

Level of 6Cs Global Competencies among Trainee Teachers upon the Implementation of Pedagogical Capacity for Deep Learning based on Rasch Measurement

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Abstract – Appropriate pedagogy and effective teaching strategy contribute to students' interest in learning. Thus, Pedagogical Capacity for Deep Learning (PCDL) was introduced as one of the latest pedagogical-centred capacities. PCDL is committed to develop learning relationship between and among students, lecturers and the community. It emphasised on design learning model which involved four main areas, namely pedagogical practice, learning environment, learning partnership and leveraging digital. The purpose of this study was to examine the implementation of PCDL in teacher training programmes at the Teacher Training Institutes to support the trainee teachers to master the 6Cs (Citizenship, Character, Communication, Creativity, Critical thinking and Collaboration) global competencies. Hence, this study aimed to measure the mastery level of the 6Cs global competencies among trainee teachers. There were 164 respondents from Negeri Sembilan, Penang, Sabah and Johor from science stream background, aged from 20 to 22 years old. The data were collected using an online survey and analysed based on Rasch measurement model. The questionnaire had 30 questions in which the respondents responded by choosing their answers based on five ranks. Quantitatively, the overall mean logit of the 6Cs global competencies was ($M = 1.11$, $SD = 1.47$). The item difficulty range (-0.85 to $+1.03$ logits) was much smaller than the range of trainee teachers' competency (-3.24 to 4.97 logits). This indicated that trainee teachers perceived they had mastered the 6Cs global competencies based on what had been asked in the questionnaire. Person separation S index of 4.49 ($R = 0.95$) and an item separation S index of 3.40 ($R = 0.92$) showed high level of instrument consistency and good category hierarchy. Based on Item-Person map, 'collaboration' was the easiest competency to acquire by the respondents while 'creativity' was the hardest. 'Critical thinking' competency was considered challenging to perform. Whereas, 'character', 'citizenship' and 'communication' competencies were distributed evenly among the trainee teachers.

Keywords – 6C, Global competencies, Pedagogical Capacity for Deep Learning

I. INTRODUCTION

Pedagogical Capacity for Deep Learning (PCDL) was implemented at three Teacher Education Institute (IPG) campuses located in Negeri Sembilan, Penang and Perak in 2018. In the year 2020, the implementation of PCDL was

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successfully expanded to all 27 IPG campuses across Malaysia. PCDL is a holistic and comprehensive approach to teaching, learning while producing relevant materials. The teaching and learning process of IPG trainee teachers is further strengthened through the concept of PCDL using four elements that support and complement each other. The four elements are pedagogical practice, leveraging digital, learning partners, and learning environment. This new pedagogy is implemented as one of the efforts to strengthen the quality of trainee teachers in the contemporary era. This effort is also in line with MOE's requirement for teachers to take initiatives in self-development by enhancing knowledge and skills as well as applying new teaching practices to meet the needs of the 21st century as stated in the Malaysia Education Blueprint 2013-2025. The concept of PCDL also encourages trainee teachers to create new knowledge and connect it to the real world by leveraging digital usage and developing 6Cs global competencies that include citizenship, character, communication, creativity, collaboration and critical thinking. The 6Cs of global competencies can prepare a new generation to face any possibilities that arise in industry, global economy, lead to rapid technological change, information overflow and the use of computers in the student-centered era.

II. PROBLEM STATEMENT

The educational transformation agenda focuses on teacher's quality as one of the main components in relation to the quality of teaching in classroom. This is seen as a challenge for teachers in ensuring that deep learning occurs in the classroom by applying elements of 21st century skills, which are important learning skills and needed by students to be competitive in this century. However, this statement is refuted by several studies which show that teacher still uses the old pedagogy for teaching like content mastery as opposed to thinking skill that do not stimulate student's interest (Arniza & Zamri, 2018; Kamarul, Farah & Hasnah, 2017; Suzlina Hilwani & Jamaludin, 2015). In addition, Rozita Radhiah, Abdul Rasid and Azhar (2016), cited a study by the Academy of Higher Education Leadership (AKEPT) in 2011 on the teaching of 125 teachers in 41 schools throughout Malaysia which found that part of the lesson is not delivered to a high standard. The teaching emphasizes on the mastery of the subject content as opposed to the involvement of students. Teachers focus on efforts to ensure that students understand the basic content of the subject for the purpose of summative assessment that is the cognitive aspect rather than balancing the application of other aspects such as character building or social aspects. The findings by Anuar (2015) also

showed that teachers' teaching competency has no significant relationship with students' academic achievement. In contrast, teachers who focus on 21st century skills related to various elements in the age of technology such as communication skills, thinking skills, interpersonal skills, intrapersonal skills, and literacy and numeracy skills will have a positive impact on student's attitudes, motivation and achievement (Ainun Rahmah, Zamri & Wan Muna Ruzanna, 2017).

