

A view into teachers' digital pedagogical portfolios showing evidence of their Technological Pedagogical Reasoning

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Abstract: This paper is a report on the findings of a study undertaken with a number of teachers who have completed their *SMART Classrooms Professional Development Framework - Digital Pedagogical License (SCPFD-DPL)*. These SCPFD-DPL's provide rich descriptions of a teacher's professional values, relationships, knowledge and practice with using digital technologies. This study extends Shulman's (1986, 1987) work on pedagogical reasoning to include technology. The aim of this study is to understand how teachers, across various career stages, reason with technology. As part of this research project, teachers have given access to their online SCPFD-Digital Pedagogical License. These SCPFD-DPLs were reviewed using Shulman's Model of Pedagogical Reasoning and Action as a lens. Findings indicate there is evidence of Pedagogical Reasoning with technology embedded in the portfolios of these four experienced teachers.

Introduction

Until recent years Australia did not have a national approach for the definition of quality teacher standards and teacher registration. Ministerial Council for Education, Early Childhood Development and Youth Affairs (MCEECDYA) rationalizes that the agreed standards "describe what teachers should know and be able to do at appropriate career stages" (2011). Australian Institute for Teaching and School Leadership (AITSL) in consultation with teachers, have defined the standards in terms of the domains of teaching including professional knowledge, practice and engagement (2011).

Parallel to this quality teacher initiative is a national policy to boost technology use in education titled the *Digital Education Revolution*. This national policy "aims to contribute sustainable and meaningful change to teaching and learning in Australian schools that will prepare students for further education, training and to live and work in a digital world" (Department of Education Employment and Workplace Relations, 2011). "Educators require the pedagogical knowledge, confidence, skills, resources and support to creatively and effectively use online tools and systems to engage students" (p.6). With these two major national policy initiatives, teachers are being encouraged to use Information and Communication Technologies (ICT).

Students are using ICT and as reported in the 2003 *Programme for International Student Assessment* (PISA), almost all participating 15-year-old students from OECD countries had experience with using computers at home and school (OECD, 2005). They suggest technology has "profound implications for education, both because technology can facilitate new forms of learning and because it has become important for young people to master technology in preparation for adult life" (2005, p. 3). The PISA results are nearly ten years old and with some of the technology innovations in the last five years, students have access to more technology and that technology is not restricted to school or home (e.g. smart mobile phones, 3G enabled tablets). In 2009, Moyle and Owens (2009) reported that over fifty percent of primary school and 84 percent of secondary students have been using technology for more than five years.

With the policy initiatives and pressures from students to use ICT, teachers need to use ICT in their teaching practices. To facilitate this at a local state level, Education Queensland (a state teacher employing authority) has developed a *SMART Classrooms Professional Development Framework (SCPFD)* (Department of Education and Training, 2012a). This framework provides a mechanism for teachers to self-assess their teaching attitudes and practices with regard to ICT use. Teachers are asked to discuss and provide evidence of their professional values, relationships, knowledge and practice in line with a series of predetermined indicators. An 'Accredited Facilitator' then accesses the portfolios before a certificate is awarded.

The *SMART Classrooms – A strategy for 2011-2014* "provides direction for harnessing the learning and business potential of ICT now and into the future" (Department of Education Training and Employment, 2012a). The strategy document provides a clear outline of the four drivers: Working Digitally; Developing Professionals; Enabling Learners; and Harnessing the Enterprise Platform. Under the 'Developing Professionals' heading, the SCPFD is outlined as a continuing strategy for teachers. "The framework is a professional learning guide that helps

teachers embrace digital pedagogy” (Department of Education and Training, 2012b). As a demonstration of their ICT competency, the majority of teachers participating in the SCPDF complete an electronic portfolio. This is not stipulated in the policy but teachers have used various tools to prepare their portfolios including webpages, virtual classrooms (BlackBoard) and wikis (EdStudio). To 2010 (from a workforce of 41,000 plus teachers), 11,714 teachers have completed ICT Certificates, 2,021 had completed Digital Pedagogical Licenses and 54 had completed Digital Pedagogical License-Advanced (O'Hagan, 2010).

The objective of this paper is to report on a qualitative study carried out on the portfolios of four teachers who are part of a larger study. The research project objective is to understand of the development of Technological Pedagogical Reasoning (TPR) over a teacher’s career and identify the influences on the development of TPR. “The opportunity to document the ‘rich’ descriptions of teachers’ thinking with technology and the opportunity to uncover influences are valuable aspects of the research”(Smart, Sim, & Finger, 2012).

