

Work Package 6: Application of PLCs

D6.3 Report on pre and post measurements of participants' attitudes, knowledge and expectations/ evaluations of applying PLCs

Report on pre and post measurements of participants' attitudes, knowledge and expectations/ evaluations of applying PLCs from HO (European University Cyprus)

Introduction

This is a report on pre and post measurements of participants' attitudes, knowledge, and expectations/ evaluations of applying PLCs from HO (European University Cyprus - EUC). At the EUC faculty worked in PLCs. In total 4 faculty PLCs (fPLCs) formed and run through the academic year 2022-2023. The first included instructors from the Early Childhood Education Program, the second one from the Pharmacy Program, the third from the Department of Health Sciences, and the fourth was an interdisciplinary group from the School of Dentistry, School of Law and the School of Humanities. Each fPLC was coordinated by a member of the group (internal coordinator). In total 26 academic professionals/instructors took part in this initiative.

Methodology

All the faculty were asked to respond to an online questionnaire (pre-questionnaire) before the PLCs started their operation. Similarly, a post-questionnaire was administered to the participants immediately after the end of the operation of the PLCs for the academic year 2022-2023. 24 participants responded to the pre-questionnaire, while 21 participants responded to the post-questionnaire. To connect the two questionnaires (identification of each participant's pre & post responses), participants were asked to fill out a unique code. During this process, 17 participants were identified (see Table 1). The results presented in the next section refer to the analysis of the data derived from the responses of these 17 participants.

Due to the non-normal distribution of the data, non-parametric tests were employed. The Wilcoxon test assessed changes in pre- and post-responses within participants. The Kruskal-Wallis test then examined differences between school fPLCs and the overall ranking across all questions within the pre and post phase. A post hoc pairwise comparison using the Mann-Whitney U test with a Bonferroni correction to control for multiple comparisons and Type I error of false positives followed.

Table 1. *Participants' demographics*

Variables	Categories	N	%
School	Humanities, Social & Education Sciences	4	23.5%
	Sciences	7	41.2%
	Law	1	5.9%
	Dentistry	5	29.4%
Gender	Male	7	41.2%
	Female	10	58.8%
Age	Below 30	1	5.9%
	30-39	6	35.3%
	40-49	8	47%
	50-59	1	5.9%
	60 and above	1	5.9%
Rank	Full-time	13	76.4%
	Part-time ¹	4	23.6%
I usually teach..	Undergraduate	12	70.6%
	PhD	1	5.9%
	Undergraduate & MA	3	17.6%
	Undergraduate & MA & PhD	1	5.9%

¹Special Teaching Personnel, Special Scientist

The pre-questionnaire consisted of three parts (a) Personal Details, (b) Participants' knowledge and expectations (c) Participants' attitudes (readiness), and it examined respondents' attitudes, knowledge and expectations/ evaluations of working in PLCs. Post-questionnaire was also created based on these parts (b & c), including an additional part with

open-ended questions. The questions asked the participants to:

1. Refer to the most positive part from their participation in their fPLC.
2. Suggest one element that they think would improve the operation of the fPLCs
3. Describe an action you have implemented with your fPLC that you believe had a positive impact on students.

Results

Due to the small sample, a non-parametric approach was adopted for statistical analysis. Initially, the Wilcoxon signed-rank test was utilised to assess the median differences before and after the PLC's operation.

Comparative Analysis Of Faculty Responses Pre And Post Participation In fPLCs

Findings, as presented in Table 2, indicate stability in some aspects as well as positive change in faculty development and cooperation. The Wilcoxon rank test applied to pre- and post-questionnaire responses indicates that for most items, there is no statistically significant change in the median responses among the 17 participants, as indicated by asymp. significance (2-tailed) values which are well beyond the typical alpha level ($P=0.05$). Notably, there were no median decreases in any area except for statement 11, "Achieved to reflect on actions that we planned and implemented", where the median difference indicates a slight reduction in reflection on actions planned and implemented, yet not statistically significant. Statement 20, "Felt ready to jointly plan actions with colleagues on area prioritised in fPLC" shows a significant median increase ($p=0.048$), suggesting a significant change in participants' readiness to plan actions collectively in their fPLC. Additionally, a few other areas did show a positive median increase, suggesting improvements due to the PLCs. For example, items 5, 6, 7, 8, and 9 all reflect a median increase, with faculty members perceiving an enhancement in deciding on actions together, planning for improvement, and experiencing more effective communication and increased trust. Despite these perceived improvements, it is important to note that these changes were not statistically significant. Similarly, items 19 and 21 also showed median increases regarding the readiness to exchange ideas and implement new practices, suggesting that participants felt ready and equipped to engage in the activities, although these changes were, again, not statistically significant.

