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Action Research Teacher Training Within a Project-Based Learning Paradigm

Russell Hazard* 
NIT Education
Beijing, China

Randal Eplin 
Southeastern University
Lakeland, USA

Liu Li 
NIT Education
Beijing, China

Yaw Owusu-Agyeman 
University of Ghana, Ghana
Accra, Ghana

Abstract. In response to socioeconomic, technological, and sustainability related challenges, schools and education systems are undergoing significant transformation. As a result, teachers are increasingly being asked to deliver innovative pedagogies such as Project Based Learning to help develop twenty-first century competencies that support effective real-world action in students. However, many educators possess no experience as students in project-based classrooms, which may result in a lack of mental frameworks pertaining to this distinctive educational methodology. This action research study explored how action research, framed within a project-based paradigm, may not only improve professional practice but also help faculty develop a better understanding of PBL. Data were gathered through semi-structured interviews from 8 high school teachers and 2 professional development instructors in Beijing, China after they completed a self-paced action research teacher training set within a PBL paradigm. Findings suggested that the teachers not only experienced self-reported gains in pedagogical knowledge and teaching techniques that were the central purpose of their projects, but also gained understanding around action research, the value of collaboration with both colleagues and students, and Project Based Learning theory and practice. Connecting action research to project-based

*Corresponding author: Russell Hazard; russellhazard@aidi.edu.cn

learning utilizing PBL design elements, teaching techniques, and project management structures assisted the participants in their own projects and produced transfer learning for their own classrooms. This study contributed to the scholarly discourse on training for action research by highlighting the perceived opportunities, challenges, and supports from the perspective of teachers as well as exploring the intersections between action research, PBL, and PBL teaching techniques such as utilization of project management processes and visualization methods.

Keywords: Action Research; Professional Development; Project Based Learning; Twenty-first Century Competencies

1. Introduction

Today, many educational leaders may find themselves in the position of needing to promote 21st century competencies in both teachers and students through inquiry-based approaches such as PBL (Chu et al., 2017). This research is focussed on exploring the potential for teacher development by linking authentic problem-based teacher action research with an overarching PBL paradigm and specific teaching techniques to stimulate reflections connecting the experience of participants in the program and their pedagogical understanding of PBL.

This study brings together two intersecting gaps in the literature on PBL and action research. The first is reporting on action research teacher training in diverse contexts with a special emphasis on including the perspectives of the teachers involved and any supports or challenges they identify (Bialen, 2025; Engane & Gonzales, 2025; Lambirth & Cabral, 2017). The second objective was to explore how learning action research might improve understanding of PBL educational models, classroom experiences, and teaching methods that could help in future PBL classrooms. To achieve the objectives of the current study, one research question was formulated:

What opportunities, challenges, and supports can be identified from the experience of teachers undergoing a relatively self-directed action research training program explicitly linked with key PBL concepts and teaching techniques?

The next section discusses PBL and action research and provides additional information concerning how they underpin the empirical study. The findings and discussion section also provide information about how action research, situated within a project-based framework, can enhance professional practice and assist faculty in expanding their awareness of PBL from the students' perspective while potentially fostering the 21st century competencies they are expected to cultivate in students.

1.1 Project/Problem-Based Learning (PBL)

The rapid pace of technological advancement and socio-economic change is profoundly transforming the landscape of work, necessitating a corresponding evolution in educational priorities. The near and medium-term future of work is

expected to be characterized by a hybrid human-machine model where human workers collaborate with AI and machine learning tools, dramatically reshaping job roles and labor market dynamics (Bessen, 2019). In an effort to keep education relevant and ensure high quality for all learners in the context of such a rapidly changing socio-economic environment, education systems are increasingly compelled to pivot from traditional rote learning methods for disciplinary knowledge memorization.

This shift is toward more dynamic, competency-based curricula that emphasize a combination of disciplinary, multidisciplinary, and interdisciplinary knowledge, cognitive and metacognitive skills, socio-emotional competence, critical reflection, self-directed lifelong learning, and the ability to combine these and other competencies to create real world impact (OECD, 2018; UNESCO, 2018; UNESCO, 2020; Zhao, 2015). Project/Problem-Based Learning (PBL) is used in both K-12 and adult education settings to support the development of 21st century knowledge and skills by solving real world problems of various types and levels of complexity (Chu et al., 2017). PBL emphasizes active engagement, collaborative learning, critical thinking, and adaptability set within real-world contexts (Larmer et al., 2015).

Studies have suggested that PBL can enhance students' ability to apply knowledge in practical contexts, such as fostering a deeper understanding of STEM subjects, and promoting creativity (Condliffe, 2017). PBL is used to support acquisition and application of disciplinary, multidisciplinary, and interdisciplinary knowledge while developing non-disciplinary twenty-first century skills such as critical thinking, collaboration, creative problem-solving, and project management abilities, reflecting the real-world nature of work environments (Larmer et al., 2015).

For these reasons, although already in use for many years in some schools, PBL has been highlighted as one of the key pedagogies to expand in the near-term future as education systems transform in response to artificial intelligence and other macro-trends relating to the fourth industrial revolution (OECD, 2024). PBL is also often highlighted in literature relating to Education for Sustainable Development and therefore as a marker for Sustainable Development Goal (SDG) 4, which is quality education for all (UNESCO, 2018). However, effective PBL requires transformations to standard curricula and teaching methods, and it can be challenging for both students and teachers without proper supports and an understanding of the unique teaching approach it utilizes (Condliffe, 2017). It also necessitates teacher acquisition of twenty-first century skills and unique pedagogical techniques (Chu et al., 2017).

