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Marguerite Maher
Charles Darwin University

Philippa Gerbic
AUT University

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E-portfolios as a Pedagogical Device in Primary Teacher Education: The AUT University Experience

Marguerite Maher
Charles Darwin University
Philippa Gerbic
AUT University, New Zealand

Abstract: Portfolios have a long tradition in teacher education and now these are available in electronic form. At the same time, there are increasing demands for primary teachers to be technologically capable and confident in classrooms. When teacher educators wish to respond through the introduction of new technologies such as e-portfolios, there are significant issues of professional learning. This paper discusses one response, a collaborative self-study, around the introduction of an e-portfolio as a pedagogical device. It highlights two key aspects of the study: first, it considers how collaborative self-study as a methodology proved crucial for sustaining lecturer motivation and commitment to the innovation; second, it describes how the e-portfolio was used to enhance the student experience in the science curriculum area which can be a challenging curriculum area for some students. Finally, some recommendations for practice are put forward for consideration.

Introduction

Portfolios have a strong tradition within teacher education and have been used for a variety of purposes including supporting and documenting professional learning and development and meeting registration requirements (Wray, 2008; Barton & Collins, 1993; Grant & Huebner, 1998; Ryan & Kuhs, 1993). The advent of Information and Communications Technology (ICT) not only creates new demands for teachers' skills in this area, but also provides opportunities for using an electronic version of the portfolio (Strudler & Wentzel, 2005). Furthermore, there is a wider interest in electronic portfolios (hereafter e-portfolios) within a policy context with governments becoming increasingly interested in electronic systems and spaces which describe learner achievement and the use of e-portfolios to support this throughout lifelong learning (Stefani, Mason & Pegler, 2007). This interest in e-portfolios is also reflected within the schools context in New Zealand, where, as part of the government's ICT development initiatives, schools are starting to use e-portfolios in a variety of ways to record children's achievements. In 2006 the New Zealand Government invested $9.6 million over the next three years to help 30 clusters of schools integrate ICT into teaching programs. This has been achieved and in 2009 an open source e-portfolio platform is available for use in all schools (see http://softwareforlearning.tki.org.nz/Products/Mahara/)

In teacher education, e-portfolios raise issues including the best ways to integrate these into preservice teacher learning, working with the underpinning pedagogies, and how best to support and assess preservice teacher learning using the new technology (Wray, 2007). For lecturers, there are further significant issues to be addressed which relate to their own professional learning about the new technology, but more importantly, the pedagogies and practice which the technology might best support. In the face of multiple demands, time pressure and often a scarcity of resources and

expertise lecturers need to develop an understanding of the learning potential of the pedagogy and its ability to be transformational (Stefani, Mason, & Pegler, 2007).

This paper discusses one example of a professional learning approach, a collaborative self-study, which was undertaken by a group of teacher educators in their introduction of an e-portfolio into a primary teacher education program in New Zealand. The paper begins by introducing the concept of e-portfolios and that of collaborative self-study as a scholarly approach to professional learning about new technologies for teacher educators. It then describes the collaborative self-study, and discusses an example in the science curriculum unit. The paper then reflects on issues which arose during the self-study and concludes with some recommendations for practice.

Contextualising E-portfolios

An e-portfolio is a "digital container capable of storing visual and auditory content including text, images, video and sound… they organise content, but also they are designed to support a variety of pedagogical processes and assessment purposes" (Abrami & Barrett, 2005, p.2)

E-portfolios can exist outside an online learning system or they can be embedded within it; currently many of the proprietary online learning platforms (for example Moodle, Blackboard and WebCT) are working to include this facility within their offerings. The personalised nature of e-portfolios fits well with the current trend of new social networking softwares, and may provide a more relevant digital technology for many of today's digital natives (Prensky, 2001) who have increasingly grown up in a technology rich environment.

Many researchers in the field identify the connection with the traditional concept of a portfolio which was originally a way of showing authentic examples of work or competency. Educators, however, recognised this portfolio concept could be extended and that their real value lay in supporting a different approach to learning which was more personalised, closely connected to workplace learning, and which provided evidence of authentic assessment and personal development planning (Stefani, Mason & Pegler, 2007). For teacher educators, what was attractive was the thinking processes that could be encapsulated within a portfolio, particularly the analysis, reflection, planning and evaluation that could accompany the collection, and the potential for developing habits that would last after graduation (Zeichner & Wray, 2001).