Given the limited sample size, while qualitative feedback and descriptive data suggest improvements in participant preparedness and collaboration within PLCs, statistical analysis yields no substantial evidence of significant changes. The lack of significant p-values in most statements suggests that the median values remained unchanged and there was no statistically significant measurable difference before and after participating in fPLCs, meaning that PLCs as interventions did not lead to significant changes in attitudes or perceptions. Therefore, any improvements might be due to factors not captured by the quantitative analysis.

From a descriptive analysis level, 1 statements that demonstrated an increase based on median differences (see Table 2) between the pre and post-questionnaires are the following:

In the context of working within my faculty Professional Learning Community (fPLC), I believe we have achieved...

- a common vision among the fellow faculty members in our fPLC (*st. 1*)
- members to decide together and choose the actions implemented (*st. 5*)
- to plan actions that were important for improvement and professional learning (*st. 6*)

Through the fPLCs operation we have achieved...

- communication among peer faculty members of the University to become more effective (*st. 7*)
- to increase cooperation between fellow faculty members of the University (*st. 8*)

- to increase trust between fellow faculty members (st. 9)

Through my participation in my fPLC, I managed to...

- look for solutions, ideas, and approaches for the area that we have chosen as a priority in our fPLC (st.12)
- learn how to overcome any challenges I face in the area that we have chosen as a priority in our fPLC (st. 14)
- become more capable to contribute to the collective effort of our university to be improved in the area that we have chosen as a priority in our fPLC (st. 15)

My participation in my fPLC was...

- a more effective form of professional learning for me than other forms of professional learning and development (st. 17)
- Regarding my participation in the fPLC, I feel ready to...
- to exchange ideas, suggestions, or experiences with other academics on areas prioritised in fPLC (st.19)
- ready to jointly plan actions with colleagues on area prioritised in fPLC (st.20)
- ready to implement new ideas or practices for area prioritised in fPLC (st.21)

In general, the participants seem to believe that through their participation in fPLCs, a shared vision and trust between colleagues was developed, resulting in more effective communication and increased cooperation between faculty members that allowed for solution-focused practices and readiness to overcome challenges. In addition, they feel that through their participation in their fPLC, they have become more capable of contributing to the area they have chosen as a priority in their PLC. They also consider their participation in fPLC as a more effective form of professional learning than other forms of professional learning and development. Regarding their participation in the fPLCs, participants responded that are ready to exchange ideas and suggestions amongst colleagues, are ready to plan actions and implement new ideas, something that further emphasises the collaborative climate nurtured within fPLCs.

The only statement that showed a decrease in the post-questionnaire is the following:

Through the fPLCs operation we have achieved...

- to reflect on actions that we planned and implemented (st. 11)

Participants did not feel that they reflected on actions that they planned and implemented. This observation aligns with earlier findings¹ indicating that the constrained time available for undertaking and reflecting upon new implementations may have acted as a limited factor in the effectiveness of PLCs to allow for deeper reflection and assessment of practices.

For the remaining statements, the data showed no difference in median responses.

In the context of working within my faculty Professional Learning Community (fPLC), I believe we have achieved...

- peer professional learning to be supported and promoted by the University (st. 2)
- collective decision making to be based on data that we have collected and analysed from our courses (st. 3)
- to explore the perspective of all involved (e.g., students, academic administration) (st. 4)

Through the fPLCs operation we have achieved...

- The skills of fellow academics to be used towards the area that we will choose as a priority in our fPLC (st.10)
- to reflect on actions that we planned and implemented (st. 11)

Through my participation in my fPLC, I managed to...

- learn to apply practices that I have heard about the area that we have chosen as a priority in our fPLC (st. 13)

¹ D4.2 Report on the application and evaluation of toolkit activities

- become more capable to contribute to the collective effort of our university to be improved in the area that we have chosen as a priority in our fPLC (st.15)
- implement innovative ideas in my teaching practice for the area that we have chosen as a priority in our fPLC (st. 16)

My participation in my fPLC was...

- a more effective form of professional learning for me than other forms of professional learning and development (st.17)
- brought positive changes in the learning experience of my students (st. 18)

Overall, participants in the fPLCs reported improvements in establishing a mutual vision, enhancing trust and fostering effective communication, collaboration and problem-solving within their groups. They acknowledged an increased capacity for implementing actions collaboratively and perceived upon self-reflection an increased sense of preparedness for exchanging and applying new ideas, something suggesting that fPLCs were beneficial for their professional development. However, these self-reported improvements were not consistently reflected in the statistical data, except for a notable readiness to plan actions collaboratively, which did achieve statistical significance. On the contrary, the capacity for reflective practice on implemented actions declined, potentially due to time constraints, showing a discrepancy between the subjective experience of their participation and the quantitative measures of its impact.