There are several ways of grouping or differentiating subtypes of inquiry-oriented learning. Some researchers clearly differentiate project-based (PjBL) learning from problem-based (PrBL) learning on the basis that project-based learning uses learning artifacts or deliverables that demonstrate acquisition of the learning goals, such as a report or other tangible product, while problem-based learning is solely focussed on developing the best solution to a problem and does not

necessarily require an artifact of learning (Kokotsaki et al., 2016). Other models, such as Larmer et al. (2015) group a variety of different inquiry education approaches under the term project-based learning on the basis that they all demonstrate the fundamental properties of projects and are likely to have some type(s) of learning artifacts/deliverables associated with them, if well designed. Larmer et al.'s (2015), five basic subtypes of PBL include: conducting research; problem-based learning; meeting design challenges; investigating abstract questions; and developing evidence-based positions on issues.

For adults, PBL in professional development settings provides a platform for continuous learning and skill enhancement. For example, by working on projects that address real workplace challenges, employees can develop advanced digital literacy and problem-solving skills that are directly applicable to their job roles (Bell, 2010). This approach not only facilitates the acquisition of new competencies but also encourages a growth mindset and lifelong learning, which are crucial for adapting to the evolving demands of the labour market (Darling-Hammond et al., 2008).

Adult PBL has become a particularly important component of professional education for jobs that require the application of knowledge in highly variable contexts and situations, such as physicians (Neville, 2009), pharmacists (Stewart et al., 2011), lawyers (Zhao, 2025), and teachers (Borhan, 2014). Previous researchers have noted school faculty and educational systems may benefit from PBL approaches to professional development in ways beyond improving professional practice by deepening 21st century competencies such as problem solving, critical reflection, and collaboration; empowering the profession; and supporting teachers in becoming more effective change agents (Milner & Scholkman, 2023).

Implementing PBL in educational and professional contexts requires a profound shift in instructional strategies and assessment methods. Educators must design and facilitate meaningful projects that align with learning objectives and industry needs, providing a balance between the freedom to make mistakes or lose direction with the guidance and support to ensure successful outcomes (Blumenfeld et al., 1991). Importantly, instructional strategies should include as much direct instruction as necessary for the level of student development and assessment should focus on the demonstration of target knowledge and competencies throughout the learning process, rather than solely on the final product or deliverable (McDowell, 2017).

The development of self-directed lifelong learning is both one of the goals of PBL as well as a design and teaching consideration. To develop this, the level of directedness within the learning experience needs to be suitable for the developmental needs of the students, so they are sufficiently guided to make efficient use of learning time but left with enough freedom to still develop self-directedness (Grow, 1991). Due to the differences in curriculum and pedagogy, the literature has many examples of pedagogical guidance for teachers who are experts in their subject knowledge but who are not familiar with PBL design or

teaching principles (Boss, 2013; Hazard, 2023; Hung, 2016; Larmer et al., 2015; Luar, 2013; Melin et al., 2009; Stolk & Martello, 2016). It has also explored training for interdisciplinary PBL in which teachers may need simultaneous development of both pedagogy and subject knowledge (Hazard & Liu, 2024).

1.2 Action Research

Set within a distinct literature, inquiry-based faculty development methods such as action research (AR) have become increasingly recognized as important for ongoing teacher development (Bergmark, 2020; Leeman et al., 2018). AR is a type of research that is used across the social sciences, in governmental and non-governmental organizations, and in industry to solve problems of practice and promote effective transformation (McNiff, 2013). Rooted in both planning and tracking the impact of social action, it is impact driven and meant to be undertaken collaboratively by a community to promote participatory change (Lewin, 1946).

When applied to education, it posits that contextual conditions are crucial and privileges rich, localized knowledge over generalizable knowledge (Crawford, 2025). It is increasingly used in education as a systematic reflective practice for educators to utilize for improving their professional practice through research that seeks to harness the participatory efforts of students as well as other stakeholders (Lambirth et al., 2019). AR empowers educators to critically examine their practices, implement innovative teaching methods, and assess the impact of their interventions in real-time (McNiff, 2013). This ongoing, reflective process not only enhances professional development in education but can be used to foster a culture of continuous improvement within educational institutions.

In addition to teacher classroom research into practice, AR can be used to develop and track policy changes, leadership initiatives, and curriculum transformation (Crawford, 2022). Typically, moving through a series of phases, this system builds in the major elements that Merriam and Baumgartner (2020) describe as central to developing lifelong self-directed learning which include planning, carrying out, and evaluating one's own learning. As such, learning a structured system of inquiry such as action research can provide professionals such as teachers with an overarching conceptual model to help them guide their professional learning.

Potential benefits include but are not limited to helping teachers: Test pedagogical innovations; improve reflection and data driven decisions; support a culture of educational innovation; strengthen professional community; challenge assumptions relating to assessment; gather relevant and suitable contextualized data; feed real-world research up for better informed policy and curriculum decisions, raise the status and voice of the teaching profession; and build understanding among educational stakeholders including parents and the community (Crawford, 2022).

Given the many potential benefits, AR is increasingly being highlighted as either mandatory or highly desirable for teachers to engage in by researchers, policy makers, districts and schools, and school accreditation bodies such as through the Western Association of Schools and Colleges (WASC). For these reasons,

educational leaders from contexts ranging from primary through to graduate school may need or want to implement professional development programs to support faculty in understanding and executing AR. It is therefore important to generate research on AR training programs from a wide variety of contexts that not only seeks to understand the effectiveness of AR in teacher development but also seeks to understand the adoption experience from the perspective of teachers as well as exploring the various program supports that may be helpful or unhelpful (Bialen, 2025; Engane & Gonzales, 2025) as well as their motivations and intentions (Bergmak, 2022).