In this regard, as a solution to produce quality teachers, the TS25 programme has been designed by the MOE as stated in the Malaysia Education Blueprint 2013 - 2025. Deep learning is part of the TS25 programme activator with the objectives to produce qualified teachers that provide impact on the production of quality schools and perceived student outcomes. Quality teachers are one of the cores for school transformation. Consequently, the IPG has a significant role in producing quality teachers who have deep learning pedagogical capacity in line with the PCDL programme initiated by the Institute of Teacher Education, Malaysia (IPGM). Accordingly, this study was conducted to study on trainee teachers 6Cs global competencies produced by IPG in overcoming the challenges of globalization with more confidence in the field of education, as well as in teaching professionalism.

III. LITERATURE REVIEW

The education system across the world has experience transformation, and Malaysia has also implemented various changes in the country's education system to remain relevant and compete globally. The government's efforts to formulate a transformation plan in the national education system is aimed at producing a balanced first-class human capital as intended in the National Education Philosophy. Various efforts are implemented in planning changes as stated in the Malaysia Education Blueprint 2013-2025. In implementing changes to ensure the development of human capital, teaching approach must also cater to the current demands.

Nowadays, deep learning with 6Cs elements is seen as suitable to be practiced in teaching and learning. Based on Fullan, Quinn and McEachen (2018), the implementation of deep learning prepares students to be confident in encountering globalization challenges. Moreover, according to Prensky (2001), students today evolve through the way they learn at the current time compared to the learning way of their teachers. Thus, researchers perceive the need to apply the latest student design model in the classroom. Therefore, the approach to measure students' development must be parallel with changes in teaching and learning (T&L) practices. Consequently, to measure student's progress, latest measuring tools must be employed. The 6Cs elements are referred as a relevant standard pertaining to learning development of trainee teachers in IPG.

Based on the findings by Burden and Byrd (2015), teaching and learning will occur if students learning can provide meaning and impact to them. This is indicated in the study conducted by Richards and Rodger (2014) who

found that characteristics of good teachers include able to increase students' interest, disseminate knowledge, use effective teaching methods and provide fun learning activities. Student development factor is important in determining the effectiveness of an institution or school.

The performance of students is not only assessed from the academic aspect but also on character building as well as the citizenship aspect. This is in line with the opinion of Stoll and Fink (2000) who indicted that an effective school or institution will produce students who not only excel academically but also have strong character, are collaborative, creative, have deep critical thinking, are good citizen and fluent in communication. All these elements are in line with 6Cs elements which are the reference standard for PCDL learning development. The 6Cs elements according to Fullan et al. (2018) include six elements namely collaboration, communication, creativity, critical thinking, citizenship and character.

There are five basic elements regarded as collaboration. The elements are clearly perceived positive interdependence, considerable interaction, individual accountability and personal responsibility to achieve group goals, use of the relevant interpersonal and small group skills and frequent and regular group processing of current functioning to improve the group's future effectiveness (Marjan, Mozghan & Zhina, 2012). Collaboration activities among students can create meaningful experience in achieving the needs of knowledge and professionalism. Learners earn the opportunity to converse with peers, debate ideas, exchange various beliefs, question other conceptual frameworks and are actively engaged.

As for the element of communication, according to Abdul Rashid and Amat Johari (2012), the knowledge attained includes formulas or rules of interaction, cultural rules that form the basis of the context and content of communication events. Novice teachers should focus on the need for communication skills in stimulating a conducive classroom environment as well as enhancing more effective teacher-student relationships. Teachers must acquire high level of communication skills to enhance and improve educational professionalism.

The construction of i-Think mind map helps students to actively stimulate thinking. This method also expands creative and innovative human capital that is able to think at a high level while achieving the goals of the National Education Philosophy (Muhamad Sidek, 2013), instead of students reproducing lessons taught by rote learning. Teachers need to create a learning environment in school for students to experience and produce authentic ideas creatively. Birgili (2015) mentions in a study that creativity is labelled as a universal ability that is practiced in daily life, which is considered as a human intellectual ability. Creativity is no longer defined as in the past, which is only subject to artistic abilities such as drawing, drama or dancing.

