

As mentioned earlier, the learning time decreased by five days from SDA 4-5 (without QBL) to SDA 6-9 (with QBL). However, there is limited insight into the actual amount of time the students spent on studying during the different course offerings. Time on task is essential for learning and might have an impact on a student's self-assessed confidence. Bälter et al. [3], had students log their study hours and no statistical differences in study time was found between the different course designs. However, not all students participated, and in some course offerings, logs were not collected at all (SDA 4, 7-9). On the other hand, the fact that the course always ran full-time decreases the risk of variation in workload between the course offerings.

5.4 Future Research

This study aimed at examining how student self-assessment of confidence relates to gender, QBL and quiz scores. As for future research, it would be interesting to conduct similar research, but from new perspectives. For example, one could look at if QBL has a different effect on confidence in different age groups. For instance, one could compare primary with secondary and higher education. Furthermore, it would be interesting to look at if the subject area matters to the self-assessment outcomes of QBL. For example, one could investigate if the results would differ if the study was conducted in a non-programming course or even a non-technical one.

6. CONCLUSION

The obtained results suggest that question-based learning increases the correlation between quiz scores and self-assessed confidence. This indicates that students are more consistent in their self-assessment of confidence with regards to their quiz scores when question-based learning is present. In practice, this means that students with high confidence score high on the quizzes, while students with lower confidence score lower.

The results also suggest that use of question-based learning material, being male and having high quiz scores in general was related to greater student confidence in programming. Gender as well as measures of knowledge, in this case quiz scores, have in previous research been shown to affect confidence. Our study confirms those findings within the context of an introductory programming course. The finding that question-based learning increases self-assessed confidence is new knowledge within the research area. However, one must consider the scope of this study. The results may not be generalizable to other types of courses and circumstances. Therefore, we encourage more studies on question-based learning and self-assessment.

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Appendix A: Topics from the confidence surveys

Table A: List of all topics on the weekly confidence surveys during the PF module with their corresponding code, if analyzed.

Week	Topic	Analyzed	Code
1	The difference between fields, constructors, and methods of a class		
1	The different components of a method header (accessibility, return type, name, parameters)	x	a
1	The difference between kinds of variables (fields, parameters, local variables)	x	b
1	Writing boolean expressions using && (logical AND) and (logical OR)		
1	Using conditional statements (if-else) to model decisions in Java programs	x	c
1	How information hiding is achieved in object-oriented programming	x	d
1	How a method can return a value of a certain type		
1	The concept of encapsulation in object-oriented programming	x	e
1	The different types that variables can have (int, boolean, String, etc)	x	f
2	Using an ArrayList to group objects together		
2	Using parameterised types / generics in collections		
2	Implementing a generic class		
2	Using a for-each-loop		
2	Using a for-loop		
2	Using iterators		
2	Using a while-loop		
2	Using an array		
2	Creating random numbers		
2	Using a HashSet		
2	Using a HashMap		
2	Explaining the differences between list, set and map data structures		
3	Inheritance as a concept in OOP	x	g
3	How inheritance syntax is expressed in Java	x	h
3	Use of abstract classes	x	i
3	Use of buffers in file input / output		
3	Use of interfaces	x	j
3	The use of exceptions in Java	x	k
3	The use of 'super' keyword		
3	Overriding fields and methods		
3	Difference between static and dynamic types		
3	Difference between checked and unchecked exceptions	x	l
3	try / catch / finally syntax in Java	x	m