Despite the many benefits of AR that have been noted in the literature covered in the preceding sections, there are also potential challenges that face teachers who are asked to implement AR projects. First and foremost is the time and effort required to pursue an AR project while engaging in lesson and course preparation, teaching lessons, attending meetings, providing student feedback and mentorship, and completing administrative and extracurricular duties (Bialen, 2025; Engane & Gonzales, 2025).

Another area of potential challenge is not having sufficient knowledge of research methodology (Bialen, 2025) as many teachers are not trained in data collection and analysis. Without any grounding or support in methodology, it could be possible to draw false conclusions from classroom research. The methodology challenge has a broad scope as AR has a different epistemology, ontology, and purpose than commonly known positivist research (McNiff, 2013).

Knowledge of educational research literature may be another area of difficulty as teachers may not have an extensive knowledge of the pedagogical research literature (Bialen, 2025). Brookfield (2017) notes the research literature is one of the four lenses for effective critical reflective practice and it forms both a launch point and a conclusion point for action research. Providing support in locating impactful research on areas relating to an action research project is an area in which schools or districts can help minimize the challenges associated with executing teacher action research (Lambirth & Cabral, 2017).

These obstacles can be partially overcome by providing sufficient direct instruction and support such as through the provision of highly directed formal professional development programs which can be taken through universities. However, while intensive formal qualifications may fill an important role for schools and districts, research into self-directed programs may also be important as these provide a more flexible approach to adult learning for professionals with variable schedules and may better promote communities of learning and the other benefits of AR (Crawford, 2025). Providing self-directed programs with sufficient supports may also help develop of self-directedness in teachers as well as give them insight into the potential benefits and challenges of such programs for their students.

2. Method

2.1 Context and Participants

This research collected data during and after the delivery of an AR teacher training program that was executed in Beijing, China with a group of eight international high school teachers and two professional development instructors. All teachers worked in a Western Australian Certificate of Education (WACE) high school program. The participants were of American, British, Canadian, and Chinese nationalities. The participants were divided into learning teams with an experienced instructor from the institutions' professional development department supporting each learning team during workshops and providing each participant with ongoing feedback, advice, and resources as well as acting as one of their critical peer observers for data collection purposes. Participants could move through the program at their own pace, taking from six months to two years to complete their project.

Convenience sampling was used due to the very long duration of the AR program. On completion of the background AR training, participants were contacted via email with informed consent information and offered the opportunity to participate in data collection via semi-structured qualitative interviews. Those who responded to the call for participants were assigned numbers to anonymize them. Instructors were also invited to give data and interviewed. The interviews were guided by protocols and ranged from 15 to 60 minutes in length, depending on the interest of the participant. The audio data from the interviews were recorded and transcribed verbatim.

Sample questions include:

- a) What factors motivated or supported your completion of the project?
- b) What factors demotivated you or challenged your completion of the project?
- c) What should schools and school systems do to better support teachers if they require action research as an ongoing proof of evidence-based practice and professional development?
- d) Are you likely to use any PBL teaching techniques used on the course such as milestones and deliverables, exemplars and success criteria, pace differentiation, Know/Need-to-Know boards, visual management systems, or others when teaching student PBL courses in future?

2.2 Procedure

The background AR training course was delivered over approximately 10 months and was primarily self-directed, though it included a number of supports based in PBL teaching practices and literature such as a series of short workshops for direct instruction on key knowledge. The AR model was based on McNiff's (2013) 4-stage cycle but modified for the context by using a Plan-Act-Analyse-Reflect system. The AR training emphasized the flexibility of use for investigating classroom problems of practice as well as team and middle leadership problems.

The program utilized approximately 18 contact hours in group workshops over 10 months. In addition, all participants were offered voluntary 15-minute individual dialogic feedback coaching sessions to provide necessary individualized learning and feedback.

AR is not typically classed as a form of adult PBL as their histories and literatures are distinct. However, in addition to the normal focus of teacher AR on improving professional practice, the program sought to explore intersections between learning to undertake a teacher AR project and experiencing PBL from the point of view of students. For this reason, explicit connections were made between the process of inquiry the teachers engaged in and student PBL. The issue of whether such explicit connections between teacher AR and effective student PBL might assist participants in becoming more conscious of the challenges faced by students who engage in PBL and of the program structures that can help mitigate these challenges was framed by linking AR to Larmer et al.'s (2015) overarching PBL categories.

For the purpose of creating an integrated whole school understanding of inquiry, AR was nestled into Larmer's (2015) PBL taxonomy as a specific methodology for impact-oriented problem solving that is context sensitive and engages stakeholders as part of the research effort (McNiff, 2013). Importantly, the distinct traditions and literature of AR and the transformative potential on organizations and communities was also emphasized to help teachers understand the differences between AR, traditional positivist research, and classroom PBL.

As it was the first exposure for most teachers to both AR and to experiencing PBL as a student, a variety of features common to student PBL classrooms were used to both support the teachers and to help model effective PBL practice. Key features of PBL classrooms utilized in the background training have been listed below as they are central to the research question and included:

2.2.1 Learner voice and choice

Voice and choice are PBL design elements that are seen across most PBL design frameworks (Hazard, 2023). Choice does not only refer to topic choices, though latitude in these is typically a design consideration. It also refers to enabling choice throughout the project whenever feasible, while considering learning efficiency as a counterpoint. Voice has some overlapping features with choice but also refers to a classroom culture in which dissent, difference, and learner power over learning processes is encouraged to a developmentally appropriate level to support ownership, agency, and empowerment (Larmer et al., 2015).

