Using Peer Instruction Method – Teacher Workshop Experience

Norbert Beták[1], Zuzana Sándorová[2]
[1] Department of Tourism, Constantine the Philosopher University in Nitra, Slovakia
[2]Department of English Language and Culture, Constantine the Philosopher University in Nitra, Slovakia
Email: [1]nbetak@ukf.sk, [2]zsandorova@ukf.sk

Abstract

The Peer Instruction method is an active teaching method that encourages students to think, act and argue continuously. Students are guided to answer questions and solve relevant problems mainly through the exercise of higher mental processes. The Peer Instruction method is based on questioning, so a strong emphasis is placed on formulating questions. Based on the possibilities of the method, it is highly recommended to expand it more widely and implement it into everyday educational practice. In the paper, we present workshops designed for university teachers to introduce the Peer Instruction method and we summarize our experiences as well. Specially, we deal with the preparation and implementation of the workshops and also analyse their progress. We give examples of questions formulated by workshop participants, present online and offline e-voting tools, and summarize teachers´ opinions on the method as well as on the workshop itself.

***Keywords**:* Education, e-voting, feedback, workshop

1. Introduction

In general, continuous professional development is an important process without which it is very difficult to keep up with the constant development and progress in different fields and sectors. In particular, lifelong learning is essential in professions that mediate, build and extend learning. The teaching profession is characterised by its breadth in terms of the required skills and competencies and calls for their regular and continuous development and upgrading in order to ensure the desired quality of the educational activity. Teachers' professional preparedness can have a significant impact on educational outcomes and also has the potential to develop students' motivation and value orientation, as well as to overcome bias.

Teachers are responsible for operating the educational system and they need strong and efficient professional competencies since they have a massive influence on the success of implementing 21st-century skill practices in educational organizations. Teachers can hone their students' talents and polish their potential to embody superior personal competencies [12]. Ideally, they should demonstrate the following competencies: 1) effective classroom management, 2) effective teaching practices, 3) effective assessment, and 4) technology skills [9].

Nevertheless, as mentioned above, today's school, in accordance with the latest trends, indisputably needs a "new profile" of a modern teacher, with a wide range of developed competencies, which would enable them to successfully organize work, motivate and encourage students, critically reflect on their practice, independently research and use these results for the purpose of self-improvement [11]. The digitalization of education has undoubtedly influenced the professional competence framework of the teacher, who must not only be able to use modern digital technologies almost as an IT expert at times but also implement them appropriately in their educational activities in order to increase the quality of their pedagogical work.

In this paper, we give an overview of two workshops designed for university teachers to increase their knowledge about interactive teaching and to encourage them to use e-voting as a teaching tool within the Peer Instruction (PI) teaching method. While the primary objective of the study is to present the online and face-to-face workshop using the PI method and the participating teachers' feedback, an introduction to the theoretical essentials, as well as a description of the applied e-voting tools is also provided.

2. The Peer Instruction method and E-Voting

One of the methods that improve the quality of education and allow active student participation is the method of Peer Instruction. This interaction-oriented approach developed by Erik Mazur [8], a Harvard physics professor and scientist, emphasizes the democratic way of teaching, has both cognitive and emotional aspects and allows in-classroom communication resulting in the desired knowledge development [2].

It was first implemented in classes at Harvard University to increase students' knowledge of physics, thus leading to better performance in various exams and quizzes, including the Force Concept Inventory (FCI). FCI is a multiple-choice instrument [6] that asks conceptual physics questions using everyday terms [7]. The PI method is based on "electronic voting" and appropriately formulated questions. It is basically a cycle that consists of several consecutive steps, the most beneficiary of which is the discussion evoked in response to a given question among students. So, the PI method is an activating way of teaching, and its effectiveness has already been established by a number of research and measurement [8], [3], [5], [14], [2], [13], [1].

A central term associated with the PI method is "concept test", presented in a form of questions and aimed at deepening the knowledge or correcting the misconceptions of some basic concepts and principles arising from the given curriculum. These questions are actually the driving force and, hence, the most important part of the teaching.

The reasons, why the courses taught through the PI approach are more successful at promoting understanding at a conceptual level than courses taught via traditional methods are, as follows:

- students arrive to class having completed pre-reading activities;
- students' attention is engaged through posing an interesting question at the beginning of the lesson;
- student misconceptions are discussed during the lesson;
- student participation is ensured by showing answers using flashcards;
- the brief summary of the given topic is reinforced with concept questions;
- students learn about their mistakes through discussions with their peers;
- after peer-discussion knowledge is reinforced through the correct answer given by the teacher [14].

The particular steps of the PI cycle are the following [8]:

1. A question is posed;
2. Students are given time to think;

3. Students record individual answers;
4. Students try to convince their neighbours (peer discussion);
5. Students record revised answers;
6. Feedback is given to the teacher: a tally of answers;
7. The instructor explains the correct answer.

