

Formative assessment methods appropriate for use in empirical investigations in biology lessons at primary school in the Czech Republic

Lukas Rokos, Radka Zavodska, Jan Petr, Miroslav Papacek

University of South Bohemia in Ceske Budejovice, Faculty of Education, Czech Republic

Introduction

Empirical investigation represents crucial competence which students can gain during inquiry-based biology education (IBBE). There is a methodological problem with the assessment of student's performance during the IBBE because the classical summative assessment is not able to capture student's progress and take into consideration all student's activities. The formative assessment (FA) can help teachers and students to feel more confident in the partial steps of IBBE and improve their achievements. Thus, the formative assessment methods (FAM) are determined as promising assessing approach.

Theoretical background

The FA can include various methods, from self-assessment, peer-assessment to teacher's assessment and it can also monitor various aspects of teaching-learning process. These methods have certain common features and their purpose is to help in the learning process. Peer-assessment is one of the FAM. Students evaluate the quality of peer's work or level of his/her performance. Afterwards they decide to which extent the peer has met set goals or criteria and guide him to improve his work and get closer to the criteria. Topping (2009, 2013) found out a positive correlation between students' achievement and peer-assessment as the FAM. Students involved in the peer-assessment process (e.g. point to strengths and weaknesses of peer's project, suggest the changes etc.) submitted better own works afterwards compared to students who received feedback from teacher and were not involved in the peer-assessment.

The international project of the 7th Framework program called ASSIST-ME (Assess Inquiry in Science, Technology and Mathematics Education) is a high level research project that will investigate formative and summative assessment methods to support and to improve inquiry-based approaches in European science, technology and mathematics education. The overall aim of this project is to verify the efficacy of the FA as well as to map the situation of this assessment approach in selected European countries and to design a range of appropriate assessment methods which would supplement current assessment tools.

The peer evaluation is a deep-rooted assessing method in the Czech education. This evaluation is limited by grading of peers and it usually does not enable progress of the formative component in assessment. Thus, we focused on this method in our study.

Methods

The peer-assessment as the FAM was implemented into the inquiry biology lessons at primary and lower secondary level at selected schools in the Czech Republic. There were 2 local research groups, first one was focused on integrated science at primary level and the second one on biology at lower secondary level. In total there were 3 local research groups, but the third group was focused on mathematics at primary level and had different research design. The research has 3 rounds and there were performed interviews with the teachers as well as with all students before the start of the research and immediately after finishing it.

In the experimental session, students designed their own experiment and their designs were assessed by their peers (detailed design is described on Figure 1). In total 291 students and 12 teachers at 8 schools in South Bohemia were involved in this research. Students were divided randomly into experimental group (received feedback from their peers) and control group (received feedback from the teacher).

Results

The peer assessment was found as appropriate method for assessing students' performance in inquiry biology lessons. Students accepted feedback from their peers but on the other hand they have problems with providing it. They need the guidance how to assess or how to express their ideas.

Moreover we were interested in the acceptance of peer-assessment among the students. Students were asked whether they preferred commentaries in the written feedback or the final grade. Three quarters of students chose the commentaries (Fig. 2) as most useful part of the feedback. After that they added these commentaries are better understandable for them and they know what to improve in their next work.

They also stated that the feedback help them to improve their product (independently on the provider of feedback). Both groups, experimental and control, found the written commentaries more helpful than classical grades.