The literature

In exploring pedagogical reasoning embedded in digital portfolios, there are two key bodies of literature that underpin this paper. Firstly, literature on the use of portfolios in an educational setting is important, as there is strong evidence of the benefits of teachers using portfolios (Shepherd & Skrabut, 2011). This leads to the exploration of the content of the portfolios and the pedagogical reasoning embedded within this type of portfolio. The second body of literature pertains to pedagogical reasoning (Shulman, 1986, 1987) where pedagogical reasoning is developed “through the process of planning, teaching, adapting the instruction, and reflecting on the classroom experiences” (Shulman, 1987, p. 117). The SCPDF-DPLs provide a vehicle for teachers to explain their pedagogical reasoning for using ICT.

Portfolios

Portfolios have been used in pre-service education programs as part of assessment (**Error! Hyperlink reference not valid.**; Davies & Willis, 2001; Napper & Smith, 2006; Ryan & Kuhs, 1993; Willis & Davies, 2002) and to prepare students in licensure with a teacher registration body (Napper & Smith, 2006). Napper and Smith (2006) suggest that portfolios completed in pre-service education programs are prepared as “evidence of meeting all of the standards for professional licensure at the entry level”(p. 2). These type of portfolios contain evidence of assessment as “lesson plans, presentations, reflections...to show how students process information and develop professional skills gleaned from their <pre-service> course” (Napper & Smith, 2006, p. 2).

Nodoye et al (2012) suggest that there is an employment portfolio which “aims to showcase a candidate’s competencies for the position” (p.1). Pre-service teachers seeking employment in Queensland are required to prepare a portfolio in preparation for the application process for Education Queensland (Department of Education Training and Employment, 2012b). This portfolio is prepared based on the ‘Professional Standards for Queensland Teachers (Graduate Level)’ (Department of Education Training and Employment, 2012b) where pre-service teachers address each standard with evidence explained and attached to show how they meet the standard. For some applicants this is a paper-based process and for others they use an e-portfolio prepared as part of their pre-service education program.

Past graduation, portfolios can be used for planning an educational program; documenting knowledge, skills, abilities and learning; track development; job seeking; evaluating a course and monitoring and evaluating performance (Queensland College of Teachers, 2009). Though Lorenzo and Ittelson (2005) acknowledge that portfolios could be used to showcase accomplishments where Napper and Smith (2005) suggest portfolios can be used for advancement in licensure. For the teachers participating in this research project, their SCPDF-DPL portfolios are not required for licensure, do not guarantee career advancement and are not affiliated with the professional standards. The SCPDF is only promoted by one employing authority but is recognized across all employing authorities in Queensland (Education Queensland, Catholic Education and Independent School sector).

Shepherd and Skrabut (2006) acknowledge that electronic portfolios “can increase reflection, develop content and pedagogy skills and facilitate communication between teachers and administrators” (p.31) but most have a limited duration. All Queensland pre-service teachers prepare a portfolio as part of their pre-service education but there is little evidence to suggest that portfolios are updated after successful job placement. Shepherd and Skrabut (2011) explain that “research on e-portfolio retention suggests that teachers quickly abandon practices following career milestones” (p.32). Though, Rolheiser and Schwartz (2011) found that there eleven first year teachers had maintained their portfolios in their first year of teaching. Grant and Huebner (2001) found in earlier research that teachers three years after graduation were still maintaining their portfolios. No research was found to further explore this issue of portfolio retention.

The key themes on portfolio use highlight that portfolios are used extensively in pre-service education programs but there is little evidence that teachers continue to use them after graduation. There is research with evidence that portfolios are useful tools for the process of accreditation and job seeking but there has been limited

research on in-service teachers using portfolios. There was no research found to support the use of e-portfolios as a tool for capturing values, relationships, knowledge and practice.