Meanwhile, critical thinking allows students to study different views on the impact of an issue or event in daily life and evaluate these issues from the perspective of the society and the environment. Such practices also help students to develop analytical skills as well as the ability to

make choices based on information in their daily lives. Based on this situation, Ruslan and Nyet (2015) in their study constructed a critical thinking test for science subjects focusing on fifth year students using a problem-based learning model. Their tests confirmed that the three most appropriate constructs in the study of critical thinking compare differences, planning and identifying cause and effect. Thus, it can be interpreted that those students who can think critically are certainly able to master these three constructs. Thus, mastery of critical thinking can be associated with high-level thinking skills (Howard, Tang & Austin, 2015).

Mastery in 6Cs competency element is required among novice teachers in order to become a competent teacher. According to Ali, Aulia and Nur (2020), teachers are considered as competent and professional when they have vast knowledge of various fields. The 6Cs elements produces a teacher who is able to stimulate conducive learning as well as improve the relationship of teachers and students as well as increase professionalism in competing in the changing world of education.

Although teachers have a positive view of the implementation of learning in the 21st century, improvements need to be made in the practice of new pedagogy (Norazlin & Siti Rohaimah, 2019). This is because, in the study by Ellyza et al. (2020), the findings postulate that those new pedagogical practices, community cooperation as a learning partner, and digital use are among the dimensions capable of increasing 6Cs mastery among trainee teachers. Mastery of 6Cs elements among trainee teachers will contribute to the aspirations for the transformation of education in Malaysia.

A study by Badrul Hisham and Mohd Nasruddin (2016) illustrate eight constructs of pedagogical practice of IPG lecturers in the 21st century approach. The pedagogical practices are critical thinking skills, communication, reflection, collaborative, assessment, problem solving, technology, as well as creativity and innovation. In comparison to the 6Cs elements, this study does not include personality and citizenship elements. However, in the speech of former Director General of Ministry of Education, Malaysia, Datuk Dr. Amin bin Senin at the KGMMB 2019 National Education Seminar in Kuala Lumpur on 23rd February, the KPP stressed that education practice is no longer just examination-oriented but has been transformed to development-oriented. Character building and personality development are considered important in the development of students. This is supported by Fullan et al. (2018) who have added the 4Cs elements to 6Cs in their theory. Therefore, the 6Cs elements can be considered as complete in measuring the trainee teachers' ability that also includes the elements of citizenship and character in its construct.

Based on previous studies, it can be concluded that the six elements of the 6Cs global competency level was referenced when measuring the competency level of current trainee teachers are highly relevant elements. The mastery of 6Cs elements in trainee teachers can prepare them to face the real challenges of the world of education that require physical, mental and emotional strength. Therefore, it is

appropriate to investigate the level of student development as well as measure the level of success of this new pedagogy, namely PCDL which has implemented four important elements by referring to 6Cs. The elements are pedagogical practice, digital utilization, learning partners and learning environment. In line with the Malaysia Education Blueprint 2013-2025, these four elements are considered as a reformation in teaching and learning to ensure change in student development.

IV. METHOD

The study was administered quantitatively based on a survey design using online questionnaire. There are two sections in the questionnaire. Section A contains items on the background of the respondents while section B contains 30 items on 6Cs elements. The six elements include four items on character element, each five items from citizenship, collaborative, communication and creativity elements, respectively and six items from the critical thinking element. The questionnaire contains five choices modified from deep learning rubric developed by PCDL panels appointed by IPGM. The five choices based on an indicator asked are arranged hierarchically from low to high ranks.

This study involved 171 trainee teachers from science stream background in various semesters that have implemented PCDL in their classroom. The respondents are Bachelor of Teaching Programme trainees from four Teacher Training Institutes in Negeri Sembilan, Johor, Penang and Sabah, respectively. Based on analysis conducted using Winsteps software version 3.73, the data retained only 164 respondents where balanced were removed as misfitting persons. The 6Cs global competencies analysis is interpreted based on item-person map or also known as Wright map. Rasch measurement model also provides the analysis of separation index and reliability of item and person studied.

V. FINDINGS

The item-person map of the 6Cs global competencies is shown in Figure 1. The trainee teachers' 6Cs global competencies level ($M = 1.11$, $SD = 1.47$) is found higher compared to the item's difficulty level ($M = 0.00$, $SD = 0.46$). The item difficulty range (-0.85. to +1.03 logits) is much smaller than the range of trainee teachers' competency (-3.24 to 4.97 logits). This means, majority of the trainee teachers perceived better competency by equivalence to the item difficultness. The response threshold levels for each indicator on the right-hand side of the map (from C1D at -0.85 logits to C2A at +1.03 logits) reveal that overall, the 6Cs global competencies indicators provide good targeting for this sample of trainee teachers.