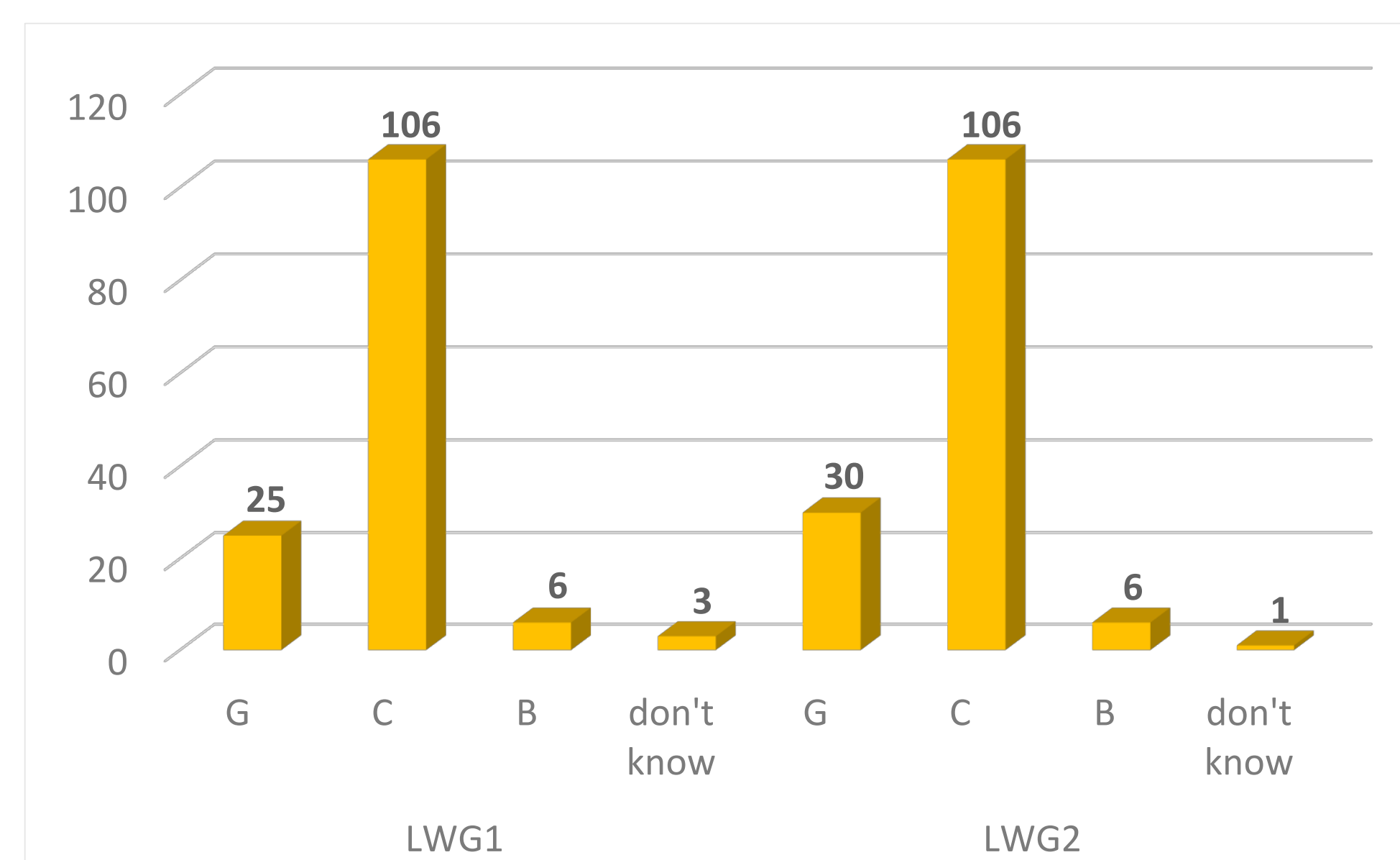


Figure 2: Students' preference in the provided feedback

Legend: LWG1 – local working group at primary level (integrated science), LWG2 – local working group at lower secondary level (biology), G – grades, C – commentaries, B – both

