Programming with B4X

Curriculum Plan for middle and high schools

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Anywhere Software

Introduction

Computer Science is more than programming, but programming is an absolutely central process for Computer Science. In an educational context, programming encourages creativity, logical thought, precision and problem-solving, and helps foster the personal, learning and thinking skills required in the modern school curriculum. Programming gives concrete, tangible form to the idea of "abstraction", and repeatedly shows how useful it is. (Computing At School Working Group, 2012)

In the following sections we will deal with the teaching of programming with the B4X language. Initially the questions that will concern us are:

- What's a problem?
- How can we clearly describe the solution to a problem?
- In what language does the computer "understand" the commands we give it?
- What is Algorithm
- Implementing a Computer Algorithm
- Programming in B4J

What pupils should know

The expected educational outcomes depend on the students' previous level of knowledge. Each teacher is recommended to adjust his expectations according to the age, background and cognitive level of his students. More general issues that the teacher should take into account are:

Algorithms

- An algorithm is a sequence of precise steps to solve a given problem.
- A single problem may be solved by several different algorithms.
- The choice of an algorithm should be influenced by the data structure and data values that need to be manipulated.
- The choice of an algorithm to solve a problem is driven by what is required of the solution [such as code complexity, speed, amount of memory used, amount of data, the data source and the outputs required].
- Familiarity with several key algorithms.
- The need for accuracy of both algorithm and data [difficulty of data verification; garbage in, garbage out]
- Different algorithms may have different performance characteristics for the same task.

Programs

Pupils should know how to write a program in B4J (B4X)

- A computer program is a sequence of instructions written to perform a specified task with a computer.
- Programs are developed according to a plan and then tested. Programs are corrected if they fail these tests.
- A well-written program tells a reader the story of how it works, both in the code and in human-readable comments
- Programming is a problem-solving activity, and there are typically many different
- programs that can solve the same problem.
- Variables and assignment.
- Programs can work with different types of data [integers, characters, strings].
- The use of relational operators and logic to control which program statements are
- executed, and in what order
- Simple use of AND, OR and NOT
- How relational operators are affected by negation
- Abstraction by using functions and procedures (definition and call), including:
- Functions and procedures with parameters.
- Programs with more than one call of a single procedure.
- Documenting programs to explain how they work.
- Understanding the difference between errors in program syntax and errors in meaning. Finding and correcting both kinds of errors.
- Manipulation of logical expressions, e.g. truth tables and Boolean valued variables.
- Lists
- Maps
- Files

Data

A pupil should understand how computers represent data:

- Information can be stored and communicated in a variety of forms e.g. numbers, text, sound, image, video.
- Introduction to binary representation [representing names, objects or ideas as sequences of 0s and 1s].
- The difference between constants and variables in programs.
- Difference between data and information.
- String manipulation

Table of teaching Items

In the table below will cover the most necessary aspects of programming with B4X. For every unit will provide:

- brief description of the corresponding theory,
- lecture slides in power point,
- examples of solved exercises for understanding,
- exercises to learn in different levels of difficulty

The total teaching time was calculated at **60** hours, but this also depends on the level of the students and can be redefined.

Lesson		Details	Hours
1	The B4X language	• Why B4X • Downloading and Installing B4J and Java • Customize environment	1
2	The meaning of the problem	• What is a problem • Ways to represent a problem	1
3	My first Program	• Create a new program • How to run a program • How to Save • The turtle	2
4	Variables and Range	• Int • Float • How to name a variable • Mathematical Operators • Assign Values to Variables • The log function • Strings	3
5	Designer	• Talking about Designer • Design the first Screen • Views: Labels, TextFields, Buttons, Panes • Saving forms	2
6	From Designer to Code	• Class_Globals • Variables and Subs • Passing Values to Code • Events • Attribute	2
7	Conditional Statement	• Boolean Variables • Relational Operators • Logical Operators • If Statement • If-Else Statement • If-Else IF - Else Statement • MAX Algorithms	4
8	Subroutines	• What is a subroutine • Declaring a Sub • Passing Values • Returning Values from a sub	3

Lesson		Details	Hours
9	Classes – Objects	• What is a Class? • What is an Object? • What are Attributes and Methods? • Create and use simple class with B4J.	3
10	B4XPages	• What is a B4XPage • How to Create and Delete a B4XPage • Passing Values within Pages	3
11	Application 1	• "Mobile Phones shop application." • With the help of teacher pupils creates a more complex application	3
12	Loops	• What are Loops? • Do While • Do Until • For – Next • Algorithms with loops	5
13	XUI Views	• What is a library. • XUI library. • Dialogs • Templates	2
14	Arrays	• One dimensional Arrays • Basic Operations with arrays • Linear search • Binary search • MAX – MIN item • Sorting with Bubble Sort • Sorting with Selection Sort	4
15	Lists	• What is a list? • Basic Operations with lists	2
16	Maps	• What is a map? • Basic Operations with maps	2
17	Complex Data Types and Views	• Create new Type • B4XViews • Combo Boxes, Lists	4
18	Files	• File location in B4J • File Methods	2
19	Application 2	• In this app pupils will test their knowledge creating an application based in previous lessons.	10
20	From B4J to B4A	How to move an application to B4A	2
		Total Hours	**60**