As item C2A is at the highest level in the map, this indicates the item as the most difficult item to be selected by trainee teachers. Their readiness to create impact in global perspective is still low. Item C1D for character construct, is the easiest item to be chosen, which denotes

that majority of the trainee teachers are capable in using digital element to enhance product quality. Table 1 shows the item difficulty measurement from the hardest to the easiest selected by trainee teachers based on perception.

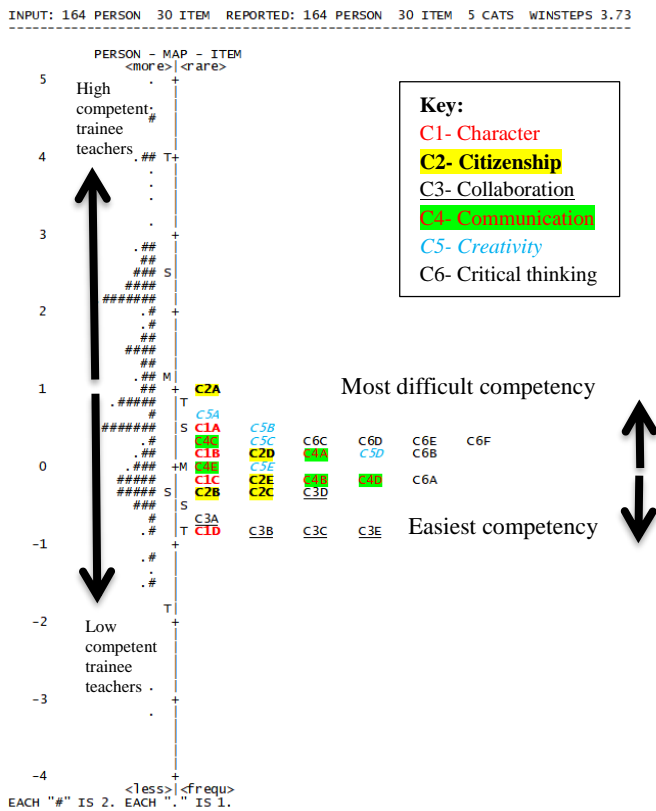


Figure 1: Item-Person Map

TABLE I: MEASURE OF ITEM DIFFICULTY

Item	Measure	Indicators
C2A	1.03	Making impact at global perspective
C5A	0.66	Economical and social entrepreneurship
C1A	0.56	Learning to learn
C5B	0.42	Inquiry to discover real issue
C5C	0.40	Implementing new idea
C6E	0.38	Testing, reflecting and implementing real world idea
C4C	0.35	Deliver big idea correctly
C6F	0.33	Skillful in using digital element to increase quality
C6C	0.29	Reasoning
C6D	0.27	Sharing intuitive thinking
C1B	0.26	Perseverance
C2D	0.20	Solving complex real world problem
C4A	0.20	Coherent and continuously
C5D	0.16	Leadership inspiration
C6B	0.16	Connecting pattern
C4E	0.16	Skillful in using digital element to communicate
C5E	0.07	Using digital element creatively
C4B	0.05	Various strategy to change people way of thinking
C6A	-0.11	Justify valid information
C1C	-0.11	Self-organize, responsible & integrity
C2E	-0.19	Utilize digital element in new context
C4D	-0.20	Intuitive in finding synergy cooperation
C3D	-0.31	Managing dynamics and challenges
C2B	-0.33	Multicultural tolerance
C2C	-0.36	Sustainable
C3A	-0.61	Manipulating teammate strength
C3E	-0.76	Using digital element to enhance collaboration
C3B	-0.78	Interpersonal
C3C	-0.83	High empathy across culture
C1D	-0.85	Using digital element to enhance product quality

As observed, most of the collaboration items are at the bottom of the map. This indicates that collaboration construct as the easiest competency to practice. As three of five items in creativity are among the top level while the rest are above item mean, this study considers this construct as the most challenging to be displayed by trainee teachers. Critical thinking competency can also be concluded as rather challenging. Whereas, communication, character and citizenship items are distributed evenly along the ruler of this map, this can be interpreted as average to achieve except for C2A item. Table 1 shows the exact measure of the item difficulty.