Table 2. *Comparative analysis of Faculty Responses Pre and Post participation in fPLCs*

Statements	Asymp. Sig. (2-tailed)	Median Difference (Pre-Post)	Pre-Median	Post-Median
1. Achieved common vision among the fellow faculty members	>0.01 (non-significance)	↑1	7	8
2. Achieved peer professional learning to be supported and promoted by the University	>0.01 (non-significance)	−0	8	8
3. Achieved collective decision-making to be based on data that we have collected and analyzed from our courses	>0.01 (non-significance)	−0	8	8
4. Achieved to explore the perspective of all involved (e.g., students, academic administration)	>0.01 (non-significance)	−0	8	8
5. Achieved members to decide together and choose the actions implemented	>0.01 (non-significance)	↑1	8	9
6. Achieved planning actions that were important for improvement and professional learning	>0.01 (non-significance)	↑1	8	9
7. Achieved communication among peer faculty members of the University to become more effective	>0.01 (non-significance)	↑1	8	9
8. Achieved increased cooperation between fellow faculty members of the University	>0.01 (non-significance)	↑1	8	9
9. Achieved increased trust between fellow faculty members	>0.01 (non-significance)	↑1	8	9
10. Achieved the skills of fellow academics to be used towards the area that we will choose as a priority in our fPLC.	>0.01 (non-significance)	−0	8	8
11. Achieved to reflect on actions that we planned and implemented	>0.01 (non-significance)	↓-1	9	8

12. Managed to look for solutions, ideas, and approaches for the area that we have chosen as a priority in our fPLC	>0.01 (non-significance)	↑1	8	9
13. Managed to learn to apply practices that I have heard about the area that we have chosen as a priority in our fPLC	>0.01 (non-significance)	−0	9	9
14. Managed to learn how to overcome any challenges I face in the area that we have chosen as a priority in our fPLC (st. 14)	>0.01 (non-significance)	↑1	8	9
15. Managed to become more capable to contribute to the collective effort of our university to be improved in the area that we have chosen as a priority in our fPLC	>0.01 (non-significance)	−0	9	9
16. Managed to implement innovative ideas in my teaching practice for the area that we have chosen as a priority in our fPLC	>0.01 (non-significance)	−0	8	8
17. Participation in fPLC was a more effective form of professional learning for me than other forms of professional learning and development	>0.01 (non-significance)	−0	8	8
18. Participation in fPLC brought positive changes in the learning experience of my students	>0.01 (non-significance)	−0	8	8
19. Felt ready to exchange ideas, suggestions, or experiences with other academics on areas prioritised in fPLC	>0.01 (non-significance)	↑1	4	5
20. Felt ready to jointly plan actions with colleagues on area prioritised in fPLC	>0.01 (non-significance)	↑1	4	5
21. Felt ready to implement new ideas or practices for area prioritised in fPLC	>0.01 (non-significance)	↑1	4	5

Analysis By Gender

Other analyses showed that in the overwhelming majority, males' responses presented higher means both in the pre- and post-questionnaires.

In the pre-questionnaires, the statements that show the biggest difference in the means of male and female - with the means of male responses exceeding those of females (see Table 3) are the following:

- Achieved communication among peer faculty members of the University to become more effective.
- Achieved the skills of my fellow academics to be used towards the area that we will choose as a priority in our fPLC.
- Achieved to reflect on actions that we planned and implemented.
- Managed to look for solutions, ideas, and approaches for the area that we have chosen as a priority in our fPLC.
- Managed to learn to apply practices that I have heard about the area that we have chosen as a priority in our fPLC.

Table 3. Means of female and male responses in pre-questionnaire

	Female	Male	Mean difference
1	7.30	6.86 ↓	-0.44
2	8.00	8.14 ↑	0.14
3	7.44	7.71 ↑	0.27
4	7.70	7.57 ↓	-0.13
5	7.80	8.57 ↑	0.77
6	7.70	8.43 ↑	0.73
7	7.60	8.83 ↑	1.23
8	7.50	8.33 ↑	0.83
9	7.20	9.17 ↑	1.97
10	7.50	9.14 ↑	1.64
11	7.80	9.00 ↑	1.20
12	7.80	9.00 ↑	1.20
13	7.90	9.14 ↑	1.24
14	8.00	8.43 ↑	0.43
15	7.90	8.43 ↑	0.53
16	8.10	8.43 ↑	0.33
17	7.60	8.00 ↑	0.40
18	7.90	8.43 ↑	0.53

In the post-questionnaires, the statements that show the biggest difference in the means of male and female - with the means of male responses exceeding those of females – (see Table 4) are the following:

- Achieved collective decision-making to be based on data that we have collected and analysed from our courses
- Achieved to explore the perspective of all involved (e.g., students, academic administration)
- Managed to look for solutions, ideas, and approaches for the area that we have chosen as a priority in our fPLC
- Managed to learn how to overcome any challenges I face in the area that we have chosen as a priority in our fPLC
- Participation in fPLC brought positive changes in the learning experience of my students

