Programming with B4X

Curriculum Plan for middle and high schools

Version 1.2, March 2021



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 problemsolving, 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

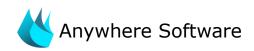


Table of teaching Items

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.

 The B4X language The meaning of the problem My first Program Variables and Range 		Details	Hours
1	The B4X language	Why B4XDownloading and Installing B4J and JavaCustomize environment	1
2		What is a problemWays to represent a problem	1
3	My first Program	Create a new programHow to run a programHow to SaveThe 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_GlobalsVariables and SubsPassing Values to CodeEventsAttribute	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 subroutineDeclaring a SubPassing ValuesReturning Values from a sub	3



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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 B4XPageHow to Create and Delete a B4XPagePassing 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.DialogsTemplates	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 TypeB4XViewsCombo Boxes, Lists	4
18	Files	File location in B4JFile 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