Based on Rasch measurement model using Winsteps version 3.73 software, the person reliability for this study is 0.95 with person separation of 4.49. In addition, the item reliability for this study is 0.92 with item separation of 3.40. In summary, this instrument shows high consistency and manage to arrange relevant hierarchy to classify person and item into meaningful categories.

VI. DISCUSSION

The discussion of this study refers to the analysis of the level of global competencies of 6Cs among trainee teachers namely character, citizenship, communication, creativity, critical thinking, and collaboration. Based on the Rasch measurement model, the findings indicate that trainee teachers consider themselves to have mastered the global 6Cs competencies. However, there are certain 6Cs global competencies that need to be sought, polished and developed in order to be a strengthened. There are trainee teachers who are aware of the advantages of 6Cs global competencies, yet they are unable to develop those competencies in certain situations due to constraints. It is hoped that the findings of this study will help trainee teachers to master the 6Cs global competencies with several additional skills for superior character building and to be competent in the industry.

The construct achieved collectively by the respondents was collaborative. Based on the findings, trainee teachers acknowledged that such competencies have helped them leverage the robustness of team members building strengths and learn new skills. The findings of this study are in line with the study of Muhammad Wafiy (2021), Ellyza et al. (2020) and Raja Abdullah and Daud (2018) who explained that various benefits are obtained by students through group activities such as interpersonal skills, cooperation, and mutual support. These competencies prepare trainee teachers to perform active responsibilities to complement each other in a team. They also agreed that positive relationships within the team members have formed high social skills and empathy across cultures.

The mastery of this competency is in line with the PCDL which requires trainee teachers to collaborate while performing project assignments where the support and views of group members can enrich learning and help build deep learning. In addition to collaborating with other students, they can team up with lecturers as co-designers and co-learners or with learning partners in performing

learning assignments or project-based coursework. The use of digital tools can improve the quality of collaboration and external networking as it provides opportunities for trainee teachers in exploring different perspectives and making innovations in new contexts. Now they are more adept at connecting the dots and expanding the connections between individuals or learning communities in new narratives. Learning networks provide opportunities for trainee teachers as proactive advocates to support and practice PCDL.

Based on the suitability of the items, the findings of the study indicate that the 6Cs global competency construct of trainee teachers that is most difficult to agree on and rarely achieved by the subjects is creativity. Trainee teachers acknowledge that such competency such as mastery of problem-solving skill, constructing provocative questions and exploring real issues must be developed. The findings of this study support the study of Muhammad Wafiy (2021) and Raja Abdullah and Daud (2018) who explained that creativity as a 21st century way of learning necessitates the ability of students to generate and solve complex problems and tasks. However, some improvements should be made so that the creativity competency allows trainee teachers to evaluate the potential and resources around them. This allows them to solve problems and have high leadership skills to perform tasks that can inspire others.

To polish and develop the creativity of trainee teachers, it is recommended that Inquiry-Based Learning, Project-Based Learning, Problem-Based Learning, Blended Learning, Flipped Classroom, STEM Approach and 21st Century Learning activities to be incorporated in lectures. Today's pedagogies warrant that learning experiences are relevant in life, provide lifelong learning, involvement in real-world problem solving and the ability to deal with life's challenges. In addition, the focus of the learning process is on creativity to produce discovery, creation and use of shared knowledge. The creativity competencies of trainee teachers will be more efficient if supported by the utilization of digital to expand the learning environment by moving beyond the traditional classroom. Thus, the ability to create, produce and develop a new and original idea can be practiced through time, space, and individuals inside and outside the classroom as a catalyst to build new knowledge and create a strong culture for learning.

Based on person-item maps, critical thinking can be considered as one of the challenging competencies. The findings suggest that trainee teachers are unable to make connections in exploring from a variety of source perspectives and identify patterns to build deep understanding. This is because they have limitations in reasoning, interpretation and analyzing skills that make it difficult to build understanding and knowledge across different boundaries and disciplines. However, item C6A is the simplest item, which shows that trainee teachers can easily provide justification through intuition and are very adept at assessing the validity of information and arguments. The findings of this study are in line with the study of Ili Atiqah and Ruslin (2016) that although students have high curiosity, they are not confident in providing

strong reasoning and critical thinking skills in constructing meaning and understanding the impact on their teaching and learning. However, they are able to build high intellectuality as well as prepare themselves to perform a complete and authentic knowledge search process and have solid evidence and facts.