Table 4. Means of female and male responses in post-questionnaire

	Female	Male	Mean difference
1	7.80	8.29 ↑	0.49
2	7.30	8.29 ↑	0.99
3	6.70	8.00 ↑	1.30
4	6.80	8.00 ↑	1.20
5	8.30	8.71 ↑	0.41
6	8.11	9.00 ↑	0.89
7	8.20	8.86 ↑	0.66
8	8.20	8.86 ↑	0.66
9	8.20	9.00 ↑	0.80
10	7.80	8.71 ↑	0.91
11	7.56	8.43 ↑	0.87
12	7.80	8.86 ↑	1.06

13	7.90	8.71 ↑	0.81
14	7.50	8.57 ↑	1.07
15	8.20	8.57 ↑	0.37
16	7.70	8.00 ↑	0.30
17	7.60	8.43 ↑	0.83
18	7.11	8.33 ↑	1.22

Analysis of fPLC Pre and Post Questionnaire Responses Across the Four Schools

In the Kruskal-Wallis tests conducted on the pre and post questionnaire data for fPLCs across three schools with multiple respondents and one school (Law) with a single respondent, significant differences were observed, as indicated by p-values less than 0.001 for both pre- and post-tests. The reason we run this test based on the school variable was because the 4 PLC groups can be partly identified based on the school instructors participated came from. The first PLC included instructors from the School of Humanities, the second and the third from School of Sciences (Pharmacy and Health Sciences), and the fourth was an interdisciplinary group with members mostly from the School of Dentistry.

Despite the limited data from the School of Law, their only respondent showed the highest expectations across all questionnaire items compared to other schools, suggesting a very high anticipation for the fPLCs' outcomes. Conversely, participants from the School of Dentistry had the lowest mean rank in the pre-test, indicating comparative lower initial expectations. The post-test data indicated a shift, with the School of Dentistry reporting the highest levels of perceived achievement, suggesting that on average, its participants felt they had exceeded their expectations more than those in other schools. In contrast, participants from the School of Sciences reported the lowest levels of achievement. Important trends are indicated in the central tendency of the responses, showing variations in the perceived effectiveness or impact of the fPLCs among the different schools. This variation led to further analysis with post hoc pairwise comparisons to clarify the specific nature of these differences between individual schools.

The post hoc pair comparisons using a Mann-Whitney U test revealed varied outcomes with some significant differences and some non-significant trends between combinations of schools in their perceptions before and after participating fPLCs.

Based on the Bonferroni adjustment with an alpha level of 0.0083 for reliability purposes, Table 5 presents the adjusted significance for the post hoc Mann-Whitney tests conducted between pairs of schools.

While the pre-test comparisons between the Schools of Humanities & Law and the Schools of Sciences & Law showed significant differences, indicating varied initial expectations, these differences were not evident and did not persist in the post-test phase, suggesting an agreement of perceptions after participating in the PLCs. The Schools of Sciences & Dentistry as well as the Schools of Humanities & Dentistry remained significant in both pre-test and post-test phases, reflecting a consistent difference in both initial expectations and perceived outcomes from the PLCs. The lack of significance in both phases for Education & Sciences suggests uniform perspectives or experiences among these groups with the PLCs. The Law & Dentistry comparison evolved from non-significant to significant indicating the impact of PLCs that emerged after the intervention. These insights show the different impacts and reception of PLCs across academic disciplines.

Table 5. *Post hoc Mann Whitney U pair comparison between schools*

Pair Comparison	Mann Whitney U Pre-test Asymp. Sig.	Mann Whitney U Post -test Asymp. Sig.	Significance (Pre-test) Bonferroni Adjustment	Significance (Post-test) Bonferroni Adjustment
Humanities & Sciences	0.848	0.191	No	No
Humanities & Law	<.001	0.009	Yes	No

Humanities & Dentistry	<.001	0.005	Yes	Yes
Sciences & Law	<.001	0.031	Yes	No
Sciences & Dentistry	<.001	0.001	Yes	Yes
Law & Dentistry	0.490	<.001	No	Yes

Bonferroni alpha correction 0.0083

Discussion

Comparative analysis on the pre and post questionnaire responses regarding the impact of PLCs at the university revealed multifaceted outcomes. Initially, positive changes were observed concerning faculty development and cooperation, suggesting a gradual improvement in interactions between members of faculty as well as professional growth¹ despite not being statistically significant. This could indicate a positive shift with a slowly evolving culture within the university, fostered by PLCs. Higher engagement levels among males suggest underlying gender dynamics that require further investigation. Initial analysis revealed significant differences in outcomes across different schools involved in the PLC initiative. The post hoc analysis indicated different impacts of PLCs across disciplines with notable shifts in perspectives and expectations in certain fields post-intervention. This variability indicates that it is necessary to adapt PLC strategies to the context and dynamics of each group so as to optimise effectiveness. The reduction in reflection on actions might be attributed, as aforementioned, to time constraints, highlighting the need for adequate time allocation for reflection and planning within PLC groups. The methodological considerations related to the small cohort size can be significant as to the generalisation of findings as well as the reliability and consistency of results due to greater variability in responses. Additionally, this poses limitations to the statistical power making it challenging to detect significant differences or potential changes over time.