E-portfolios are a technological, rather than a conceptual innovation. For example, Strudler and Wetzel (2005) identified prior experience with paper-based portfolios as a successful factor in their case study of an e-portfolio introduction in a teacher education program. However, e-portfolios do differ from paper-based portfolios. Challis (2005) identifies these differences as:

- ease of managing material which supports more rigorous selection, analysis and reflection in a more timely fashion,
- reduced size which significantly improves portability and storage,
- global access, and therefore availability to wide audiences, and
- communicating online through a wider range of materials including digital media such as video and sound clips.

Butler (2006) identifies further benefits, which include ICT skill development, facilitating feedback, fostering a sense of pride in work, providing rich pictures of student learning and competencies, engaging students more in the assessment process and they are less costly to reproduce and generally include privacy features.

There now appears to be general recognition of three main types of e-portfolio. Abrami and Barret (2005) show the first of these is a process or learning portfolio where the focus is on the process of learning. This is student-focused and includes students reflecting, evaluating and interacting with their peers and the teacher in giving and receiving feedback. The second kind is

that of a showcase portfolio where the purpose is to demonstrate competence and achievements. The emphasis here is on showing, rather than evaluating, and on the product rather than the process of learning. The third kind is that prepared for some form of assessment, where the focus is on external evaluation or judgement. This generally includes authentic assessment and involves the use of criteria and standards which are most widely recognised through graduate outcomes and registration and accreditation standards.

In teacher education, regardless of the kind of portfolio described above, a central purpose of e-portfolios is the development of teachers as reflective practitioners. Reflection within a portfolio is a way of strengthening the interrelationships between the theories and principles learned in the university and the preservice teachers' practice and emergent philosophies in school classroom settings. This can promote greater awareness of the theories and assumptions underlying practice and promote professional and collaborative dialogues (Zeichner & Wray, 2001). In their investigation of e-portfolios as a tool for the development of self-reflection, Pellicconne, Dixon and Giddings (2005) found students valued the way in which their portfolios "came to life and mirrored the individual's personality and traits" (p.533) which resulted in greater commitment by the students to self-reflection on their personal and professional growth and clearer links by them between their teaching artefacts and the program outcomes and attributes.

Much of the attention now being paid to e-portfolios arises because of the recognition of the value of their underlying pedagogies which have always been a part of portfolio pedagogies. Writers have described portfolios as embodying constructivist pedagogies because of their ability to enable preservice teachers to be actively engaged in their own learning and to support their construction of what it means to be a teacher. This may also include socio-constructivist concepts. For example, Evans and Powell (2007) discussed the use of an e-portfolio to support a community of learners, where teachers view themselves as researchers, and which was focused on enculturating new teachers into the teaching community. Two other pedagogical perspectives are frequently discussed; these are student-centred philosophies and those related to authentic activities for assessment. In support of a student-centred approach, Acosta and Liu (2006) discussed the ways in which e-portfolios can shift the locus of control from lecturers to students with their emphasis on analytic and reflective processes rather than product. Abrami and Barrett (2005) also indentify other relevant student-focused concepts such as self-regulation and self-efficacy beliefs. The ability of e-portfolios to allow students to document and reflect on their real world experiences and to receive feedback on these and to connect them to graduate profiles, provides a degree of authenticity highly motivational for students (Emmet, Harper & Hauville, 2006).

Nevertheless, there are issues and conflicts relating to the use of e-portfolios. The issue of student perceptions is an important one. Anecdotal evidence suggests students are often more focused on the use of an e-portfolio to help them gain employment whereas their lecturers are more focused on the ability to support learning. There is some evidence, however, of students appreciating both aspects of an e-portfolio. In their study of first year student teachers, Peters et al. (2006) found students regarded the e-portfolio as a learning tool because it contributed to the growth of their self-esteem, developed their reflection, self-evaluation and organisational skills, as well as helping them to show their best work to get a job.