Pedagogical Reasoning

Shulman (1987) suggested a Model of Pedagogical Reasoning and Action (MPRA). There are six processes to develop the knowledge base for teaching: Comprehension; Transformation; Instruction; Evaluation; Reflection; and New Comprehension. *Comprehension* involves teachers understanding what they are going to teach. *Transformation* is about changing the content to suit the learner where Shulman suggests *Transformation* involves: Preparation; Representation; Selection; Adaptation; and Tailoring. *Instruction* is the act of teaching as “organizing and managing the classroom; presenting clear explanations and vivid descriptions; assigning and checking work; and interacting effectively with students through questions and probes, answers and reactions, praise and criticism” (1987, p. 17). *Evaluation* is the check for student understanding. *Reflection* involves looking “back at the teaching and learning that has occurred, and reconstructs, re-enacts, and/or recaptures the events, the emotions, and the accomplishments” (1987, p. 17). *New comprehension* is the new understanding the teacher has gained from going through the above process. Wilson, Shulman and Richert (1987) further developed the model after studying pre-service teachers making the transition into classrooms. Wilson et al confirmed the existence of Shulman’s MPRA and drew the model with linear relationships among the constructs.

This Study

The theoretical framework for this naturalistic qualitative research project is informed by Shulman’s MPRA. This will be used as a theoretical lens to determine if there is evidence of TPR in teachers SCPDF-DPLs. Findings are presented as a multiple case study design where each teacher will represent one case. While conclusions drawn from this small qualitative study may lack statistical significance, the insights gained from the number of case studies will add to the growing body of literature on teachers’ use of ICT. This paper concludes with suggestions for the use of portfolios by practising teachers as a way of capturing evidence of teachers’ Technological Pedagogical Reasoning to help all teachers with using ICT. It adds to the current body of educational literature by presenting a new view on how teachers’ reason with ICT as evidence embedded in their SCPDF-DPLs.

The research aim driving this project is to: *To investigate how teachers reason with ICT and what influences their development of technological pedagogical reasoning.* The larger study involves fifteen teachers employed in Education Queensland. The fifteen teachers have participated in video-simulated recall interviews, prepared concept maps and some have made available their SCPDF-DPLs.

The teachers

The four teachers (n=4) were experienced teachers with at least 10 years of teaching experience. They were all females and were purposively sampled by being known to the researcher. Two of the teachers were early childhood trained, one primary trained and last a secondary trained. All would be considered digital pedagogy leaders in their schools with only one of the four recognized with a part-time position of leadership. Three teachers were working in two P-12 schools and the other teacher was working in a P-7 school and all were located in South East Queensland. All portfolios have been prepared in an online secure learning management system environment where ethics approval has been obtained (from the university, their employer, their school principal and each teacher) for the researcher to be able to access the portfolios). These portfolios include the following types of data:

- Context statement (details about the school);
- Teachers belief statement for using ICT;
- Items with complete descriptions (as two items are required for submission);
- Evidence for each item including: unit overviews; assessment tasks; virtual classrooms; webquests evidence; links to learning objects; lesson plans; photographs; blogs; student work; recorded lessons; national testing data; resources; and grading;
- Individual support statement from school administration (principal or nominee); and
- Mapping of the SCPDF indicators against their evidence.

The teachers’ responses were mapped against Shulman’s MPRA. Data from each teacher was compared and contrasted within and across each to identify similarities and differences.

The Results

The teachers

Teachers are asked to prepare a Belief Statement that showed an influence from educational theory. Analysis of their belief statements, show they are influenced from a mix of educational theorists including Gardner, Lave, Vygotsky and Piaget. With all mentioning various educational learning theories including constructivism, connectivism and situated learning. Key messages included in their statements suggest interesting topics for learning and providing learning experiences that relate to the real world. All emphasized the importance of using digital tools for learning and were able to show evidence in their SCPDF-DPL to support this.

Teachers are asked to map their responses to Value, Relationships, Knowledge and Practice predetermined indicators. Various forms of evidence were provided and mapping to the indicators were included throughout their SCPDF-DPL portfolio. The evidence was constrained to a specific format to ensure all information for assessing the SCPDF-DPL was provided. This included: year level; item overview; reason for inclusion; development and planning; curriculum links; curriculum intent; sequence of learning; teaching and learning approach; my learning's and further reflections and information. All teachers submitted three items of evidence with supporting materials to support their discussion. From this evidence, a review of the embedded Pedagogical Reasoning was performed using Shulman's MPRA as a lens. The results are discussed in the next section.