6.3 REPORT ON PRE AND POST MEASUREMENTS

The purpose of this study was to investigate teachers' expectations prior and their evaluations after their participation to a Professional Learning Community within their schools. For this purpose, during the school year 2022-2023, a pre- and a post-questionnaire were administered online to 43 schools of all levels, which participated in the CPI Professional Learning Support Program (PLS Program). The PLS Program aims to create and evolve in-school PLCs and focuses on in-site PLCs of teachers who work on an issue they choose to set as a priority, create a common vision and shared goals, collaborate to co-design, implement and self-evaluate their actions with reflective meetings. Participating schools are supported by teacher trainers working at the Cyprus Pedagogical Institute who act as facilitators of the Professional Learning Community at each school. Some of the schools in the study participated in the PLS Program for the first time, while for other schools it was the second year of participation.

Research Questions

The following research questions were set:

- Q1: How do teachers evaluate the operation of the PLC in their school?
- Q2: What elements have facilitated the operation of the PLC within the schools?
- Q3: How are expectations prior the participation and evaluations after the participation to a PLC compared?
- Q4: What challenges and suggestions for improvement emerge?

Data collection and analysis

An online pre-questionnaire was administered at the beginning of the school year and an online post-questionnaire was administered at the end of the school year, aiming to describe teachers' expectations at the beginning of the year and their evaluations at the end of the year as regards specific characteristics of PLCs. In pre-primary and secondary schools, all teachers were asked to respond to the questionnaires. In large schools (e.g. secondary and vocational education schools with 40-100 teachers), only teachers who were actively participating in the PLCs created under the Professional Learning Program were asked to respond.

Even though specific questions were included for pairing pre and post responses, only 38 cases were paired. Therefore, both parametric and non-parametric analyses were conducted for independent groups and for paired samples. Moreover, qualitative data was collected from open-ended questions included in the post-questionnaire.

Pre-questionnaire – September 2022

Totally, 195 participants responded, 55.9% of which had 20+ years of experience, 29.2% had 11-20 years of experience and 14.9% of participants had 1-10 years of experience. Also, 52.3% of them were pre-primary or primary school teachers and the rest worked as secondary or vocational education teachers. For almost half of the respondents it was the first year they would experience the participation in a PLC within their schools, but there were respondents that had had prior experience, as they had participated in the PLS Program in other schools in the preceding years (See Chart 1).

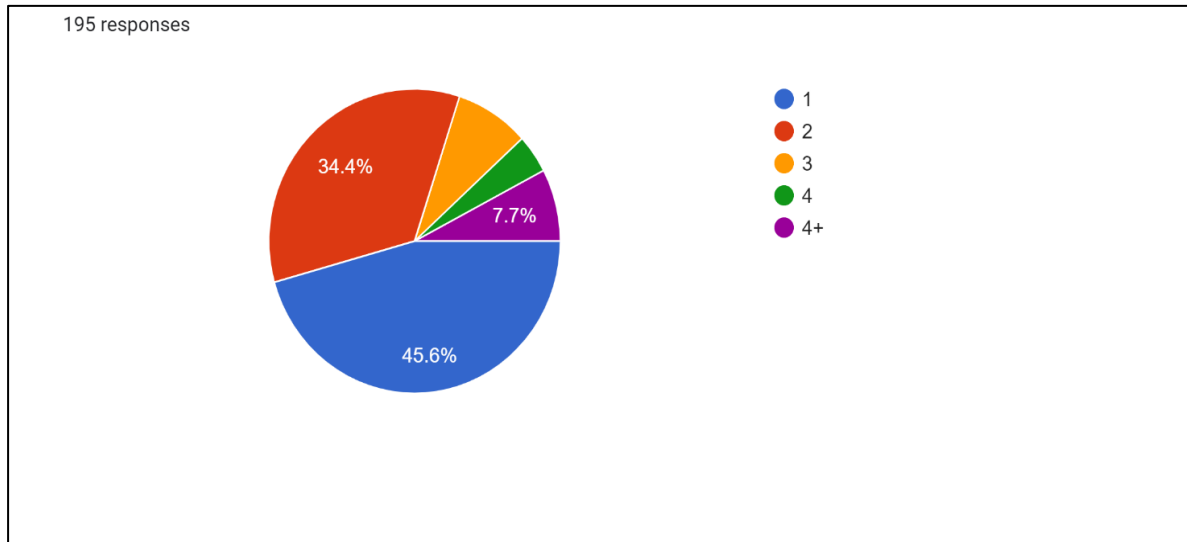


Chart 1. Respondents' years of participation to a PLS Program – Pre-questionnaire