Another conflict recognised throughout the literature is the tension between using e-portfolios for both developmental/learning/process goals and assessment of outcomes and/or external standards. Pearl and Paulson (1994, cited in Barrett, 2005) described the tension between these two approaches where the constructivist approach was focused on learning from the students' point of view whereas the positivist approach emphasised standards and interests outside the student. It is now possible with some e-portfolios to provide two different views which enable students to separate these different goals; however, students must learn to do this and to understand these different purposes. Evans and Powell (2007) reinforced this when they argued there is an inherent tension between national standards and the behaviours reinforced through the e-portfolio

process and recommend more research on the existing social fabric of teaching. Several authors (Acosta & Liu, 2006; Pelliccionne, Dixon & Giddings 2005; Peters et al., 2006) examine the assumption that portfolios are valuable for promoting high-quality reflection and found the mere construction of a portfolio in itself did not yield critical levels of reflection by teachers. Rather, other factors, such as collaborative processes, were further critical aspects in creating deeper reflection.

Context of the current research

During 2006, the Tertiary Education Commission (TEC) in New Zealand, through its e-Learning Collaboration Development Fund, began the development of an e-portfolio project (Eduforge, 2006). This comprised the creation of an e-portfolio platform for the New Zealand Tertiary sector, named Mahara, and its introduction within a variety of tertiary settings. Seven tertiary institutions were funded to implement Mahara under this project and one of them was the authors' university through the School of Education.

In the AUT University School of Education, the e-portfolio was introduced to final year teacher education students across all (seven) units (Record of steering committee meetings, 2007). With schools in New Zealand constantly embracing new technologies in the compulsory sector, the steering committee considered it imperative for graduating students to have enhanced capabilities in this area. They believed an e-portfolio could provide opportunities for students to develop their technology skills and understanding of the potential (and challenges) of technology to assist learning, facilitate their achievement of the graduating standards and provide a new way of demonstrating capability for teacher registration with the New Zealand Teachers Council. The essentially democratic nature of the self-study approach encouraged participation by motivating busy academics to take risks and embrace innovation to improve teaching and learning, specifically demonstrating to students that lecturers viewed knowledge as a socially constructed activity (Record of steering committee meetings, 2007).

Methodology

In the current context, where e-portfolios were being introduced for the first time into a teacher education program, there were considerable professional learning issues which related not only to understanding the technologies themselves but also to using them in pedagogically responsive ways with their student teachers. Within teacher education, there is a tradition of teacher-researcher which Cochrane-Smith and Lytle (1999) have identified as a significant form of professional development. Because this approach combines work and a research orientation, it therefore provides "a unique opportunity for individual and professional growth" (Cochrane-Smith et al., 1999, p.241).

Self-study is one form of teacher research which has emerged in the latter decades of the 20th century. Bullough and Pinnegar (2001) identify the origins of self-study as arising from the rise of qualitative and naturalistic approaches to inquiry in education, the significance of the *self* in teaching and curriculum studies, the contributions of scholars across the world (for example, phenomenology, narrative) to educational research, and growing recognition of the value of action research, which has particularly blurred the distinction between researchers and practitioners.

While there are definitional issues concerning self-study, most descriptions centre on teacher educators studying their own practice, and this often includes the self. "Self-study points to a simple truth, that to study a practice is simultaneously to study self: a study of self-in-relation to other" (Bullough and Pinnegar, 2001, p.14). Other self-study features identified by Loughran and Northfield (1998) point to the value of collaborative self-study when they discuss the need for checking data and interpretations with others, the difficulty for individuals to reframe their

interpretations of their experiences on their own, and the value of colleagues and the *shared adventure*. While the focus of self-study is often on professional learning, there are other sometimes overlapping reasons for taking such an approach. These include enhancing self-knowledge, constructing new knowledge, uncovering the real story of what might be occurring in a context, and celebrating success in learning. Reflecting on a number of self-studies, Loughran, Mitchell and Mitchell (2002) identified benefits from self-study such as increasing the ability of teachers to take risks with innovations, and developing the ability to articulate their beliefs and practice and where collaboration was involved, to reframe these with new ideas and practices. Other beneficial outcomes were the ability to challenge existing practices and provide "new visions of what is possible" (Loughran, Mitchell, & Mitchell, 2002, p.255), deeper understanding of student learning and changing learning patterns, and from this, innovations in practice. Specifically, self-study is an extension of such a reflective approach which has public dimensions in the sense that it intends to create and communicate new knowledge and understandings.