2.2.2 Group learning workshops

Grow's (1991, 1994) Staged Self-Directed Learning (SSDL) model describes a four-stage process for supporting students to become more self-directed in their learning which progresses from dependent learners who need to be directed in all learning to a fully self-directed learner who is capable of completely independent projects. Those at beginner and intermediate levels benefit from an appropriate level of structural support. Direct instruction acts as a support for extended self-directed learning and has been identified as an important structure to support

successful PBL learning, particularly for foundational stages of the learning process for a topic (McDowell, 2017). The amount of structure designed into a PBL program is one of the ways designers control how challenging the program is, along with the depth of inquiry (Hazard, 2023). Direct instruction for key concepts can progress learning efficiently by pitching the learning at an appropriate level of complexity and by synthesizing different sources and perspectives.

Major workshop topics for direct instruction included: history and epistemology of action research; comparison between action and traditional research; phases of action research; investigation of the program goals and learning artifacts; peer assessment of success criteria through exemplar evaluation; identifying a problem of practice and linking it with an area of pedagogy; conducting an introductory literature review; designing an action initiative; philosophy of qualitative and mixed data; planning data collection; designing data instruments; qualitative data analysis; quantitative analysis; generating findings from the analysis; linking findings back to literature; embedding findings in practice; mobilizing knowledge; and initiating a new cycle of research.

2.2.3 Individual dialogic feedback and coaching

Dialogic feedback involves two-way communication to support learning (Rao & Norton, 2020). Focussed on progress, content, and process, this approach to feedback is often used in PBL and other forms of Assessment as Learning (Dochy et al., 2023; Saeed et al., 2020). The sessions were voluntary and could be booked by participating teachers to check milestones and discuss feedback to move learning forward. They were 15 minutes in duration as a standard but could be extended by mutual consent.

2.2.4 Learning artifacts

Learning artifacts are a form of project deliverable that are designed to require demonstration of the program learning objectives (Larmer et al., 2015). They can take any form that is relevant to the content, such as reports, artworks, models, or other. The program learning artifacts included an action research report and a short research video presentation. To ensure the basic requirements that reflected the key learning goals were met, a series of prompts and transparent success criteria were given for both.

2.2.5 Learning artifact exemplars

The use of learning artifact exemplars demonstrating an example of high-quality work and linked to a rubric or success criteria is a common feature of PBL (Boss & Larmer, 2018). A high quality but purposefully imperfect exemplar was provided early in the program. As well as demonstrating high-quality work, the participants used the transparent success criteria to peer grade the exemplar and discuss variation in their findings in order to further develop understanding of criteria.

2.2.6 Project milestones and deliverables

The use of project milestones with linked deliverables that represent major steps in the process of project completion were developed in project management for industry and have been adopted by K-12 PBL instructors (Larmer et al., 2015). Key

milestone deliverables included: The choice of an overarching pedagogical topic to explore based on a problem of practice the teacher was experiencing; the formulation of a rationale for the topic choice including a description of the reflective process utilized; a description of research literature findings on the topic and problem; the development of a plan for a classroom initiative to seek to address the problem; a data collection plan with a focus on bringing stakeholders into the research process; a description of the focus for the peer-observer and observation plan; a plan for data analysis; a data analysis summary; a report on key findings; a reflection on learning; a report on conclusions and limitations; a review connecting findings to the literature; a knowledge mobilization plan; final draft completion of the entire project report; and completion of short (4-6 minute) research summary video.

2.2.7 Pace differentiation

Promoting differentiated learning is a common feature of PBL (Boss & Larmer, 2018). As well as providing choice over topics, initiative design, and data, participants could proceed through milestones and deliverables at their own pace to allow for individual learning differences, variation in teacher schedules throughout the year, variability in the complexity and duration of their chosen projects, and to give the necessary freedom to develop self-directedness.

2.2.8 Use of visual management boards

Visual management boards, including Toyota's Kanban boards and those developed at MIT, have revolutionized project management and process efficiency (Alaidaros et al., 2021). These visual management tools signal tasks that need to be done, tasks in progress, and tasks completed, thus streamlining project tracking, enhancing team collaboration, fostering continuous improvement, limiting work in progress, identifying bottlenecks, and improving overall productivity (Benson & DeMaria, 2011).

2.2.9 Know and Need-to-Know boards to drive inquiry

The Know/Need to Know board is a method of driving inquiry in the PBL classroom that grounds participants in what they have learned in the inquiry thus far and what new questions have arisen in the process (Larmer et al., 2015). As items in the Need-to-Know section are investigated and resolved they move to the Know section and are in turn used to generate new sub questions for inquiry that are put on the board. The board thus acts as an ongoing reference for what has been investigated and what avenues for inquiry remain. Priorities for inquiry could then be discussed. This tool was introduced and modelled to support the learners in driving their inquiry.

2.2.10 Critical reflection as a central feature of the learning process

Critical reflection on learning and the learning process is a central feature of PBL (Larmer et al., 2015) which links clearly to AR models such as McNiff (2013). As a part of design, reflection is explicitly built into the learning process and project deliverables rather than being assumed or only after completion of a learning program.

3. Data Collection and Analysis

Semi-structured interview data was gathered from the participants and program instructors. The researchers also kept detailed notes throughout and discussed them in regular meetings. These discussions were recorded and transcribed. Qualitative data gathered from the teacher participants, instructors, and the researchers were coded and categorized to create a structured narrative of the findings (Creswell, 2012). The data were assessed using Braun and Clarke's (2006) six-phase thematic analytical process: familiarization with the data, creating initial codes, developing themes, reviewing prospective themes, defining and naming themes, and writing the findings. We reviewed the three sets of transcribed data multiple times to familiarize ourselves with them. The approach also involved compiling preliminary notes and juxtaposing them with the recorded field notes.