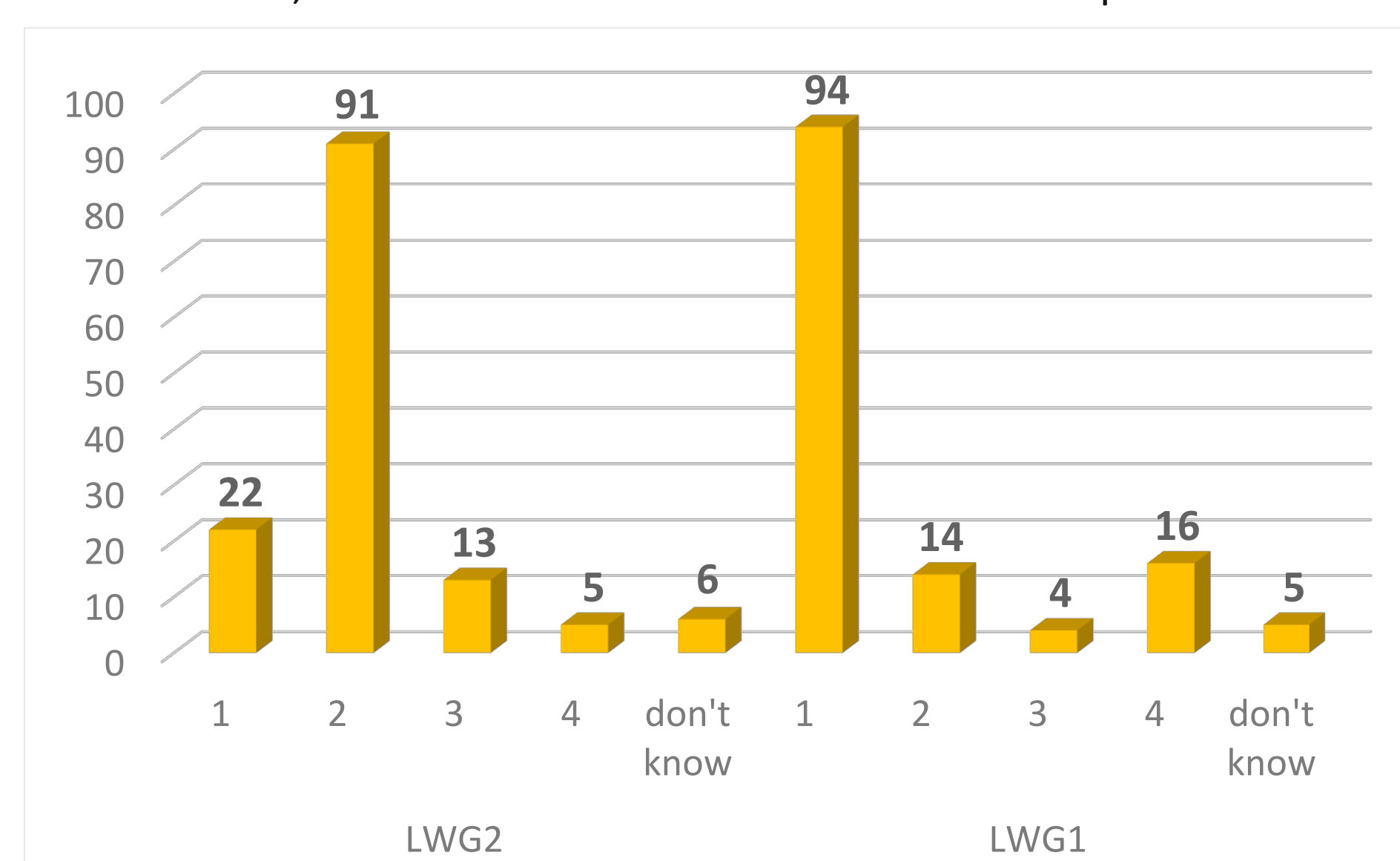


Fig. 3: Students' opinion on usefulness of provided commentaries

Legend: LWG1 – local working group at primary level (integrated science), LWG2 – local working group at lower secondary level (biology), 1 – very useful, 2 – rather useful, 3 – rather useless, 4 – useless

References

BERNHOLT, S.; RÖNNEBECK, S.; ROPOHL, M.; KÖLLER, O.; PARCHMANN, I. (2013). National reports of partner countries reviewing research on formative and summative assessment in their countries. Kiel: Leibniz-Institute for Science and Mathematics Education (IPN).
 TOPPING, K.J. (2009). Peer assessment. *Theory into Practice*, 48, 20–27
 TOPPING, K.J. (2013). Peers as a source of formative and summative assessment. In: McMillan, J.H. (Ed.): *Handbook of research on classroom assessment*. Los Angeles: Sage, 395–412

ACKNOWLEDGEMENT:

Publication of this poster was supported by ASSIST-ME project (SiS.2012.2.2.3-1) and grant GAJU 118/2016/S.