Usually, special digital tools are also used when teaching with the PI method. Electronic Voting Systems (EVS) generally include a collection of handsets (transmitters), a receiver and bespoke software. Naturally, a number of different propriety systems are available, each providing variations in functionality and methods of communication. For example, some systems use infra-red light whereas others radio frequency to facilitate communication between the transmitters and the receivers [10]. In addition, online form-voting is also known. Its advantage is that no special technical means are needed to vote which leads to the elimination or reduction of the expenses on technology. It is enough to have access to the Internet (wi-fi) and to the software that allows online voting. In this case, students usually give their answers - votes via their smartphones or tablets. Not surprisingly, hence, online voting due to its independence from specific technical devices and the classroom has become extremely beneficial during the Covid-19 pandemic when online learning was often the only possible form of education.

3. Peer Instruction Workshops for Teachers

During the last year, we planned two PI training activities for university teachers with the following main objectives (MO):

MO1. To familiarize the participants of the training with the PI method and the possibilities of its interdisciplinary use.

This objective consisted of three steps:

1.1 To introduce the PI method and the possibilities of using e-voting in the educational process;

1.2. To highlight the need to develop students' intercultural competences;

1.3. To identify the possibilities of developing intercultural competences using the PI method.

MO2. To learn about the opinions and recommendations of experienced practitioners regarding the use of PI in the educational process.

The individual learning activities were organised as workshops; while the first (Workshop 1) took place online in January 2021 and the second (Workshop 2) was held face-to-face in June 2022.

Workshop 1 comprised the following steps:

1. The participants were provided with online video lessons on the essentials of PI;
2. The participants were given time to study the given materials;
3. The participants were given tasks to complete individually based on the materials;
4. The participants used www.padlet.com to share their responses and opinions.

The tasks of Workshop 1 were, as follows:

1. Answering a question based on the video lessons: „Why is the PI method effective and useful?“

2. Formulating one question that does not meet the criteria and one question that meets the criteria for a conceptual PI question.

Workshop 2 consisted of seven steps:

1. Learning about the essentials of the PI method;

2. Trying out the voting system – online and offline;

3. Answering the PI questions individually using the voting system;

4. Discussing the PI questions in groups;

5. Answering the PI questions individually using the voting system again;

6. Discussing the PI questions with the whole class;

7. Completing the post-workshop questionnaire.

Workshop 1 was held during the first wave of the Covid-19 pandemic. Even though we originally planned to conduct it face-to-face, due to the strict anti-pandemic measures, it was necessary to change the form of the workshop, as well as its content in accordance with the changed conditions.

As mentioned earlier, firstly, the participants were asked about the efficiency and usefulness of the PI method based on the provided materials. In the following part of the study, selected answers that can serve for future consideration when planning lessons using the PI method, are presented.

Participant1: The PI method works because the students have already pre-studied the issues within their homework assignment - if we provide the materials in advance. Also, the students have space/time for discussion and, thus, can think more intensively about the given issues.

Participant2: The PI method can work because students can study the topic at home at their own pace, they are not under any pressure from the teacher/classmates to understand it in a short time. In addition to the materials provided, they can also look up additional information. Another plus is the follow-up discussion in class, which reveals the students' knowledge and preparedness for the lesson. Furthermore, as explained in the video, it is better for students to talk about the topic with their classmates than if it was explained only by the teacher in form of a lecture.

Participant3: The PI method is successful mainly due to several reasons. 1. It is student-centred, but at the same time, it also develops students' self-responsibility as they have to study the material and prepare for the class. 2. It is interactive: instead of the classical, monotonous delivery of the material, the students are actively involved in the learning process, due to which can also have an impact on motivation. 3. The student/participant develops several skills at the same time (cognitive, digital, soft skills, etc.) 4. It provides the teacher with almost immediate feedback and, thus, also with the possibility to modify the teaching process (methods, tasks, etc.).

To summarise the above-provided opinions and complete it with some additional facts based on the literature review, the success of peer instruction lies in the fact that students can learn from their classmates who are closer to them in age and style. As Mazur (1997) points out, students usually trust their peers more than the teacher who (often) does not understand what the students do not understand; however, the fellow students, who are also about to acquire the knowledge,

understand better what the problem might be, are more sensitive and, therefore, able to respond better to the needs of those who feel to be lost. Furthermore, PI does not stigmatise error but regards it as an opportunity since students can learn from it and draw on their peers' way of understanding. Also, students have a more active role in learning, which leads to more lasting and practical knowledge. In addition, the teacher gets feedback (sooner) on how well the students understood the given issue and can tailor the further part of the course/lesson in accordance with the group's needs with guided and appropriate questions. Last but not least, access to knowledge takes the form of a "democratic" discussion, for which there is more time in the class because the issue had to be pre-studied.

As already mentioned the second task in Workshop1 was to formulate one question that did not meet the criteria and one question that met the criteria for a conceptual PI question. This step followed the first part of the training, during which the participants had already gained knowledge about the PI method. We present a selection of questions created during the training which are all related to the topic of intercultural competence.