Moreover, 54.9% of respondents were working at schools that were participating in the PLS Program for the second year, 39.5% were working at schools that were participating for the first year and 6.2% of respondents were working at schools that were participating the PLS Program for more than two (2) consecutive years.

Post-questionnaire – June 2023

The post-questionnaire was filled-in by 132 participants, 75% of which were pre-primary or primary school teachers and 25% were secondary or vocational education teachers. Most of the respondents (54.5%) had 20+ years of experience, 28.8% had 11-20 years of experience and 16.7% of participants had 1-10 years of experience. As far as the years of experience in participating to a PLC are concerned, 48 respondents (36.4%) participated for the first time, 45 respondents (34.1%) participated for the second year, and 39 respondents (29.5%) had experienced participation in a PLC for three or more years (See Chart 2).

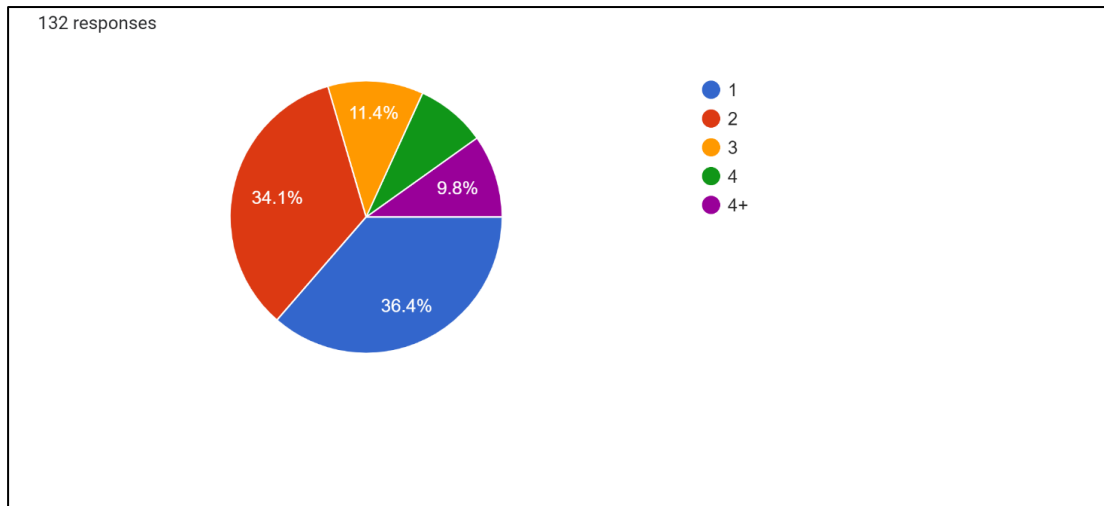


Chart 2. Respondents' years of participation to a PLS Program – Post-questionnaire

Also, 50 respondents (37.9%) were working at schools that were participating in the PLS Program for the first year, 69 respondents (52.3%) were working at schools that were participating for the second year and 13 respondents (9.8%) were working at schools that were participating the PLS Program for more than two (2) consecutive years.

Findings

Q1: How do teachers evaluate the operation of the PLC in their school?

Teachers stated that several elements concerning the functioning of the PLCs in their school applied at a fairly high level. As shown on Table 1 below, mean values were above 7 on a 10-point scale (0=Not at all and 10=Very), for some variables higher than others. Trust among colleagues, importance of designing actions and effective communication had the highest mean values, while the importance of everyone's perspectives in decision making, common vision and data-based decisions had the lowest mean values.

Table 1: Mean and Standard Deviation per variable – Functioning of PLCs (N=132)

	Mean	SD
Trust among colleagues	8.45	1.986
Designing actions considered important	8.30	1.633
Effective communication among members of the PLC	8.26	1.750
Making the most of colleagues' skills	8.18	1.873
Arrangements to facilitate PLC functioning	8.14	1.919
Seeking for solutions, ideas and approaches	8.11	1.727
Decisions on selection of actions	8.08	1.765
Action design was important	8.08	1.734
Collaboration among colleagues	8.05	1.931
Reflection on actions planned and implemented	7.95	1.777
Data-based decisions	7.83	1.931
Shared vision	7.61	1.844
Importance of everyone's perspectives in decision-making	7.25	2.080

Also, teachers stated a fairly high level of personal involvement in the PLC within the school. Items regarding personal involvement (see Table 2) were rated with very close mean values, which were all above 7 (on a 10-point scale).