Pedagogical Reasoning

Comprehension - In preparing a SCPDF-DPL, the teacher needed to decide to use evidence they had already taught or evidence from a unit/lesson they planned to teach. All teachers selected had used Units they had delivered in the twelve months prior to submitting their SCPDF-DPL but it is unknown if the units were purposely completed for inclusion in their SCPDF-DPL. There was significant evidence that they had developed a very detailed comprehension of their units as the required portfolio format covered many headings to explain and justify the inclusion of the item in their SCPDF-DPL.

All teachers had not decided in isolation the content for their units – the secondary teacher was following a national vocational approach with specific competencies while the other teachers had used student initiated units after negotiation with their students. The secondary teacher was using a virtual office environment that was available through a learning management system. The other teachers were using a variety of differing ICT tools available over the Internet or from within a secure web-based environment.

Transformation – All of the teachers selected have been using ICT for a many years and developed a range of lessons that included a wide variety of ICT including: websites; blogs; presentations; video conferencing; claymation animation; simulation environments; learning management systems; and virtual classrooms. Shulman describes *Transformation* as the move from “personal comprehension to preparing for the comprehension of others” (1987, p. 16). Transformation “requires some combination or ordering of the following processes: Preparation, Representation, Selection, Adaption and Tailoring” (Shulman, 1987, p. 16). As all teachers had been teaching at the same level for multiple years, there was evidence of previous *New Comprehensions* to aid in their Preparation, Representation, Selection, Adaption and Tailoring practices. For Teacher A, the students creating their own story was important but adding ICT to that *in classroom* event meant it could be captured on the video camera to extend on the classroom experience. Not only did it add further evidence for assessment but it ‘triple-coded’ the experience (real life, books and Internet) for the students. There was little evidence of Tailoring to suit individual learners needs except as an option for extension work or providing alternative ICT options for students with learning support issues.

Instruction – The SCPDF-DPLs held rich evidence of teachers' instructional activities including photographs, professional observations, examples of student work and lesson recordings. Many unit plans were included but there were not lesson plans to be able to assess the full level of instruction. As part of this research project, these teachers were videoed in the classroom to show their instructional practices with using ICT. Although not discussed in this paper, this data will be used in the final research thesis.

Evaluation - As evidence of checking for student understanding, photographs and examples of student work were included. Teacher A used checklists to capture evidence of student understanding, while Teacher M was able to track student use in the virtual classroom. Teacher K used the lesson to capture evidence of competency with online recording using BlackBoard Collaborate (one of Education Queensland's available online tools).

Reflection – Teachers were asked to evaluate how they used ICT in each evidence item. The following questions were offered as a guide:

- What worked?
- What didn't work?
- What would I change?

There were technological issues highlighted with student use of ICT and failure of the ICT devices. However, teachers commented that it helped build their confidence in using new devices, it allowed opportunities for families to see inside and be better connected to the classroom and that students enjoyed using ICT.

New Comprehension – The SCPDF-DPL asked a question relating to the skills that have been developed with implementing their evidence item. All teachers added that they had developed better understanding of using ICT in their teaching. All comments related to the new understanding they had gained from using ICT in the classroom not solely related to learning a new ICT tool.

Is this Technological Pedagogical Reasoning (TPR)?

There was evidence of Shulman's MPRA as the SCPDF-DPL evidence could be mapped to the model, as shown in data presented in Appendix A. Each element of the model was evident in all four SCPDF-DPLs. Because

the focus of the SCPDF-DPL was on teachers using ICT and this could be mapped to the MPRA, could this be termed Technological Pedagogical Reasoning? Or could MPRA with technology be redefined as TPR? In Shulman's original work there were many references and examples to teachers' work that do not reflect the current use of ICT. Shulman's work was published over twenty-five years ago when ICT did not have a great impact on the practice of teachers. The SCPDF-DPLs do not provide a 'full' picture of the process of TPR, as some aspects of *Transformation* could not be captured in SCPDF-DPLs as it was not the purpose to capture those details in these portfolios. There was also little evidence of *Instruction* unless the teacher was able to capture a recording of the lesson, one teacher did have recordings but the nature of the captured lessons via distance education would not assist in defining TPR for classroom-based teachers.

Other themes identified

The portfolios showed many items of evidence of where students were involved in curriculum decision-making for early years learning (Teacher A, Teacher M). This student-negotiated curriculum was driving the teachers' ICT choices, not innovative ICT driving the curriculum choices. Teachers were making ICT decisions based on their students and how they could engage them in the learning. This was reflected in their Belief Statements where these teachers talked about Constructivism and Vygotsky's Social Development Theory. The second major theme highlighted in this research is the use of ICT in the early years of learning – students aged 4-5 years old. Some evidence items used by teachers show that early years learners are capable of using ICT to make movies, use email, photography, Claymation and using a virtual classroom. Even at this early age, these students were capable of using ICT and that teachers can develop *New Comprehensions* of what is possible with that age range.