CORRECT QUESTIONS:

1) What is it? "Based on my experience some people in Slovakia tend to be rather conservative."

a. stereotype

b. cultural expectation

c. cultural barrier

d. cultural generalization

2) Which of the following had the most positive impact on the modern world?

a) coffee

b) tea

c) chocolate

d) sugar

e) spice

INCORRECT QUESTION:

1) What is the name of the long black dress worn by Muslim women?

a. hijab

b. abaya

c. burka

d. dress

2) In communication the person who gets the message is known as the ___:

a) receiver

b) receiver response

c) race

d) none of these

When developing good PI questions it is recommended to consider which problems are notoriously difficult to solve for the students. The basic criteria to create appropriate ConcepTest questions are, as follows [4]:

- Focus on a single and important concept, ideally corresponding to a common student difficulty;
- Require thought, not just plugging numbers into equations;
- Provide plausible incorrect answers;
- Be unambiguously worded;
- Be neither too easy nor too difficult.

Workshop 2 was held as a side event of an international conference on teaching the English language; hence, it dealt with the possibilities of using innovative teaching methods including "Peer Instruction" and "Design Thinking" within the subjects developing intercultural communication skills in the English language. During the workshop, the participants had the opportunity to get acquainted with the methodological approach of these teaching methods, as well as to try out how they work in practice, especially in developing the mentioned skills. The number of participants was 25, with a total of 11 respondents answering the post-workshop questionnaire that was distributed the next day after the workshop. Figure 1 presents selected responses collected from the participants. After graphically processing the results obtained using the Likert scale, we can declare that all the three presented statements obtained predominantly “Agree” or “Strongly Agree” opinions. It means that most of the respondents identify with the following statements: a) they can imagine using the PI method in their classes, b) the workshop was well organized and implemented c) the content of the workshop was engaging and motivating. However, even though to a much lesser extent, we also observed criticism concerning the organisation of the workshop; also, 18% of the respondents took a neutral position on whether they can imagine using PI in their subject.

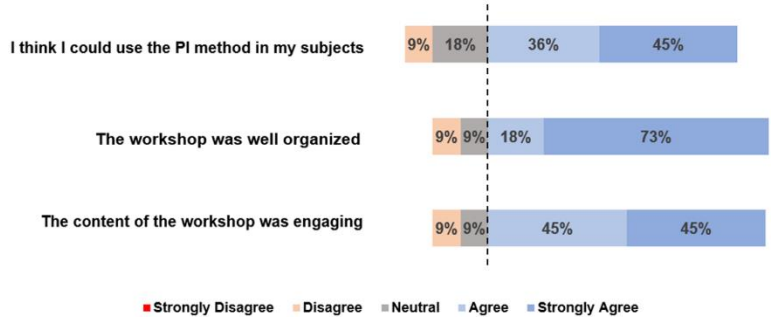

Fig. 1 Participants’ feedback on the workshop

In addition, we also asked respondents to justify their opinions, i.e., to write a few words that best describe their previous choice. (It could be a both positive and/or negative standpoint). We grouped the received answers alongside four different aspects, as follows:

- **Efficient**
- **Interesting**
- **Engaging**
- **Relevant**

Thus, according to the participants, the PI method was most often associated with the following features: high effectiveness, interesting for students, high level of student engagement and high relevance to language learning and the development of intercultural competences.

4. Conclusion

In the planning phase of the workshops, two main objectives were set. We can claim that they were fulfilled since the participants of the workshops gained the theoretical and practical basis necessary for the implementation of the PI method in the classroom. Also, the participants got acquainted with the principles of using e-voting, (both the online and offline version), gained experience with the use of the PI method, i.e., created and formulated questions, as well as led discussions and practised argumentation. A not least significant benefit of the workshops is that the teachers expressed their willingness to continue practising and work with the PI method, as well as to cooperate in the future.

The feedback collected after the workshops is extremely important and will, therefore, be incorporated into the design of future training in order to meet the participants' expectations and to achieve their satisfaction to an even greater extent. Based on the above-provided analysis and information from the participants of the workshops, several conclusions and recommendations can be drawn.

1) It is necessary to increase the amount of time allotted to learn the theoretical foundations of the PI method, together with pointing out the examples of best practices of its application in different areas and subjects.

2) Also, it is advisable to pay more attention to the creation of questions and Concept Tests and to create more opportunities for the participants to formulate them. The aim is to improve the creation of the right questions, to practise questioning, leading discussions, and argumentation, to be able to distinguish between questions suitable for teaching with the PI method and the inappropriate ones and to collect possible misconceptions from the disciplines being taught.

3) We recommend creating a comprehensive training material that is suitable for self-study and for reviewing basic concepts and principles of the method in question.

4) Last but not least it is also important to strengthen teachers' engagement and motivation to use activating teaching methods such as PI.

Therefore, we consider it pivotal that teachers expand their knowledge and competences through continuous further education. It is important not only due to the constant transformation of the

world and the emerging new challenges of society, but also because generations change, and every single student is different, unique and worthy of a professional approach.

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