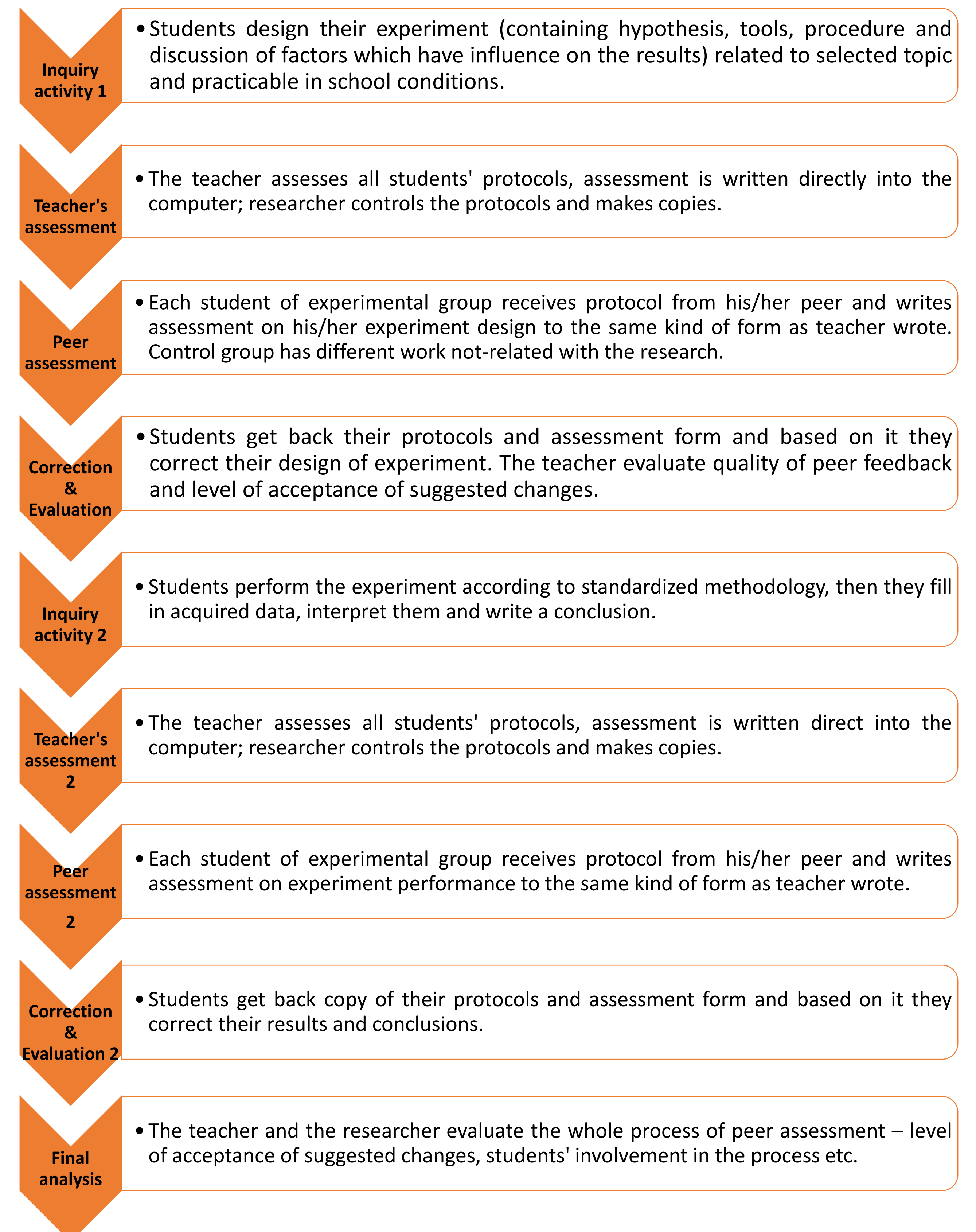


Figure 1: Description of the research design

Beside this fact we asked the students whether they prefer assessment from teacher or from their peers. During the experiment there were no boycotting of the peer feedback but most of students would prefer the teacher's assessment (Fig. 4). In the additional question they quoted that their teachers are educated, more responsible, trustworthy so they trust them more than their peers.