Following the data familiarization phase, we produced the preliminary codes through a recursive process of segmenting and cataloguing the numerous recurring phrases. We subsequently derived the preliminary themes from the categories generated from the original codes. Phase four of the process entailed an evaluation and reorganization of the probable themes and the verification of their appropriate linkage to the established categories. The latter stages involved the designation of themes and the documentation of findings.

4. Findings

4.1 Theme 1: Opportunity - Pedagogical Knowledge and Practice Gains

Although it is not the purpose of this research to evaluate the gains in pedagogical knowledge or practice, it is worth noting that the participants unanimously identified gains in both their pedagogical knowledge and in their practical teaching methods through engaging with their project. The opportunity for this learning was in turn a significant motivating factor for completing the projects in relation to a core ethic to better serve their students. An example of this desire to help others can be found in the statement of participant 7 that: *"I really want to help my students and the topic I chose really confused me a long time... so that I chose this topic and I really wanted to solve that as soon as possible"*. This sentiment was expressed in varying forms by all the participants and instructors discussing experiencing pedagogical learning as a meaningful opportunity.

4.2 Theme 2: Opportunity and Support - Action Research Methodology

Highlighting the impact-oriented and participatory nature of action research was an important support for teachers, and once understood, noted as a significant opportunity emerging from the work. Many teachers initially understood research solely in its traditional positivist form using quantitative methods and experimental designs. Understanding the problem-focused, participatory, and impact-oriented nature of AR was a crucial area of support that emerged which made a difference in topic choice, data collection, analysis choices but also in organizational relationships such as when engaging students as active co-researchers in teacher projects.

Importantly, this issue went beyond a general lack of knowledge about research methodology and instead required participants to reframe their understanding of

the different purposes of research and the unique methods of AR, such as impact and stakeholder participation planning. For example, participant 4 stated: *"I kind of was surprised at how the things that I thought [about research] weren't really what action research was about"*.

As part of the participatory element of AR, the teachers engaged their students and peers in their research. As a result, the participants noted the positive impact of the AR process on their relationships with their students (or, in the case of a participant who did a leadership project, on relationships with her team members). Participant 7 described improved trust stating that, as a result of the research effort and interviews the students: *"believe in me... they think I really have a systematic way to help them solve their problems"*.

The participatory research paradigm of AR also needed to be explicitly linked to the rationale and procedures of rich data qualitative or mixed data collection as a means of truly listening to, understanding, and empowering stakeholder voices. Few of the participating teachers previously gathered data from students at all outside of normal attendance, participation, and assessment data. Those who did, primarily used simple surveys. The change in perspective coming from bringing students into the research process was evident in participant 4's statement that:

"I quite enjoyed, and I think the students...I think they did get a bit of a kick out of being brought into the teaching process. Like me talking about, okay, this is why we're doing this activity... And then when we were doing the post-lesson student interviews and they're quiet, kind of, curious about it and they're asking me questions about why we're doing this and I'm like, well, I'm trying to be a better teacher and I'm trying to develop... And I think they quite enjoyed feeling or understanding that I am a student, and they are students. And there was a very, quite positive, almost like, comradery that you don't experience all the time."

Similarly, the impact of collegial collaboration outside the regular teaching team was noted. For example, participant 8 stated: *"I think the first and foremost (sic) most important part of this action research was the importance of collaboration, of interacting with all levels of colleagues"*. AR as a means of organizational transformation needed to be emphasized because participants didn't initially comprehend that the practical aspect of this lies in communication and collaboration among all stakeholders. Importantly, the instructors modelled this empathetic process of power-sharing. Instructor 1 felt that, overall, this was the most important support provided describing coaching sessions in which:

"We talked with them very deeply and made connections with the candidates to feel their feelings. Even though sometimes at first... we didn't talk about action research. We just show we care about others. The connection is the basic fundamental way that we can engage or motivate our candidates to move forward. And during the discussion we helped them, we give them practice, we give them ideas, we just do not teach them directly. We just guide them and work together, make them feel like... this is their project."

4.3 Theme 3: Opportunity - Acquisition of 21st Century Competencies

With regard to 21st century or OECD 2030 competencies, all participants and instructors felt subjectively that these competencies were developed, and this was a motivating factor. Some participants and instructors described OECD 2030 competencies while most expressed themselves using various 21st century skill frameworks (Dede, 2012), with participant 7 noting: *“I benefited from the collaboration and cooperation with my observer and also with other teachers. This is also important for students’ projects. They learn to work together and learn from each other to solve the real problems”*. Participant 3 focussed on critical thinking, stating: *“although we are all talking about critical thinking skills, I guess in real practice many of us don't really understand what critical thinking is. So, this project helped me to reflect my own understanding on critical thinking”*.

The notion of high-quality work and self-directedness in PBL also came up. For example, participant 8 described their growing awareness of cultivating self-directedness and high-quality work, stating:

“It specifically showed me the value of being self-motivated to get my work done... People who we consider to be great are people who are constantly growing and changing ... if you are a person who wants to put yourself in that situation of job security, life security, in an ever-changing 21st century world, I think you should... be the kind of person who's trying to do their best.”

All the above factors came together for some participants as an integrated set of understandings that connect 21st century skills and real-world competencies like self-directedness to project work that is designed to give learners the freedom required to at least occasionally need to seek learning out, without letting them become untethered from learning and always providing direct instruction, coaching, or other supports as needed. For example, participant 4 stated: *“It definitely made me realize that... as the teacher, even though it is about self-directedness, you can't just step back”*. Participant 3 framed it in the following way:

“It [PBL] has great potential to have students master self-regulation skills. But my own experience is that depends a lot on the teacher or the coach of the PBL. How do you activate? How do you, in a very nuanced way, feel the students, their backgrounds, and ability, and match this with the learning objectives and aims... providing minimum help to give them chance to learn and grow by themselves.”