For these reasons, the steering committee of the AUT University project favoured this methodology. Nevertheless, there are challenges for self-studies. First there is the issue of whether, in fact, self-study is a valid form of research and how rigour might be demonstrated. Some follow a qualitative tradition and argue for an emphasis on explicit descriptions of the research process in reports which includes context, evidence, analytic processes and changes (Thorne, Kirkhan, & MacDonald-Emes, 1997). These authors also regard collaborative processes as an essential feature in successful self-studies. On the other hand, Bullough and Pinnear (2001) provide for more individual approaches in their guidelines for greater quality in autobiographical forms of self-study. LaBoskey(2004) emphasises the role of presenting the research to professional communities for "deliberation, further testing and judgement" (LaBoskey, 2004, p.860).

There are also process issues which can affect rigour, some of which arise from the multiple roles discussed above. Data collection can be messy and not always systematic as teachers try to fit the collection in around their work and teachers often make changes immediately, before they have completed any research processes (Loughran, Mitchell, & Mitchell, 2002). Other process issues in collaborative projects include issues of ownership and commitment, the differing roles and status of the team and consequent power relations and the impact of personal and professional goals and commitments on the collaboration; Clift, Brady, Mora, Stegemoller and Choi, (2006) provide thoughtful recommendations for addressing these.

Ethics Issue

AUT Ethics committee had no concerns around the use of a blog within the research, and perhaps this is a commentary on the pervasive nature of the Internet and, now, also, Web 2 tools in modern life. Instead, issues arose around the collaborative nature of the project. AUT university's ethics policy states that when an individual teacher is the only researcher and is the subject of research into their own teaching, then ethics approval is not needed. The steering committee initially considered that a collaborative self-study was similar. Although there was no need to obtain consents from participants, it was important to still show participation was voluntary and this was done by documenting the introduction of the implementation and the consequent self-selection process for the research project. It was also necessary to address the issue of dependent relations and possible conflicts of interest (Clift et al., 2006). Two of the team members had some responsibilities regarding others within the team; however, this was considerably ameliorated by the generally distributed nature of roles within the school. To avoid potential conflicts of interest, it was agreed the researcher who was in the dominant position (for example, signing off leave) would hand the matter to another person outside the team to address. The ethics committee also required the provision of a 'Collaboration Protocol'. In essence, this documented that participation was

voluntary and members could leave at any time, that all members had access to the data and the right to publish under their own names for their own constituencies.

The next sections of this paper introduce the e-portfolio project and the rationale for the self-study. As the introduction of this new technology was considered, it was clear a learning and development process would be required; the collaborative self-study would be the best methodology for accessing and providing support, cataloguing progress and problems, and evaluating the success of the initiative.

Implementation, Successes and Challenges

Science as an Exemplar

The teaching of science in primary schools has been an area of concern for many years across many countries (Appleton & Kindt, 1999). Many preservice teachers cannot recollect any engaging, positive science experiences they had as school children; these poor experiences affect the belief systems preservice teachers have about their own science teaching and their capacity to do so effectively (Sherman, 2007). Explicit teaching of science concepts through hands-on activities ameliorates against lack of confidence (Taylor & Corrigan, 2005). A further factor which mitigates, leading to more effective teaching of primary science, is correlated to school size: larger schools having more confident and competent science teachers as there is support within the community of learners (Murphya, Neilb, & Beggsc, 2007).

It was, therefore, a priority of the steering committee to find ways to use the e-portfolio as a pedagogical device that would: a) foster the development of a community of learners comprising both students and lecturer, and b) enhance the confidence of the students in their ability to be effective science teachers (Record of steering committee meetings, 2007).

Curriculum Subject: science was the last curriculum area studied by final year preservice student teachers; this fell in their last semester, when they had already been working with the e-portfolio platform for six months. Because there had been more collaboration between lecturers than in the past (Loughran, Mitchell, & Mitchell, 2002) rather than working in isolation, it was possible to craft multidimensional tasks that allowed students to meet learning outcomes across three units, including science. Furthermore, it provided students with a better understanding of the interlinked nature of their preservice teacher education program, and the interrelatedness of curriculum areas in all teaching and learning. It was emphasised to students that an e-portfolio was a technological, not a conceptual, innovation (Strudler & Wetzel, 2005).