Table 2: Mean and Standard Deviation per variable – Personal Involvement in a PLC (N=132)

	Mean	SD
Learned to apply more practices	7.95	1.775
Applying new ideas or changes in my teaching practice	7.84	1.902
More able to contribute to collective effort	7.75	1.801
Learned to overcome challenges I faced	7.69	1.850
Positive changes in students' learning experiences due to participation to a PLC	7.61	1.905
Participating to a PLC as effective form of professional	7.40	2.082

Statistically significant differences were found between different levels of education. Teachers working in pre-primary or primary schools responded differently from teachers working in secondary schools (Gymnasiums, Lyceums, Technical Schools) or special schools (Mann-Whitney, $U(130)=2167, z=.56, p<.05$) in some elements regarding the functioning of a PLC. Table 3 shows the statistically significant differences.

Table 3: Differences in elements of PLC functioning according to level of education

	Level of Education	Mean	N	SD	Asymp. Sig. (2-tailed)
Arrangements to facilitate PLC functioning	Pre-primary, Primary	8.44	99	1.814	.001
	Secondary, Special Ed.	7.24	33	1.969	
Effective communication among members of the PLC	Pre-primary, Primary	8.37	99	1.877	.014
	Secondary, Special Ed.	7.91	33	1.259	
Decisions on selection of actions	Pre-primary, Primary	8.25	99	1.763	0.16
	Secondary, Special Ed.	7.58	33	1.696	

Additionally, participants' answers to open questions regarding the most positive experience highlighted cooperation and interaction. Interaction included sharing common goals, exchange of ideas, help.

“Sharing the decision for the common goal [...] Sharing the positive outcomes [...] teachers managed to work together more effectively.”

“Cooperation with colleagues made work easier.”

There was special reference to learning activities that were based on cooperation and opening-up to colleagues, i.e. lesson study and team-teaching as well as to cooperative planning and action.

“Observation of each other in the classroom improved teaching practices”.

“Creating lessons in cooperation with other colleagues was an opportunity to exchange ideas for improving learning outcomes”.

“Discussions and thinking in common, exchanging ideas...”

Moreover, there was special emphasis to the support received through the interactions with the facilitator and/or the trainer/specialist.

“We were supported as a team by the CPI facilitator who actually supported our team of colleagues in planning activities.”

“New knowledge and skills related to our priority as a learning community.”

“We had the opportunity to try new approaches, evaluate results and improve action.”

Limited reference was made to reflection, as in only three cases reflection was regarded as the most positive item of the PLC work:

“Reflection after each activity gave the floor for suggestions and thinking”.

Q2: How are expectations prior the participation and evaluations after the participation to a PLC compared?

Analyses of dependent variables for 38 matched participants showed differences between their initial expectations at the beginning of the school year and their final evaluation of the PLCs at the end of the school year (see Table 4). Mean values of responses at the pre-questionnaire were higher, indicating the increased expectations that the 38 teachers had. However, statistically significant difference was found only as regards the collaboration among colleagues.

Table 4: Differences between initial expectations and final evaluation of PLCs

		Mean	SD	N	Two-sided p
Shared vision	Initial	8.03	1.952	38	.337
	Final	7.63	1.866	38	
Arrangements to facilitate PLC functioning	Initial	8.50	1.484	38	1.000
	Final	8.50	1.720	38	
Data-based decisions	Initial	8.18	1.943	38	.840
	Final	8.11	1.573	38	
Importance of everyone's perspectives in decision-making	Initial	7.92	1.964	38	.057
	Final	7.29	2.039	38	
Decisions on selection of actions	Initial	8.53	1.447	38	.241
	Final	8.11	1.900	38	
Designing actions considered important	Initial	8.55	1.389	38	.347
	Final	8.26	1.639	38	
Effective communication among members of the PLC	Initial	8.87	1.070	38	.061
	Final	8.32	1.526	38	
Collaboration among colleagues	Initial	8.50	1.289	38	.025
	Final	7.66	2.172	38	
Trust among colleagues	Initial	8.61	1.386	38	.626
	Final	8.45	1.899	38	
Making the most of colleagues' skills	Initial	8.55	1.350	38	.271
	Final	8.18	1.738	38	
Reflection on actions planned and implemented	Initial	8.50	1.390	38	.086

	Final	7.87	1.773	38	
Action design was important	Initial	8.50	1.484	38	.168
	Final	8.00	1.724	38	
Seeking for solutions, ideas and approaches	Initial	8.47	1.310	38	.465
	Final	8.24	1.700	38	

Q3: What elements have facilitated the operation of the PLC within the schools?