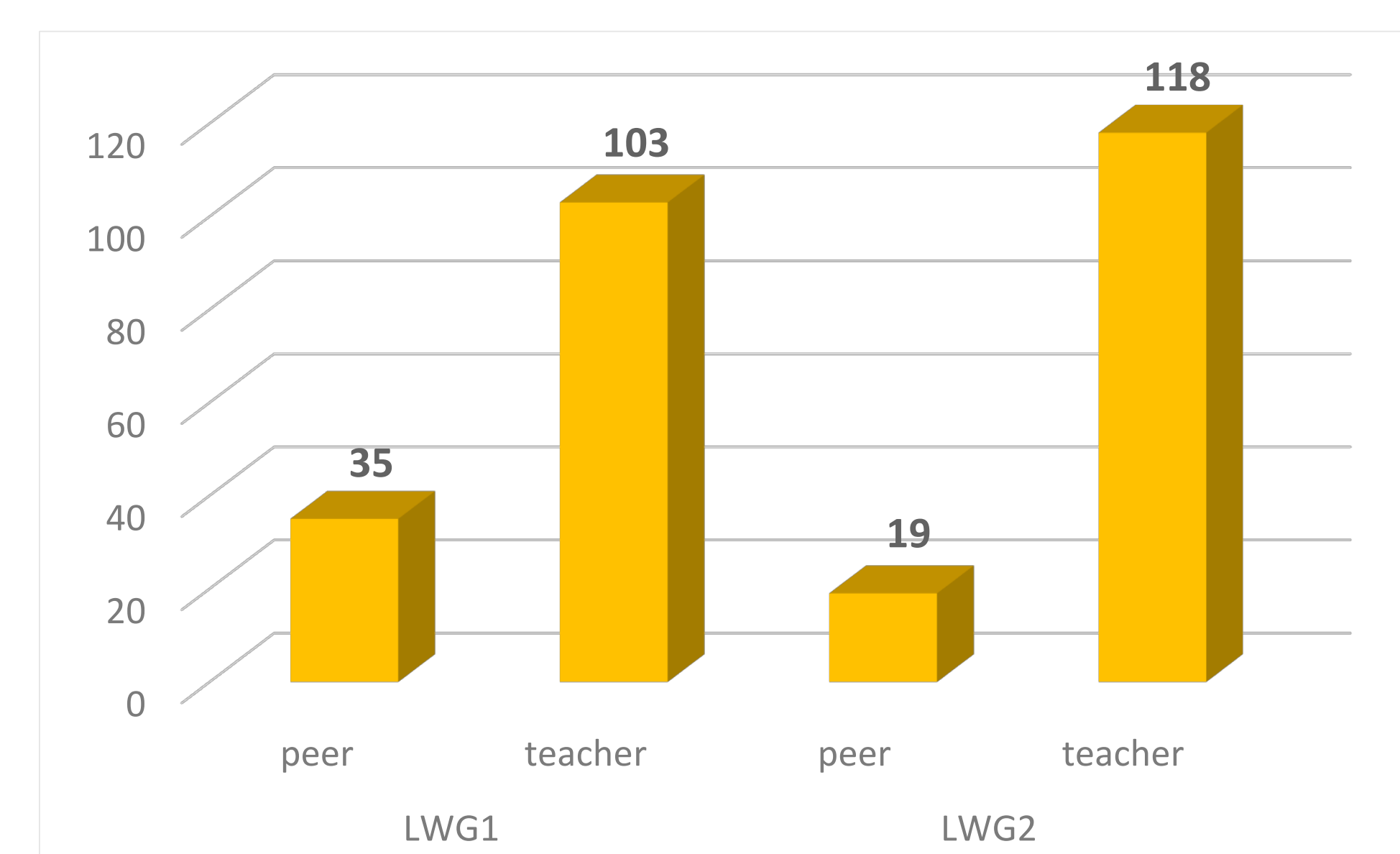


Fig. 4: Students' preference of assessing person

Legend: LWG1 – local working group at primary level (integrated science), LWG2 – local working group at lower secondary level (biology)

Conclusions

The peer-assessment seems to be a perspective method for assessing students in the inquiry-based lessons in integrated science at primary level and biology at lower secondary level. This assessment method enables to express students' performance in all steps of inquiry tasks. Although the peer-assessment is said to enable a combination of formative and summative assessment, the formative non-evaluative peer-feedback is the most important component of this assessment (also see Topping, 2013).

In the comparison of experimental group (received feedback from peers) and control group (received feedback from teachers) both groups perceived the feedback in the same way. The students prefer written commentaries rather than classical grades and they found them helpful for improvement of their product as well as for their future work. Interesting finding is the fact that students still prefer assessment from teachers because of their presumed quality and credibility.



ASSISTME



Pedagogická fakulta
Faculty of Education

Jihočeská univerzita
v Českých Budějovicích
University of South Bohemia
in České Budějovice

Corresponding author:
Lukas Rokos - Lrokos@pf.jcu.cz