4.4 Theme 4: Challenges - Time and Perception of Research

When describing factors that inhibited their progress the most common responses centered around finding the time to do it with busy teaching schedules. Participant 3 exemplified this universal challenge when stating:

“I will mainly talk about the challenges I faced. I think the time management skills, because we all know that teachers and also leaders in the school, we are so busy... So, I think time management is very challenging”.

Another important response was that some teachers initially felt they did not have anything to learn or that investigating pedagogical knowledge through research would not help them. Participant 4 stated:

"I think that maybe there's a tendency among educators to be like, I know what I'm doing... I personally felt a sense of yeah, yeah, yeah, I know. I get it. I know what I need to do. And then when you actually go do it you're like, ah, I should probably have focused on that a little bit more... So yeah, I would definitely agree that theory is actually practical. It actually does help when you are in the classroom if you know the theory".

All of the teachers who initially felt they had nothing to learn from the action research process self-assessed as having learned a great deal at the end of the project.

4.5 Theme 5: Support - Critical Dialogic Feedback

Another theme was the importance of effective critical feedback throughout the process. Although in a perfect world all learning might be self-organized among teachers, it became apparent that effective critical feedback could dramatically improve the learning resulting from the AR projects. There were several key timings for this feedback. The most important was during individual milestone checks, both for feedback on progress to date and questions relating to next steps.

Participant 6 highlighted the importance of this personalized support when stating: *"it's always specific. So, if you have any questions you ask, you always get an actionable answer"*. Some teachers initially pushed forward into their projects without having milestones checked and it was later found that there were significant opportunities for pedagogical, methodological, or practical learning that had been missed and required backtracking. Participant 1 noted that: *"peer feedback was very important. It exposed some blind spots in my research and pushed me to higher standards"*.

As this problem was uncovered, the teachers became more aware of the benefits of seeking critical feedback at each milestone and the quality of learning improved as a result while the overall workload was reduced. For example, the researcher notes stated:

"I have noticed several times that some participants immediately gravitate to things they really believe in and are passionate about while others immediately gravitate to the simplest topics. When offered a more meaningful alternative from the literature almost all begin to see the program as more valuable. Perceived value is tied to meaning and impact."

This was also true when considering the impact of the instructor observation of lessons relating to the research projects. One of the teachers who tried to complete their project quickly initially didn't use the instructor as an observer and instead asked a friend to observe. The data they received had no critical component and did not push their thinking or offer alternative viewpoints. When they redid the

lesson with an experienced instructor-observer they emerged with much more meaningful data and drew more meaningful conclusions from it. Participant 4 also noted the benefit of the peer observation on future practice, stating:

"The feedback from the observer was important because it in some ways kind of reinforces your ideas. It can be a good confidence booster to know that you are not completely off track. But then it also kind of gave me some ideas that I ultimately built on in my conclusion of things I can do in the future."

This is not to say that peers cannot fulfil the role of providing critical feedback effectively, only that it should not be assumed that they will. The instructors also noted that they benefitted from the observations and ensuing discussion for all parties, with instructor 2 stating: *"I think observation actually has very many benefits for the observers, also for the teachers, and also eventually it will be impactful for the learners"*.

The provision of critical questioning to support reflection and provide alternative viewpoints rooted in the educational research literature was noted as important by all data sources. Experienced observers supported accountability and transparency as well as ensuring quality feedback and providing suggested resources. Templates to guide pre-and-post observation discussions as well as the observations themselves helped to structure and document discussion and observer feedback.

When not utilized, the lack of formality lowered the quality of feedback as well as lost focus on the research question and concept in the observation. Overall, the provision of experienced instructors as data sources for the participants' research increased overall quality with critically reflective feedback that was grounded in the literature to complement the research-based workshops and coaching for theory.

4.6 Theme 6: Support - PBL Conceptual Links and Teaching Techniques

Researcher notes, instructor interviews, and participant interviews all point to successful cross learning between AR and PBL. However, this learning was dependent on the explicit links that were made in the group workshops and coaching sessions. This notion was exemplified by instructor 1 who stated:

"I think if we didn't reinforce the statement that this is the kind of a PBL course, and not only an action research course... I think some of the candidates who never had a PBL program or never taught (sic) PBL before will feel it's very hard to link."

All participants noted PBL teaching and project management techniques helped their learning throughout the AR project and that they would transfer these to their classrooms in future. Participant 1 said: *"Experiencing PBL as a learner gave me valuable insights... This firsthand perspective will help me design more effective PBL tasks, scaffold collaboration, and guide inquiry processes better for my own students"*. Participant 5 focussed on teaching techniques, stating: *"If I had to do PBL... I think*

that I learned many different techniques to do it". All of the key techniques described in the method section were noted by different participants as supportive. Importantly, they were noted as useful both from the standpoint of supporting success in the AR project and, from the perspective of all participants, as transferable to PBL classrooms.

The comments relating to the project management techniques often additionally mentioned providing project management and visualization structures to support students through self-directed elements of a program. Milestones with deliverables to demonstrate acquisition of learning goals were highlighted as one of the most important techniques to support participants in completing their action research projects. Participant 5 described how it supported and gamified the workflow stating: *"I think, like a video game or something, having the next step in the journey and having clear identifiable goals... milestones, makes it not seem like a whole year long project. It makes it seem like a series of doable things"*. Participant 4 offered an example of the transfer that was noted among the participants from their own AR projects to their future classrooms when stating:

"Next year, maybe for new year 10 students, we need to lead a PBL project. I think these ideas are useful for students. They can manage their time better. They need a deadline for each project process... milestones are really useful to guide them what to do and what they need to think of during the process."