Conclusion

This paper has been prepared to report on part of a qualitative study currently being completed. This paper reports on the use of digital portfolios of four experienced teachers. The research project objective is to understand the development of Technological Pedagogical Reasoning (TPR) over a teacher's career and identify the influences on the development of TPR. The research project will look into SCPDF-DPLs, teachers' thoughts about TPR and teachers' interpretations of their teaching with ICT. This paper has been prepared to discuss initial analysis thoughts of SCPDF-DPLs.

The research has collected the voices of four experienced teachers as represented in the SCPDF-DPL online portfolios. The objective of the SCPDF-DPL is to capture evidence of teachers using ICT purposefully and for that to be professionally recognized by their employer. With some modification (some extra questions) a new ICT focused MPRA could be embedded into the SCPDF-DPL to provide a theoretical base. A new framework could provide the basis for a national approach for recognizing ICT using teachers within the teaching profession. This could influence the definition and development of the career stages in the National Professional Standards and that more emphasis is placed on a digital portfolio to be used as evidence for the move from proficient to highly accomplished and to lead teacher. As there is no connection between the SCPDF-DPL and the pre-service teacher digital portfolio, this framework could influence the development of a pre-service digital portfolio that moves to a in-service digital portfolio and is used across a teacher's career rather than being separate requirements. This emphasizes the "role pre-service portfolios can play in creating a base for professional growth"(p. 16) as suggested by Shulman in 1987.

Not all teachers use ICT and as the SCPDF-DPL is not mandatory students will have teachers using ICT and the next year teachers that do not use ICT. These disruptions in ICT learning will be noticeable by students and their parents. Parents that want their children to use ICT will lobby for their children to be placed in ICT-using teachers' classrooms. This novelty factor will continue as fewer teachers are using ICT but this will change as more teachers complete their SCPDF-DPLs and use ICT in their teaching, though the completion of SCPDF-DPL offers no tangible reward or benefits for teachers. This will need to be reviewed to increase the number of teachers completing their SCPDF-DPLs.

This research has focused on Shulman's MPRA as separate to its role in creating Pedagogical Content Knowledge (PCK). Further work will be completed as part of this research project to understand the implications on MPRA and TPR in the development of Technological Pedagogical Content Knowledge (TPACK) (Koehler & Mishra, 2009).