Several elements facilitated the operation of the PLCs. As shown on Table 5, all elements facilitated the operation of the PLCs, as all means are above 3 on the 5-point scale. The most important elements that helped were the Support from the School Head, utilization of staff meeting time and lesson observation or co-teaching. Less important to the operation of the PLC was the role of the school inspector.

Table 5: Mean and Standard Deviation per element that facilitated the operation of the PLC

	Mean	SD	N
Support from the Head Teacher	4.27	.989	132
Utilizing staff meeting time to evolve the PLC	4.18	.940	131
Lesson observation or co-teaching	4.06	.990	126
Personal involvement/participation of colleagues	3.90	.976	131
Linking actions to daily school work	3.87	.976	130
Utilizing teachers' non-teaching time	3.83	.958	127
Available resources (e.g. digital, financial)	3.53	.991	127
The role of the school inspector	2.88	1.259	116

Statistically significant differences were found between different levels of education as regards the elements that facilitated the PLC operation. Teachers working in pre-primary or primary schools responded differently from teachers working in secondary schools (Gymnasiums, Lyceums, Technical Schools) or special schools (Mann-Whitney, $U(130)=2167$, $z=.56$, $p<.05$) in three of the elements that facilitated the PLC operation (see Table 6).

Table 6: Differences in elements that facilitated the operation of the PLC according to level of education

Level of Education	Mean	N	SD	Asymp. Sig. (2-tailed)
Pre-primary, Primary	4.27	98	.926	.040

Utilizing staff meeting time to evolve the PLC	Secondary, Special Ed.	3.91	33	.947	
Linking actions to daily school work	Pre-primary, Primary	3.99	99	.974	.006
	Secondary, Special Ed.	3.48	31	.890	
Lesson observation or co-teaching	Pre-primary, Primary	4.19	95	.949	.008
	Secondary, Special Ed.	3.65	31	1.018	

Q4: What challenges and suggestions for improvement emerge?

Participants emphasized the issue of time needed for interaction, coordination, discussion and reflection. They suggested more opportunities for professional collaboration through co-teaching and lesson observation, but also more meetings with the CPI facilitator, more training and materials. Participants also suggested more training for headteachers and PLC coordinators at schools, in order to get more empowered for their roles in promoting the PLC in the school.

Discussion

The Teachers' Professional Learning Support Program offered by the Cyprus Pedagogical Institute, which focuses on facilitating the creation and evolution of in-school PLCs, aims to promote inquiry-based and school-based learning for teachers and the creation of PLCs (Eracleous et al, 2022). In a centralized education system, such as the one in Cyprus, PLCs in public schools focus on "decentralized-centralism" as a state agency of teachers' professional learning that pursues transformational (Lee & Lee, 2018).

In this study, participants' evaluations were positive regarding the operation of PLCs, their personal learning and their engagement. A number of elements that defined the functioning of PLCs in schools, such as design and implementation of actions and practices, communication and trust among colleagues were highlighted. Also, several elements related to opportunities for teachers' learning were found, such as implementing enriched practices, experimenting with new ideas and changes in teaching practices, the ability to contribute to the collective effort and mitigating challenges. Particularly important was the positive evaluation regarding the opportunities students had for positive changes in their learning experiences due to the involvement of their teachers in school-based PLC.

Findings also showed the importance of teachers' high expectations regarding their school-based PLC. These findings stress the need to respond to teachers' expectations and support PLCs within schools by applying approaches that transform the learning and practice of teachers and students. There is need to work even more systematically to further strengthen the elements that support the functioning of PLCs in schools, as well as to pursue consistency, coherence and sustainability of teachers' PLCs.

At the same time, on a school level, differences between levels of education and school contexts need to be considered. Further investigation is needed into the ways in which small sub-groups of teachers can be created within in-school PLCs and existing structures may more effectively support the creation of small groups of teachers collaborating. Additionally, further exploration will shed light on how the role of the teacher as a leader within a PLC could be strengthened, and on how different PLCs experiment with organising daily schedules and practical details to maximise time and interaction. Setting the school context at the core of how PLCs are created, function and evolve, focusing on

distributed leadership, might help school PLCs make a shift from individual roles or positions towards combined and collective actions that may address the needs and promoting the levels of expertise within the school organisation (Antinluoma et al, 2018; Leithwood et al, 2020; Thorpe et al, 2011).

Also, on a system-level, creating space and regular time for teachers to meet and reflect are critical factors for the implementation of PLCs (Day et al, 2016; Hairon & Tan, 2017) and the expected collaboration. As PLCs focus on teachers learning for change, it is important to set the framework for the teachers to experience activation, collaboration and participation, through decision making and action for change using knowledge, new experiences and competences regarding learning and its meaning making (Wenger-Trayner & Wenger-Trayner, 2020).

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