The use of visual management boards to track progress through milestones and subtasks was mentioned by both participants and instructors as providing clarity on where the learning was going and a sense of accountability. Participant 7 discussed how project management can support self-direction, stating:

"A clear design for the whole process is needed, because teachers perform as the leader... I think this guidance is relatively difficult for teachers. A clear guide is very important. We can't give students the direct answer, but we need to direct themselves to solve their problem. This is really challenging work, I think."

Exemplars and transparent success criteria were also noted as useful. When discussing this, participant 2 stated: *"I think exemplars are very important because it gives a standard of what we need to do. A lot of people, including me, like to see an example of what it should look like before. So, I know what's expected"*.

Group workshops were seen to be effective support. The key benefit according to participants, facilitators, and observed by the researchers was the provision of direct instruction for surface learning of key concepts, much as McDowell (2017) argues. In addition to direct instruction, group learning activities allowed the participants to process and contextualize ideas. Participant 5 was enthusiastic about this component, stating:

"Being in a group with your peers and kind of seeing the way that they were picking through each section was very helpful... having like-minded"

individuals that are literally going through the same thing you're going through I think is great."

However, as the workshops were paced over the duration of the program and participants could move individually through the program as quickly or slowly as they wanted, occasionally they reported getting ahead of the content in the workshops and therefore finding them useful, but too late.

This pacing issue was mitigated by individual coaching sessions. Individual interview sessions for dialogic feedback and coaching were identified as even more important than group workshops by most participants due to their specificity and differentiation. Participant 7 noted:

"This [individual coaching] is the most important part for me, because I stopped in step [milestone] three, the literature review, for a long time... I read the literature, but I don't know what I will do next... after talking I knew what kind of plans I need to make... What kinds of data I needed to collect and design.... After that, I designed my action phase and the next stage very quickly."

Participant 3 noted the relative strengths of the group workshops and individual coaching, stating:

"I think the workshops are very important... because it provides basic knowledge about action research and PBL and some methodology when you do action research and also the basic idea of what action research is... But for very concrete learning, I think I prefer personalized instruction, and I think is (sic) more helpful for me."

Learner voice and choice was also highlighted as important to the participants, with participant 5 describing the difference between their AR project experience and more standard professional development offerings in the following way:

"I think PD is important in any type (sic), but one thing that I've found is oftentimes when you're kind of told what to do... this is for everyone. We're all doing this big training. Sometimes you can find yourself thinking, oh, this isn't going to work for me, I don't need this specifically... But the thing I think that is great about action research is I like that we get to choose something that applies to us, and I think that is more beneficial than having kind of random training sprinkled throughout a semester."

Participant 4 also connected their experience to offering voice and choice in future PBL stating:

"I think that having taught PBL before and now being a student of PBL, engaging with a student's inherent enthusiasm is very important if we want it to work. And I think that this kind of action research project has been good for that because it's allowed people to develop ideas that

might've been in the back of their heads... So, I think engaging with the students' inherent enthusiasm for something that they're interested in is very crucial."

5. Discussion

5.1 Opportunities, Challenges, and Supports from the Perspective of Educators

The first element of the research question relates to the perceived benefits, identified supports, and challenges of engaging in AR from the perspective of teachers in a Chinese international school environment. In terms of opportunities, the findings of the study support previous research findings that AR can be a valuable tool for faculty professional development (Bergmak, 2022; Bialen, 2025; Crawford, 2022; Engane & Gonzales, 2025). First, it provided professional development targeted to the teachers' individual interests and needs (Crawford, 2022, 2025). Secondly, methodology built relationships and community of practice among faculty while enhancing communication and understanding between teachers and students (Bergmak, 2022).

The primary challenges faced by teachers were also congruent with literature. These included existing time pressures in their schedules (Bergmak, 2022; Bialen, 2025; Crawford, 2022; Engane & Gonzales, 2025). They also included a lack of methodological knowledge, knowledge of the research literature, and a predisposition among some teachers to think of research as theoretical and an ineffective vehicle for pedagogical improvement, which has been noted previously (Bialen, 2025).

With regard to supports, the program was self-directed but with substantial support and structure. In cases where professional development in AR is instituted, whether due to mandatory accreditation requirements or based on the potential benefits alone, decisions on how formal or informal and how directed versus self-directed the AR projects must be made. Identifying structures that support teachers through effective yet relatively self-directed programs is important as the number of contact hours required for formal qualifications programs may be beyond the allotment of professional development hours for a school or district, especially when training needs to happen at scale.

Previous research has noted a perceived lack of support for teachers and the benefits of considering incorporating program elements such as time management training (Engane & Gonzales, 2025). As time restrictions may be among the most important challenges to completing AR projects from teacher's perspectives (Bialen, 2025), flexible delivery and self-directedness maybe more convenient and enjoyable for educators in some cases. There may also be other benefits to using less directed programs such as fostering self-directed lifelong learning, nurturing organic communities of learning, and empowering teachers as agents of educational change (Crawford, 2022).

Teachers were primarily supported by their own motivation to develop their practices and help their students, which is in common with previous findings (Bergmak, 2022; Bialen, 2025; Engane & Gonzales, 2025). However, they benefited greatly from a range of other supports. For example, due to its uniqueness, an

orientation to action research perspectives and methods can be valuable even in groups with some exposure to positivist research methods. Detailed knowledge of the research literature has also been reported as a perceived challenge (Bialen, 2025; Engane & Gonzales, 2025) and this was noted by the participants to have been mitigated by having experienced instructors and peer observers available for coaching that included suggested sources for their topic.