Appendix A

		Pedagogical Reasoning with ICT = Technological Pedagogical Reasoning												
		Teacher 1			Teacher 2			Teacher 3			Teacher 4			
		Early childhood (P)			Early childhood (P-3)			Early childhood			Secondary			
		Item 1	Item 2	Item 3	Item 1	Item 2	Item 3	Item 1	Item 2	Item 3	Item 1	Item 2	Item 3	
Shullman's Model of Pedagogical Reasoning and Action		DPL Heading	Plants	Medieval	Communication	Welcome to my class	Data conferencing	Scientist for a day	Claymation	GXXXX Virtual Classroom (VCR)	Participate in OHS processes	Work effectively with others	Using meetings	
		ICT Approach used	Interactive whiteboard (IWB) Digital photography	Created movie	Email	PowerPoint with digital photographs, video, voice and hyperlinks	Data conferencing Teleconferencing	Digital storytelling	Claymation animation	Virtual classroom - This wasn't a specific unit but rather an extra for the classroom	Virtual office Web conferencing Learning management system	Virtual course Wiki Learning management system	Web conferencing Email	
Comprehension - Understand what is to be taught		Item description Curriculum links	Early maths Language learning	Language and communication Active learning process Health and physical learning Early Maths Social and personal learning	Social and personal learning Health and physical learning Language learning and communication Early maths Active learning processes	English SOSE	Language learning and communication Early maths Fine motor Social and personal learning	English Science	Science	Provide a safe and secure environment	Competency based requirements Virtual office already designed with applicable content Situating learning	Competency based requirements Virtual classroom with applicable content Constructionist learning	Competency based requirements Discovery learning approach	
Transformation - taking subject matter and understanding student minds and motivations	Preparation - examining and critically interpreting the materials	How this task was developed Central focus of the student learning Teaching and learning approach used and why	Student initiated idea Student negotiated curriculum Play based Intellectual quality Connectedness	Idea student initiated Student negotiated curriculum Play-based Whole language Triple coding Connectedness	Teacher initiated Knowledge integration	Teacher initiated Multimodal text	Teacher initiated Distance teaching approach	Teacher initiated Natural world investigation	Student negotiated curriculum	Teacher developed materials to assist students in gaining competency	Teacher developed materials to assist students in gaining competency	Teacher developed materials to assist students in gaining competency		
	Representation - thinking alternative ways of teaching	Why this is in my portfolio Evidence provided for this item	Display large images on IWB Triple code - real life, internet and books	ICT became whole learning experience Used ICT to solve problems eg costume consistency	ICT an avenue for students to use a range of communication tools	Students opportunity to communicate and share Learning by doing Planning and making	New approach on old paper based way to communicate	ICT to record experiment to be able to show parents and future students	Student engagement in a topic Ability to communicate work	Using virtual office and web conferencing through distance learning	Using virtual classroom and web conferencing through distance learning	Using email as a communication method to simulate an office communication Web conferencing to simulate an office meeting		
	Instructional Selection - teaching strategy	Item description Teaching and learning approach used and why	Research Labelling plants and seeds Science experiement	Research Electronic storyboarding Costume capture Movie making Editing Premiere invitations Premiere showing	Roleplay Communication wall of fame Travelling pet Email	Intel teach to the future module - Creating student multimedia presentations	Data conferencing Teleconferencing	Experiement Digital video Digital photography Software editing	Video Digital photography Voice recording Story plan	Online strategy	Online strategy	Online strategy	Virtual work environment	
	Adaption - fitting material to students	When this item was implemented Year level and student context	2006	2007	2007	2006	2006	2006	2006	2008	2008	2011	2011	2011
	Talloring - To suit individual students							Photo Story used as extension for some students and support for others		VCR provides content as an extension to classroom learning VCR allows for different lerning styles	ASD student issues addressed through Task Planning Sheet	ASD student issues addressed through Task Planning Sheet		
Instruction - the act of teaching		Evidence provided for this item	Unit plan Photographs - student work	Unit plan Student work Movie Photographs of work Invitations	Unit plan Email tasks Photographs Communication wall of fame	Powerpoint template and examples Student work	Meeting examples Video of lesson	Teacher instruction Student experient	Clamation video Video Story plan Photo Open day photo	Online access	Online access	Online access Web conferencing	Email Web conferencing	
Evaluation - checking for understanding		How as this item assessed	Observing child with ICT Photgraphs as evidence of professional observations	Observing child participating in Movie creation Photgraphs as evidence of professional observations Checklist for specific tasks	Observation Reflect with students individually Digital photos Checklist for letter recognition	PowerPoint presentations Feedback from student	Observations Listening to students	Written and verbal recall of information, material and process	Observations Photographs Interview	Able to track student usage	Competency demonstrations	Competency demonstrations	Competency demonstrations	
Reflection - looking back at teaching and learning		Why was this item worth doing: 1. what worked 2. what didn't work 3. what I would change Further reflection or other information	Revisit work completed Use of camera difficult for students Time to test equipment Use photography more More PD	Learnt software use Confidence of using IWB Costume making and consistency was a problem Technological problem with video camera	Communication wall of fame Linking families with the class Blog idea was not suitable Email addresses for parents collected at start of year	Intel Teach to the Future - Module on creating student presentations Use a VCR to share online	Learnt how to use NetMeeting Design lessons in on online environment	Software use	More understanding of MovieMaker Better understanding of doing claymation Good for students Good to communicate students work to others	Opens lines of communication with families	Students enjoy the virtual work space Relationships with developers and other users	Detailed planning best for successful students Students liked the activity Students questioned the time to complete the activity	Pleased with realism of meeting and students approach Students motivated to participate	
New Comprehensions - learning from experience		Skills I developed by doing this item	Extension topics Use digital camera more	Software use Use of video cameras by students	Email communication with parents	Using Powerpoint with students	Students learnt the technology very quickly	Use of digital storytelling for experiments	Peoples interest in children using technology	VCR use for teaching	Using a virtual office for teaching competencies	Organising student into effective teams Virtual classrooms	Realistic student experiences	

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