To develop critical thinking among trainee teachers, this study suggests that trainee teachers be provided with PCDL tasks. Planned assignments will assist them to perform learning assignments or project-based coursework that combine several courses under one main idea. This opportunity allows trainee teachers to be more confident in sharing intuitive thinking and generate new knowledge collaboratively. The interdisciplinary task can also create opportunities for trainee teachers to test, reflect and perform idea based on actions in the real world. In the aspect of digital utilization, trainee teachers can apply the aspect of partnership and collaboration to generate thoughtful ideas in addressing their challenges or problems. This coincides with their need to develop analytical skills and choice making ability, which is nurtured to study different views on the impact of an idea or solution from the perspective of society and environment.

The findings of this study indicate that the 6Cs global competencies of trainee teachers for character, citizenship and communication are evenly distributed. Based on the trainee teachers' perceptions of the three competencies, there are elements that are easy to practice, and vice versa. In PCDL, it was found that trainee teachers are skilled in using digital elements to improve the quality of their learning. At one level, they are able to produce their own digital tools and to explain the advantages of using such digital elements in generating new knowledge that has an impact on life. This means that character, citizenship, and communication competencies are used optimally by trainee teachers to enhance the collaborative quality, innovation, and value of communication in the teaching and learning process.

Discussing character competency, the finding of this study is in line with the study of Sofia, Kamarul Azmi and Muhammad Azhar (2016) who reported that teachers practice admirable personality in teaching and learning practices and such practices are able to develop teacher abilities in line with world trends in educational development. Based on this study, it is found that trainee teachers are skilled in designing new learning experiences, able to withstand obstacles and challenges and plan, monitor progress, reflect and make continuous improvements on the quality of work. This means that trainee teachers prioritize competence in various teaching approaches, informing and leveraging the use of digital tools as suggested by other researchers. It is recommended that trainee teachers inculcate and nurture with noble values and ethics towards the formation of national identity according to the Malaysian mould and these will refine the personality and character of trainee teachers.

In discussing citizenship competency, the findings of this study are in line with the study of Sitti Hasnah, Mohd Mahzan and Abdul Razaq (2016) who reported that students need to be educated to care and benefit the world

in thinking about matters related to survival because citizenship competency is an essential element of community development. Based on this study, it was found that trainee teachers have exhibited curiosity, have an open mind to cultural diversity and appreciate environmental sustainability. However, item C2A is the most difficult item to accept which shows that trainee teachers are still not competent on their role to be actively involved in addressing problems universally. Although citizenship competency has been applied by trainee teachers, solutions undertaken are local in nature.

Finally, the findings of the study indicate that the communication competency of trainee teachers are at a developing stage. The findings of this study are in line with the study of Saidatul Nadhirah (2020). At this stage, trainee teachers use a diversity of communication tools and modes to produce coherent communication. However, teachers require to build confidence to communicate coherently and continuously to create meaningful experiences (Fullan & Langworthy, 2014) by creating messages that are applicable to the audiences. Although trainee teachers are skilled at using various strategies to combine information, they are unable to ascertain the 'big idea' and the best way to convey that information using the right combination of tools and modes of communication.

At this developing stage, trainee teachers use various perspectives to produce expectations related to communication challenges, however, skill and higher intuitive level is necessary including in utilising digital elements. Therefore, trainee teachers should be given more opportunities in moving forward to discuss issues in a new and different context such as exchanging views with the learning community or the local community. The trainee teachers must exhibit the ability to observe, listen and give feedback to friends or other individuals. In an effort to build cooperation synergies, 21st century learning activities such as think-pair-share, round table, gallery walk, hot seat, stay-stray, games, jigsaw puzzle, forums, public speaking or knowledge sharing can help the flow of ideas and information sharing in an effective communication process.

VII. CONCLUSION

Pedagogical Capacity for Deep Learning (PCDL) in Teacher Education Institute (IPG) is an effort to produce competent trainee teachers within new environments. The new learning environment and pedagogical practices, community collaboration as a learning partner and leveraging digital are the PCDL factors that necessitate trainee teachers to master 6Cs global competencies. The grasp of 6Cs among trainee teachers has a vital part in achieving educational transformation. It is hoped that the production of future teachers assists in increasing quality of students and school. Therefore, the study is optimistic that successful transformation of the education system through PCDL will result in producing competent novice teachers of IPG, in the areas of collaboration, citizenship, character, critical thinking, creativity and communication. Nonetheless, concerted efforts are needed to ensure this implementation is a success.

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