The data from the participants and instructors particularly supported the use of experienced instructors or instructional coaches for observers as part of the critical reflection process, though this is not the only valid model (Crawford, 2025). However, having at least one observer for each AR project who was an experienced professional development instructor served multiple purposes including direct pedagogical support, provision of an alternative perspective in project planning, supplying a verification source for data collection, and as an impetus for nurturing interdepartmental collaboration.

Coaching used a dialogic feedback and assessment as learning approach (Dochy et. al., 2023) and the findings overwhelmingly supported this. Much as described by Crawford (2022), having a clear observation protocol and including pre-observation data decisions and debriefs after the observation was noted as beneficial.

5.2 Linking AR to PBL in Educational Settings

Connecting the AR process to PBL both conceptually and through the incorporation of PBL teaching techniques is one of the key elements of originality in this paper and forms the second element of the research question. These connections and techniques were identified by participants as important supports. The data strongly suggested the PBL paradigm helped educators navigate their own AR projects and also build a mental model of how to transfer PBL design elements, teaching techniques, and project management structures not related to their inquiry topics to their future classrooms.

The issue of self-directedness versus program structure came to the fore in researcher notes, instructor data, and participant data relating to PBL. Becoming an effective self-directed learner who can solve problems contributes to continual personal and professional adaptation throughout the lifespan, and there is an increased recognition that competence in self-directed learning needs to be an explicit target of education (Pachauri & Gure, 2023). Furthermore, self-directed learning and citizen agency are important components of current educational reform because they support an ability to maintain learning through the lifespan; to make this learning more profound and transformational; and support the application of learning to emancipation and social action (Merriam & Baumgartner, 2020). The research findings supported the literature reviewed.

PBL typically requires a measure of self-direction and the gradual development of self-directedness in learning is often one of the objectives of PBL that program designers may consider through curriculum design variables such as the amount of intellectual challenge, the depth of inquiry, and the amount of structure built

into a program (Hazard, 2023). However, it is important that proper support and structure, are planned to reduce the level of self-directedness required for effective inquiry to a tolerable level, especially at critical stages as participants develop surface levels of understanding (McDowell, 2017). Increasing the amount of support may also increase the efficiency of learning for learners that are not expert self-directed learners.

The Staged Self-Directed Learning model (Grow, 1991; 1994) provides a useful map through conceptual stages of self-directedness in learning and links them to instructor roles and potential learning activities that shift gradually from more teacher-centered toward more project-based approaches as learners become more self-directed. Although these levels may be considered from a whole course design perspective, they may also provide a continuum of learning activities within PBL programs that can be used to make programs more-or-less structured.

The findings suggest that PBL potential support for AR training is numerous and may be more traditional (such as direct instruction by experts), structural (such as time management and project management techniques), or maybe technical (such as Know-Need to Know boards and other specialized techniques for research, design, teamwork, data analysis, or impact assessment).

Overall, the implications of this research supports previous work that suggests leaders, program designers, and other stakeholders should consider what support can be given to reduce teacher workload during cycles of inquiry as well as what can be done to maximize the impact of the effort. This is particularly important in cases where teachers may presume they have nothing to learn pedagogically from action research, but who may dramatically change their perspective if given the support to develop a high-quality project. These findings also give credence to the idea that as education systems change with society, teacher professional development approaches should evolve alongside changes to pedagogy for students (Milner & Scholkmann, 2023).

Linking action research to PBL conceptually may help teachers be successful in their own AR project and create transfer knowledge when they plan their own PBL programs. The use of key PBL teaching techniques may also be effective in supporting successful pedagogical research and model specific techniques for classrooms. The importance of planning for high project impact is an important concept from effective PBL design (Hazard, 2023) that can reinforce explicit impact planning and participatory methods in both faculty AR, and later PBL experiences teachers may design for student learning.

As action research is context specific, the findings are not generalizable. In the research context, none of the teachers interviewed had previously experienced PBL as a student. In other contexts, it is possible that a larger proportion of teachers may have grown up with inquiry-based education as part of their own educational background. Also, due to the long duration of the AR training program participants were recruited from, and because it was self-paced, the participants for this research were composed of relatively early finishers of the AR

training program. They could potentially have different perceptions than those who finished after this research was completed.

6. Conclusion

The current study sought answers to the question, what opportunities, challenges, and supports can be identified from the experience of teachers undergoing a relatively self-directed action research training program explicitly linked with key PBL concepts and teaching techniques?

Teachers identified many opportunities such as pedagogical improvements, improved collaboration with students and peers, and the development of their own 21st century competencies. Challenges were primarily time constraints and an initial perception among some that AR might not result in meaningful pedagogical improvement. With regard to identified supports, making an effort to provide teachers with sufficient time to complete the project at high quality, allowing for differentiated pacing to accommodate their variable schedules throughout the year, giving credit for completion, providing one or more AR experts or experienced colleagues to consult with at major milestones, and providing mentor-observers with a knowledge of the research literature may help avoid AR initiatives being completed superficially.

The main unique finding of this research was that linking faculty AR projects to an overarching PBL paradigm and utilizing PBL teaching techniques can provide support to complete quality action research projects and simultaneously help create transfer learning for this increasingly important area of pedagogy. Levering a PBL paradigm and teaching techniques in the first few cycles of faculty AR may contribute to a whole-institution understanding of effective inquiry-based education in both K-12 and adult education environments such as postgraduate programs that use action research as an option for dissertations.

7. References

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