First, students used the e-portfolio to create a cross-curricular unit of study on the topic *Education for Sustainability* for primary school children of a level of their choice; this could include a wide variety of content and artefacts, including images, video clips and sound (Abrami & Barnett, 2005). This was an authentic assessment for the education students as an increasing number of schools in New Zealand are known as *Ecoschools* in which education for sustainability is the lynchpin of all teaching. Completion of this unit of study would enable children to meet science, Sociology and Health learning outcomes.

Second, students were required to include within their e-portfolio a reflective piece on their philosophy of teaching and learning. They needed to articulate how this would align with the underpinning philosophy of an Ecoschool. This tasked linked theory to practice in students' final professional experience unit and was an authentic assessment as many students would, within weeks, be applying for jobs in Ecoschools.

E-portfolios were used in the unit in all three ways identified by Abrami and Barrett (2005):

- for the process of learning as students increased their own scientific knowledge,
- for showcasing exemplars which they shared with their peers, and
- for assessment purposes as this work contributed to students' final grades.

The reflective pieces and units of work in the e-portfolio were available to the rest of the students in the class and lecturers, promoting professional and collaborative dialogue (Zuchner and Wray, 2001). Feedback provided by peers allowed for enhanced levels of reflection (Stefani, Mason & Pegler, 2007).

Since students had worked with the e-portfolio for six months already, they readily adapted to using this technology in the completion of these tasks. The e-portfolio assessment was optional and students could choose to write an essay in preference. Exactly half the students chose the e-portfolio task, but those who did not still contributed by visiting the shared sites, offering comments to their peers, and using the information provided as they prepared for interviews at schools. Students formed a genuine community of learners (Evans & Powell, 2007; Murphya et al., 2007) sharing ideas, and offering support to one another (Record of steering committee meetings, 2007). Specifically, those students who were not confident in their own scientific knowledge gained in confidence, knowledge and skill as they looked at work in their peers' portfolios and/or received feedback from their peers on their work. This community of learners has continued as students have left university and have taken up positions as beginning teachers. Sharing of the units of work developed by the students continues today as there is still ongoing communication between lecturer and students through the e-portfolio platform.

Value of a Collaborative Approach

The collaborative approach as described by Loughran and Northfield (1998) was a highly successful aspect of the implementation; the self-study project supported this well. Accessing the literature enabled team members to use research and scholarship to understand the learning potential of e-portfolios and to consider how best to incorporate this new technology into their programs as suggested by Zeichner and Wray (2001). The team was able to provide, collaboratively and individually, a rationale for students which was informed by the literature. Following research by Butler (2006), each lecturer had a different perspective on e-portfolios and through their articulation of these, students and lecturers together, with careful listening and feedback, were able to discuss differing positions and perspectives on this technology in relation to their professional development and lifelong learning (Record of steering committee meetings, 2007).

Part of the introduction to students of the e-portfolio included the self-study; lecturers were therefore able to model the concept of teachers as researchers, a practice of increasing significance in teacher education today as highlighted by Evans and Powell (2007). Since lecturers' experience of e-portfolios was not much greater than that of the students, it was possible, through collaboration in the study, for lecturers to work alongside students as a learning community of educators. This tended to ameliorate the usual power relations between lecturers and students as explained by Clift et al. (2006); anecdotally, students found this motivating.

The article will show the research process resulted in deeper analysis and evaluation of the technology and its use within the program. The collaborative nature of the project meant no lecturer was an isolated *lone ranger* and each had access to a wide range of perspectives, and advantage described by Acosta and Liu (2006) and Evans and Powell (2007). This was especially important in the early phases as participants developed out understanding of the learning potential of e-portfolios and considered their inclusion within our units. The group face-to-face sessions supported the rapid development of ideas and intense interaction and exchanges of perspectives (Record of steering committee meetings, 2007).

Issues arose regarding the useability and reliability of the software and this was highly frustrating for both students and lecturers. Addressing these tended to interfere with ability to reflect and analyse; ultimately technical issues operated as barriers to pedagogic understanding in this first implementation. Had there not been a collaborative, supportive environment engendered by the collaborative self-study, many lecturers would not have persevered with the implementation of the

e-portfolio in their units (Record of steering committee meetings, 2007). In order to ameliorate the impact of these technical issues, and to address student anxiety and dissatisfaction, through the project processes lecturers and students were able to document and discuss these collaboratively and recognise through the literature that this was a common problem with new technologies. In order to ensure no student was disadvantaged, some lecturers thought it wise to alter assessment tasks from summative to formative, or to make them optional, as was the case with the science assignment (Record of steering committee meetings, 2007).

