaborative learning can occur between two students or in larger groups. Students discuss concepts or solve problems. The benefits of collaborative learning include:Development of higher-level thinking, oral communication, self-management, and leadership skills.Increase in student retention, self-esteem, and responsibility.Exposure to and an increase in understanding of diverse perspectives.Preparation for real life social and employment situations.[[2]](#footnote-2)During activities in this module the use of **personalized learning is assumed**. **Personalized learning**[[3]](#footnote-3) is one of the top buzzwords in education nowadays. It suggests a host of different learning methods that are typically institution-driven. Personalized learning is, and will continue to be learner-driven where learners control their learning and become not just consumers of content but active creators of content, building knowledge through collaboration and connectivity via smart phone apps. Students will be in control not only of when they learn, but will demand that they contribute to their learning through discussions and collaboration, creating content while doing so. This student-driven phenomenon suggests that universities will need to respond and acknowledge that the learner is seeking this kind of personalized learning experience. |

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| **Remarks** |
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1. https://www.heacademy.ac.uk/enhancement/starter-tools/bring-your-own-device-byod [↑](#footnote-ref-1)
2. http://digitalhumanlibrary.com/3-effective-teaching-methods-for-new-teachers/

http://www.valleymorningstar.com/news/local\_news/article\_de0acb2e-1a2a-11e6-91bf-a30730d8c688.html [↑](#footnote-ref-2)
3. https://onlinelearninginsights.wordpress.com/2016/01/10/three-trends-that-will-influence-learning-and-teaching-in-2016/ [↑](#footnote-ref-3)