Significance of the Research and Conclusion

The research has demonstrated a self-study produces more informed and rigorous approaches to curriculum design, and embedding new technologies as described by Loughran, Mitchell and Mitchell (2002). Of particular value was the literature which provides scholarly perspectives and inspiration as a complement to experience. The self-study drew on the strengths of lecturers who regularly reflected on their practice and created a bridge into further research as a form of professional learning. Self-study created a supportive environment for emergent researchers as suggested by Cochrane-Smit et al. (1999).

Staff working collaboratively had the benefits of allowing multiple perspectives in all phases of the research. Collegial support saw *buy in* enhanced, despite lecturers having differing expertise across the areas of technology, pedagogy and research; it helped to ensure ongoing commitment to the implementation. Being involved as a participant in the project was a strong motivator for some lecturers, providing them with opportunities for publication (Record of steering committee meetings, 2007).

Students having the self-study explicitly explained resulted in their feeling part of a team working towards a common goal as described by Northfield (1998). Students mentioned they felt it important they understand the rationale for introducing new technologies; they also learned from reflecting on the associated change issues which arose. Furthermore, the self-study modelled the teacher as researcher and illustrated scholarly approaches to change and professional learning. Working with students in this way fostered excellent student-lecturer relationships (Record of steering committee meetings, 2007). Following Clift et al. (2006), in order to maximise everyone's contribution and the development of everyone's skills, members of the team with positional authority or expertise balanced their positions so their role was democratic rather than directional.

There were tensions between understanding the technology and developing its pedagogic potential. The emphasis should be on the pedagogy, noted as pivotal by Stefani, Mason and Pegler (2007); however, especially in the beginning lecturers and students focussed instead on incremental understanding and refinement. The transformational aspects could only evolve once the technology was mastered (Record of steering committee meetings, 2007).

Using different communication media to support the study and to shift the locus of control from lecturers to students proved invaluable as described by Acosta and Liu (2006). Virtual spaces offered time for reflection, and an interaction process based on reading and writing. Using the blog, for example, extended collective reflection of the study group and added new dimensions to such reflection (Record of steering committee meetings, 2007).

Using the e-portfolio itself to create a community of learners and to support the self-study became an important factor as suggested by Evans and Powell (2007). For the research study itself, the e-portfolio provides a permanent receptacle for all the study artefacts which can be accessed from any place and over time, providing a flexible communication medium for the researchers. This was pivotal in meeting the varying needs and capabilities of participants, and the understandably variable amounts of time they were able to allocate to the project. Also, working with the e-portfolio in this way provided teacher-researchers with an opportunity to develop their own e-

portfolio skills as well and to illustrate these by referring to the e-portfolio (Record of steering committee meetings, 2007).

Implications for Further Research

This research demonstrates it would strengthen the study if student perspectives were to be included. The current study was unable to do so because of time constraints and this is considered to be a limitation of the study.

While collaborative self-study can be highly suited to introducing a new technology and its accompanying pedagogy, it is not without challenges. An investigation of how best to provide technological support to students, particularly those studying externally, would be useful.

The support necessary for developing researcher comfort with the technology, especially regarding participating in, and fully using, the reflective and interactive potential of the technology, should not be underestimated. Good ways of accomplishing this would better inform practice.

In Summary

This paper has discussed lecturers' perspectives on the introduction of a new technology in a teacher education programme via a collaborative self-study. This was important in providing a rigorous and scholarly approach to introducing the new technology and supporting the professional learning of the teacher educators involved.

The collaborative nature of the research process ensured that, as teacher-researchers, enhanced capacity generalised to all levels of experience. The self-study provided a basis for sustained development and further embedding of the e-portfolio within the earlier years of the program. The self-study also provided the opportunity to model good practice as teacher-researchers for the preservice teachers. There were clear benefits for both lecturers and students.

Challenges aside, the findings from this research project strongly suggest new technology implementations should be carried out in teams and, also, that collaborative self-study is an effective methodology to consider.

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